INDIA ENERGY FORUM

TOTAL ENERGY

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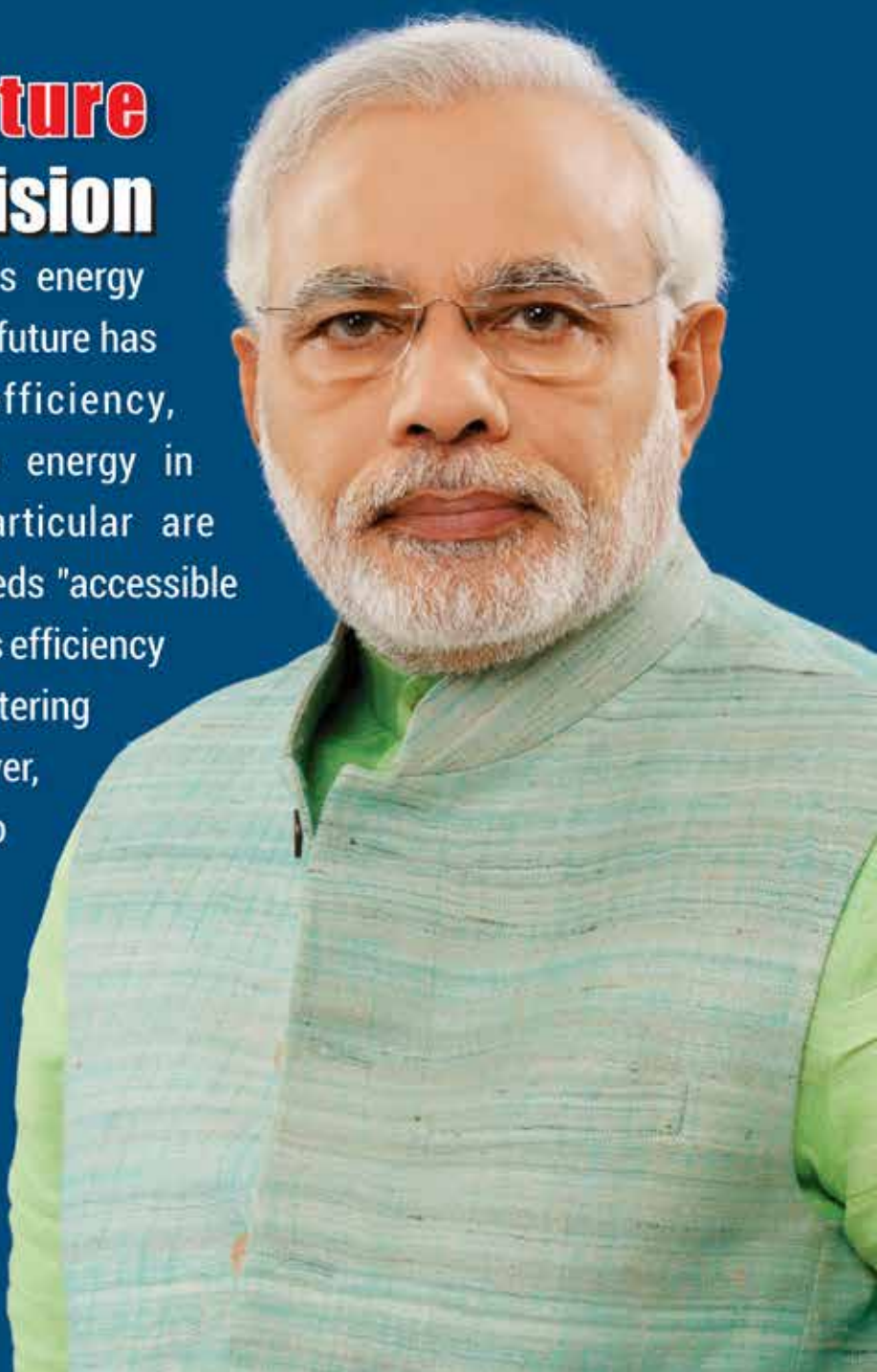
India's Energy Future

PM's Vision

The Prime Minister said India needs energy security. "My vision for India's energy future has four pillars. Energy access, efficiency, sustainability and security." While energy in general and hydrocarbons in particular are important part of the vision, India needs "accessible and affordable tools," he said. "It needs efficiency in energy use." The world, he said, is entering an era of energy abundance. "However, 1.2 billion people don't have access to electricity. Many more do not have access to clean cooking fuel. We must ensure that this situation is not exploited to the determent of underprivileged. People must have access to clean, affordable and sustainable supply of energy."



INDIA
ENERGY
FORUM

OUR VISION

To Contribute Effectively for Development of Sustainable Energy Security for India

OUR MISSION

- To help evolve a dynamic national energy policy
- To provide a platform for deliberation and recommendations towards development of competitive energy sector.
- To advise and assist the stakeholders in formulation and implementation of policies and programmes in energy sector.
- To promote a favourable regulatory framework for development of energy sector.
- To contribute towards optimal, efficient and sustainable use of energy resources.

CALENDAR OF EVENTS FOR 2018

- **7th Coal Summit and Expo**
  Theme: "Can India Grow Sustainably without Green Coal"
  5th & 6th September, 2018; Hotel Ashok, New Delhi
- **10th Nuclear Energy Conclave**
  25th October 2018, Hotel Le Meridien, New Delhi
- **21th India Power Forum**
  27th November 2018, Hotel Le Meridien, New Delhi
- **18th Renewable Energy Summit**
- **16th Petro India**
- **Chennai Conference**
- **Urja Vichar Manch on Last Friday of every month.**

From the Editor

India to Launch Natural Gas Trading Hub

In a welcome move "The Government has envisaged ushering into a gas-based economy by increasing the share of natural gas in the primary energy mix of the country from current level of about 6 per cent to 15 per cent by 2030." For this, the thrust is on increasing the availability of natural gas by enhancing the domestic production, encouraging the import of Liquefied Natural Gas (LNG), completion of national pipeline grid and speedier roll out of City Gas Distribution network in the country.

The PNGRB has been asked to initiate steps for framing of necessary regulatory framework to enable the establishment and operation of a Gas Trading Hub.

The target for launch of the gas trading hub has been set for October 2018. A hub is used as a central pricing point for a network that could aid better price discovery for domestic as well as imported gas. It isn't clear if the government would abandon fixing the gas price and allow the rates to be discovered on the hub.

Globally the world's largest natural hub is Henry Hub in USA. Natural gas hubs tend to be at the heart of gas infrastructure networks such as pipelines and liquefied natural gas (LNG) terminals. The hub is used as a central pricing point for the network's natural gas. In some cases, a financial derivative contract is priced off gas delivered at this point as well. Establishing a gas trading hub takes time, investment and Political Will to let prices develop without regulatory intervention. Gas hubs require pipeline networks and storage sites that allow supplies to be traded and moved about at short notice.

Diverse sources of gas supply, including from domestic output, pipeline imports and overseas LNG shipments, are seen as favorable to avoiding domination by a few producers. A strong consumer base, with competing buying interests - for example, from household, power and industrial consumers - is also seen as crucial to developing a diverse market place.

Regulation allowing domestic and foreign participants to trade and access pipelines and storage facilities is also seen as essential to establishing a gas hub. Participants also need to know they can rely on government not to intervene when prices go against local interests. An oversupply of gas is also seen as necessary in the early stages of developing a trading hub.

China also wants to establish gas trading hub that will become price benchmarks for Asia.

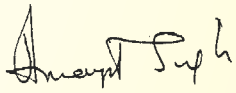
The country's diverse supplies, including domestic production, pipeline imports and LNG shipments, and its vast, growing consumption are seen as beneficial for a gas hub. However, strong government intervention - as seen in coal markets - the dominance of state-owned energy majors and underdeveloped gas infrastructure are seen as hurdles.

Japan, the world's biggest importer of LNG, is trying to establish deliveries to its shores as Asia's LNG price benchmark. Its lack of domestic output, however, and a falling demand trend due to population decline and competition from other fuels, are seen as stumbling blocks.

Mr. Sashi Mukundan, Regional President and Head of Country, India, BP Group, says "I strongly believe market conditions need to exist where the barriers to entry and exit are non-existent, adequate infrastructure for customers to access supply is available, and access is made easy and non-discriminatory. This along with a digital platform that brings producers, suppliers, marketers, traders, infrastructure providers and customers together and integrate the market in a real time and in an open and transparent manner.

"There is also a need for unbundling — transport and gas marketing businesses. Initially, both can functionally be separated and later separated at entity level," says Mr. Rajesh Kumar Mediratta, Director Business Development of Indian Energy Exchange, adding that in case of imbalance — for example scheduled supply is different from actual, such imbalances should be priced or treated rationally."

A tough task, but doable is how all stakeholders see it.



Amarjit Singh

Sectoral News

Affordable Energy to All

Responsible Pricing a Must: PM

In a subtle message to oil cartel OPEC, Prime Minister Narendra Modi said efforts to artificially distort prices are self-defeating, and a global consensus must be built for responsible pricing to provide affordable energy to all. With ministers from Organization of the Petroleum Exporting Countries (OPEC), including kingpin Saudi Arabia, Iran and Qatar in audience, Modi said artificially distorting prices causes undue hardship particularly to importing countries. “The world for too long has seen oil prices on roller coaster. We need to more responsible prices which balances interest of both consumer and producer,” he said addressing the 16th International Energy Forum (IEF) Ministerial meeting here. The world, he said, needs to move towards a transparent and flexible market for both oil and gas. “Only then we can serve the energy need of the humanity in an optimum manner.”

India, the world’s third largest oil consumer, is 80 percent dependent on imports to meet its needs. Stressing on “mutually supportive” relationship between producers and consumers, Modi said it was in the interest of producers that other economies keep growing steadily and rapidly to ensure growing energy market. “Efforts to artificially distort prices are self-defeating as history has shown us. They also cause undue hardship, particularly to those at the bottom of the pyramid in developing and least-developed countries. Let us use this platform to build a global consensus on responsible pricing. This will serve the mutual interest of both consumers and producers,” he said. His statement comes days after it was reported that Saudi Arabia and Russia were looking at extending a short-term pact to curb oil supplies with a view to check prices. Russia, not a member of the OPEC, has worked alongside the 14-member group since January 2017 after a crash in crude prices.

Mr. Modi said India is committed to combating climate change curbing emission and ensuring sustainable future. The launch of International Solar Alliance is a stand to fulfil this commitment. The IEF ministerial is being attended by energy ministers from producing and consuming nations as well as heads of international organisation and CEOs of global majors. “The world is seeing a great transition in energy supply and consumption. Consumption growth has shifted to non-OECD countries, Middle East, Africa and developing nations,” he said.

Solar energy becoming economical is changing supply paradigm, while abundant availability of natural gas globally has increased, he said. Coal may gradually go out of favour as a major contributors to primary energy and adoption of electric vehicles will be the centre of talks. “Last month, I came across energy forecast prepared by an agency according to which India will be the key driver of global energy demand in next 25 years. India’s energy consumption will grow by 4.2 percent a year for next 25 years. This is fastest among major world economies. “The report also mentioned that gas demand will triple by 2040. The number of electric vehicles will rise to 320 million by 2030 up from 3 million today,” he said. Stating that India is the fastest-growing large economy of the world, Modi said ADB, IMF and World bank are estimating India to grow at 7-8 percent in near future.

The high growth has been achieved with low inflation and fiscal deficit under control. “This macroeconomic stability is boosting both consumption and investment in the economy,” he said.

Bid Norms for CNG, PNG Retail Licence Changed

After 'one paisa' bids spoilt the initial auction rounds, oil regulator PNGRB has radically changed the bidding parameters for obtaining a licence to retail CNG and piped cooking gas in cities. The Petroleum and Natural Gas Regulatory Board (PNGRB), in the new regulations released, said future auctions would be conducted by asking companies to quote the number of CNG stations to be set up and number of domestic cooking gas connections to be given in the first eight years of operation. Companies quoting higher number of CNG outlets and piped natural gas (PNG) connections would get more marks, it said.

The tariff they will charge for transportation of CNG and piped gas or PNG within the city, which previously was the deciding criteria for winning a licence, has been given just 10 per cent weightage. Number of CNG stations and PNG connections to be released command 70 per cent of the bidding weightage, the PNGRB said in an amendment to the Petroleum and Natural Gas Regulatory Board (authorising entities to lay, build, operate or expand city or local natural gas distribution networks) Regulations, 2008. Besides, bidders will also have to quote how much pipeline they would lay on winning the licence. PNGRB has so far held eight rounds of bidding where companies were asked to quote the tariff for pipeline that carries gas within the city limits.

This bidding criteria did not include the rate at which an entity would sell CNG to automobiles or piped natural gas to households using the same pipeline network, leading to companies offering one paisa as tariff to win licences. Entities having experience of at least one year in operation and maintenance of a city gas distribution (CGD) network and having "adequate" number of technically qualified personnel would be eligible for bidding, it said.

Companies having a net worth of no less than Rs 150 crore can bid for cities with population of 50 lakh and more while the same for cities with population of 20 lakh to 50 lakh has been proposed at Rs 100 crore.

The net worth eligibility goes down with population, with a Rs 5 crore net worth firm being eligible to bid for cities that have less than 10 lakh population. PNGRB said any entity security CGD licence would have to enter into a firm natural gas supply agreement with a natural gas producer or marketer in a transparent manner on the principle of 'at an arm's length' within 180 days of winning a license. The authorised entity has to achieve financial closure within 270 days from date of grant of licence. The winning company would have 8 years of marketing exclusivity in the given city. Current licences provide for 5 years of exclusivity.

India to Launch Gas Trading Hub

The government plans to launch a natural gas trading hub by October, creating an Indian gas benchmark which will spark a surge in consumption of the cleaner-burning fuel. Oil regulator PNGRB has sought bids to hire a consultant to help develop a regulatory framework for operationalising the gas trading/exchange hub. "In order to further boost the consumption of natural gas in the country, Government is considering the establishment of a Gas Trading Hub / Exchange (GTHE), where natural gas can be traded, and supplied through a market-based mechanism instead of multiple formula driven prices," PNGRB said in the tender floated for hiring the consultant.

Currently, the government fixes the price of the bulk of domestically produced natural gas. The rate, arrived at using price prevalent in gas-surplus nations of US, Canada, UK, and Russia, is USD 3.06 per million British thermal unit for six month period beginning April 1. In comparison, the cost of imported LNG into India

is around USD 7.5. “The Government has envisaged ushering into a gas-based economy by increasing the share of natural gas in the primary energy mix of the country from current level of about 6 per cent to 15 per cent by 2030,” PNGRB said. For this, the thrust is on increasing the availability of natural gas by enhancing the domestic production, encouraging the import of Liquefied Natural Gas (LNG), completion of national pipeline grid and speedier roll out of City Gas Distribution network in the country.

The Petroleum and Natural Gas Regulatory Board (PNGRB) said the oil ministry has asked it to initiate steps for framing of necessary regulatory framework to enable the establishment and operation of a GTHE. The regulator said it wants to hire a consultancy firm to provide assistance in carrying out a detailed study on various pre-requisites. PNGRB would visit USA, UK, and Australia, where the gas trading hub is successfully operating, to decide if there is a need to amend existing regulations. The target for launch of the gas trading hub has been set for October. A hub is used as a central pricing point for a network that could aid better price discovery for domestic as well as imported gas.

Natural Gas Trading Hub

PNGRB to Act as Market Regulator Proposed

India’s downstream oil and gas regulator Petroleum and Natural Gas Regulatory Board (PNGRB) is set to take up the role of the market regulator for the natural gas sector, when the planned natural gas trading hub comes into being, much on the lines of the capital markets regulator Securities and Exchange Board of India (SEBI).

“The government is quite eager to establish the trading platform and the hub as soon as possible and has entrusted the work to suggest overall structure of the platform, the path forward and its pre-requisites to a professional firm engaged through Oil Industry Development Board (OIDB). PNGRB is expected to play the role of the market regulator, similar to SEBI in case of stock exchanges,” PNGRB Chairman D K Sarraf told in an interview.

He added that a different entity would act as system operator, like POSOCO for power exchanges. And PNGRB is in the process of hiring a consultant for drafting requisite regulations. “We are meeting global gas exchange regulators and industry players to gain international experience on this. Lack of adequate gas pipelines and volumes to begin with may be an issue. However, that should not deter us from going ahead as opportunity cost of waiting for ideal conditions is huge,” Sarraf said.

PNGRB is going to work loosely with OIDB for making the final framework for the gas exchange as a trading hub and the larger gas market. Oil Minister Dharmendra Pradhan had, at an industry event in in October last year, said the ministry is working on creating a platform for trading of natural gas and intends to send a proposal in the cabinet soon. The main idea behind the move is to set up a pooling mechanism of the kind that exists in the fertilizer sector and using a transparent market-driven mechanism to arrive at gas price, Pradhan had said.

The plan to establishing a natural gas trading platform is part of a larger effort by the government to build a vibrant and transparent gas market in India, according to Sarraf. “The idea is to create an ecosystem where the competing buyers would be able to buy gas from competing sellers and transport the same from gas source to the place of their requirement by getting a non-discriminatory access to the pipeline capacity. This end-to-end solution would reduce customer risk and enhance customer confidence on gas as an alternate fuel and feed,” he said.

India’s Oil Import Bill to Jump By 25 Per Cent in FY’18

India’s oil import bill is likely to jump by a quarter to USD 87.7 billion in the current fiscal year as international oil prices have surged. India had imported 213.93 million tonnes (MT) of crude oil 2016-17 for USD

70.196 billion or Rs 4.7 lakh crore. For 2017-18, the imports are pegged at 219.15 MT for USD 87.725 billion (Rs 5.65 lakh crore), according to the latest data available from oil ministry's Petroleum Planning and Analysis Cell (PPAC). India relies more than 80 per cent on imports to meet its oil needs. During first 11 months of current fiscal (April 2017 to February 2018), the country imported 195.7 MT crude oil for USD 63.5 billion. The basket of crude oil that India imports averaged USD 55.74 per barrel in the April-February period as compared to USD 47.56 a barrel in 2016-17 and 46.17 in 2015-16. "April 2017-February 2018 crude oil imports are based on actuals and for March 2018, crude oil imports are estimated at crude oil price USD 65 per barrel and exchange rate Rs 65 to a US dollar," PPAC said. Every dollar per barrel change in crude oil prices impacts the import bill by Rs 823 crore (USD 0.13 billion). The same is also the impact when currency exchange rate fluctuates by Re 1 per US dollar.

Domestic crude oil production was almost flat at 32.6 MT in April-February. It was 36 MT in whole of 2016-17 and 36.9 MT in the previous fiscal. As against this, domestic consumption has been rising -- from 184.7 MT in 2015-16 to 194.6 MT in 2016-17. It was 186.2 MT in first 11 months of 2017-18, according to PPAC. Data also showed that the share of High Sulphur crude in total crude oil processed increased to 75 per cent during April-February, from 72.4 per cent in the corresponding period a year ago. The trend indicates the increasing complexity of state-run refineries.

400,000 Tripura Families to Get Free Cooking Gas Connections under Ujjwala

Over four lakh poor families in Tripura will be provided free cooking gas connections under the Pradhan Mantri Ujjwala Yojana to ensure clean energy access to all and to protect the health of rural women, an IOC official said. "Our target is to provide free Liquefied Petroleum Gas connections under the Pradhan Mantri Ujjwala Yojana (PMUY) to over 400,000 poor families in Tripura," Indian Oil Corp Chief General Manager Uttiya Bhattacharyya told the media here. Chief Minister Biplab Kumar Deb flagged off 50 mobile publicity vans to help PMUY benefits to reach across Tripura.

India Will Overtake China as Largest Market for Energy

BP Energy Outlook

India will overtake China as the largest growth market for energy by late 2020s with the country's energy consumption growing by more than 4.2 per cent per annum, the fastest among all major economies of the world, according to BP Energy Outlook 2018. "India's demand growth of 165 per cent, nearly three times the overall non-Organisation for Economic Co-operation and Development (OECD) growth of 61 per cent, also outpaces each of the BRIC countries: China (+ 41 per cent), Brazil (+ 60 per cent), and Russia (+6 per cent)," the highly-cited report estimates.

India's overall energy consumption will rise to 1,921 Million Tonne of oil equivalent (MToe) in 2040 from 724 Mtoe in 2016 with an average per annum growth rate of 4.2 per cent, according to the report. The increase in India's energy consumption will push the country's share of global energy demand to 11 per cent by 2040 from 5 per cent in 2016, accounting for the second-largest share of the BRIC countries.

Demand for renewables will see the highest growth of 1,409 per cent to 256 Mtoe in 2040 from 17 Mtoe in 2016, with an annual growth of 12 per cent. The renewable energy share in India's energy mix is also slated to increase to 13 per cent in 2040 from 2 per cent in 2016.

Primary Energy consumption (Units in Million tonne of oil equivalent)

Primary Energy	Consumption 2016 (Mtoe)	**Consumption 2040 (Mtoe)**	Energy Share 2016	**Energy Share 2040**	**Overall Growth**
Oil	212	**485**	29%	**25%**	**129%**
Gas	45	**128**	6%	**7%**	**185%**
Coal	412	**955**	57%	**50%**	**132%**
Nuclear	9	**44**	1%	**2%**	**389%**
Hydro	29	**52**	4%	**3%**	**80%**
Renewable	17	**256**	2%	**13%**	**1406%**
Total	724	**1921**			**165%**

Source: BP Energy Outlook 2018

Nuclear energy demand will witness the second-highest growth among all energy sources, growing by 412 per cent to 44 Mtoe in 2040 from 9 Mtoe in 2016. However, with an annual growth of 7 per cent, nuclear energy's share in the country's total energy mix will only grow to 2 per cent in 2040 from 1 per cent in 2016. Demand for natural gas will grow by 185 per cent to 14 Billion cubic feet (Bcf) per day in 2040 from 5 Bcf per day in 2016. With an annual growth of 4.5 per cent, natural gas' energy share in the country's total energy mix will grow to 7 per cent in 2040 from 6 per cent in 2016. Also, demand for coal will grow by 132 per cent to 955 Mtoe in 2040 from 412 Mote in 2016. With an annual growth of 3.6 per cent, coal's energy share in the country's total energy mix will decline to 50 per cent in 2040 from 57 per cent in 2016.

The report also said that the demand for oil, including petroleum products, will grow by 129 per cent to 10 Million barrels per day (Mbpd) from 4 Mbpd in 2016.

With an annual growth rate of 3.5 per cent, oil's share in the country's total energy mix will decline to 25 per cent in 2040 from 29 per cent in 2016.

India's Hydrocarbon Production Growth
(Units in Million tonne of oil equivalent)

Full	Production 2016 (Mtoe)	Production 2016 (Mtoe)	**Change**
Oil	40	24	**(40%)**
Gas	25	49	**96%**
Coal	289	734	**154%**

Source: BP Energy Outlook 2018

The report predicts that India's energy mix is estimated to evolve slowly with fossil fuels meeting 82 per cent of demand in 2040 down from 93 per cent in 2016.

It added that power consumption will more than treble, growing by over 241 per cent, with coal remaining the dominant fuel source. The fuel's share of generation is seen dropping to 64 per cent in 2040 from from 77 per cent in 2016 while renewables' share rises to 23 per cent from 5 per cent in 2016.

Promoting Strategic Energy Security Goals - India Key Partner

Tom Vajda, USA

India received its first LNG cargo from the US under a long-term supply deal, the Trump administration has said that New Delhi is a key partner in promoting its strategic energy security goals. GAIL India has contracted 3.5 million tonnes per annum of liquefied natural gas (LNG) from US energy firm Cheniere Energy's Sabine Pass liquefaction facility in Louisiana. The first cargo from the project arrived at Dabhol in Maharashtra.

"The US views India as a key partner in promoting our shared strategic energy security goals regionally and globally, and we are working closely with India to find policy and regulatory solutions to scale up investment for a diversified energy economy,"said Tom Vajda, the Acting Deputy Assistant Secretary of State for South Asia.

"Our partnership with India on energy is a great example of the US' 'all of the above' approach to energy, which includes traditional sources like coal, oil, and gas, as well as renewables and nuclear," Vajda wrote in a State department blogpost.

"This LNG delivery is the first of many that will ship from Cove Point in Maryland and Sabine Pass in Louisiana as part of two 20-year contracts with India's Gail Limited," he said.

Vajda said American energy is central to its National Security Strategy, which notes that "exports of our energy resources, technologies, and services help our allies and partners diversify their energy sources and brings economic gains back home."

Boosting production from Mature Fields

Oil and Natural Gas Corporation Ltd (ONGC), has invited a global tender for undertaking work to boost production from mature fields under Production Enhancement Contracts (PEC).

The ONGC had issued in a Notice Inviting Tender in January, Schlumberger Asia Services Ltd, Halliburton Offshore services and Baker Hughes Singapore PTE Ltd have been pre-qualified. “We had floated an Expression of Interest (EOI) in June last year calling for suitable service providers with expertise, financial capability and proven track record of increasing production from mature fields. We received interest from nine companies of which we have qualified three, including Schlumberger, Halliburton and Baker Hughes,” said a senior ONGC executive who did not wish to be identified.

He added that in the next stage, a pre-bid round will take place later this month and the company expects it will be able to award the contract by the end of the second quarter (July-September) of current fiscal.

The EOI floated in June last year states that the duration of the PEC will be 15 years with a fixed service fee to be paid for any incremental oil or gas produced over the baseline. Also, the service provider will have to make its own investments to increase the production without any interference of monetary support from the company. “In fields which are ageing and mature, you have to continue investing more to maintain the baseline production. PEC contracts will help us shift the risk on the service provider, who will have to invest and increase production for these fields. We are not looking at other fields at the moment,” another senior ONGC executive said. ONGC’s onshore crude oil production increased by 2 per cent to 6.064 Million Tonne (MT) for the financial year 2017-2018 as compared to the previous fiscal. The company’s natural gas production from onshore fields rose 8 per cent to 6 Billion Cubic Meter (BCM) last fiscal.

15th Petro India Conference

16th, March, 2018, Hotel Le Meridien, New Delhi
Future of Mobility in India: Outlook & Challenges

In Partnership with ORF, The Forum Organised its Annual Flagship Event 15th Petro India Conference on 16th March, 2018 at New Delhi, the Theme was “Future of Mobility in India: Outlook & Challenges”. The conference brought together experts from various domains and organisations for a holistic debate - Senior most experts from SIAM, FIPI, SMEV, NIAS, III D, IOC R&D, Strategy &, PwC, WRI, EIL, Petronet, Maruti, Hero Honda and media like ET and others shared their asessment of outlook and challenges. We thank such eminent experts for sharing their views.

Mr. Anil Razdan, President IEF gave welcome address and said that Future Mobility has taken centre stage in the national debate in the country. This event has been designed to cover views of all the stake holders.

Mr. Ashok Dhar, Director, Observer Research Foundation, Kolkatta gave a well-researched presentation on the theme.

Dr. Rajiv Kumar, Vice Chairman, NITI Aayog inaugurated the conference and said that there is

need for a policy to promote electric vehicles in India and all the stake holders must combine to deliver a transportation model for future that meets country global reality. He said that Aayog is close to identifying the principal driver of this policy.

Mr. Sunjoy Joshi Chairman, ORF gave Concluding remarks.

Session I : Future of Mobility : Perspectives from the Automobile Sector

The Session was chaired by Mr. J. M. Mauskar, Advisor, Observer Research Foundation. The other Distinguished Speakers were Mr. P K Banerjee, Deputy Executive Director, SIAM; Dr. Tapan Sahoo, Sr. Vice President (R&D), Maruti Suzuki India Ltd.; Mr. Sohinder Gill, Global CEO, Hero Electric & Director (Corp. Affairs), The Society of Manufacturers of Electric Vehicles; and Mr. Christoph K. Klunker, Senior Fellow, ORF.

Session II : Future of Mobility : Policy Options and Challenges

This Session was chaired by Mr. S. C. Tripathi, Former Secretary, Petroleum & Natural Gas & Patron, India Energy Forum. The other Distinguished Speakers were Mr. Girish Sirodkar, Partner, Strategy &, PwC; Dr. R. K. Malhotra, Director General, FIPI; Dr. Rumi Aijaz, Senior Fellow, ORF; and Prof. R. Srikanth, National Institute of Advanced Studies

Session III on Future of Mobility : Perspectives from the Refining Sector

This Session was chaired by Mr. G. C. Chaturvedi, Chairman, Oil & Gas Group, India Energy Forum and Former Secretary, Petroleum & Natural Gas. The other Distinguished Speakers were Ms. Vartika Shukla, Executive Director (R&D), EIL; Mr. N. K. Bansal, Director (Refining), FIPI; and Dr. SSV Ramakumar, Director (R&D), IOC. The Rapporteur was Mr. Y R Mehta, Treasure, IEF & Former Director, GAIL

Session IV: Future of Mobility : Transition to Low Carbon Fuels

The Session was chaired by Mr. T. K. Arun, Editor, The Economic Times. The Other Distinguished Speakers were Prof. L. M. Das, Emeritus Prof., IIT- Delhi. The Mr. Amit Bhatt, Strategy Head (IUT), WRI; and Mr. Pankaj Wadhwa, Senior Vice President, Petronet LNG.

Soft copy of Mr. Dhar's Presentation available on request.

India's Development Goals

Energy Efficiency, Green Concerns Key: R.K. Singh

Edited excerpts from Ministers address at Mint Conference

Energy efficiency and protection of the environment will remain at the heart of India's development goals even as Asia's third largest economy tries to improve living standards and ensure access to electricity for all, Power and Renewable Energy Minister R.K. Singh said. He added that while enhancing access to energy and raising per capita consumption of energy were priorities, India will play a responsible and global leadership role in ensuring that future generations inherit a healthier environment.

The government's economic development agenda will result in per capita consumption of energy going up by about three times from 1,200 units at present by 2025-2030, which will also result in an increase in installed power generation capacity. "We need development to bring people out of poverty. Every country has a right to develop and we shall develop. But at the same time, we have a responsibility and we are conscious about it. It is this consciousness that drives us to embrace energy efficiency and to scale up renewable energy capacity," said the Minister. Singh also expressed confidence that India will achieve about 200 gigawatts (GW) renewable energy capacity before 2022, exceeding the target of 175GW.

The Minister said the potential of energy efficiency in cutting down avoidable consumption was immense. India is on a massive drive to replace incandescent bulbs with light emitting diode (LED) bulbs and is installing LED street lights. Singh said that India has already replaced over 5 million street lights with LED bulbs. India has made a commitment to contribute to global efforts to cut down carbon emissions. In October 2015 just before the Paris Climate Agreement, India announced its climate goals—or intended nationally determined contributions (INDCs)š—pledging to reduce the emissions intensity of its gross domestic product (GDP) by 33-35% by 2030 from 2005 levels, and achieve 40% of its cumulative electric power of around 350GW installed capacity from non-fossil fuel-based energy resources.

Energy efficiency is central to India's INDCs which state that the nation would aim to promote energy efficiency in the economy, notably in industry, transportation, buildings and appliances. For instance, about 144 old thermal stations have been assigned mandatory targets for improving energy efficiency.

Discoms to Pay for Unplanned Outages

RK Singh

Power utilities may soon be paying for unannounced power cuts. The Ministry of Power proposes to amend the Electricity Act and come up with a fresh tariff policy to ensure that consumers are not taken for a ride. Minister of State (Independent Charge) for Power RK Singh, told that until now the Electricity Act has been deficient in protecting the rights of the people as it does not go beyond providing connections. "But we are remedying that. It is the right of the consumer to know why load shedding is happening or tariffs are higher. The utilities can't do these things randomly," he added.

The amendments to the Electricity Act will focus on assuring cheap and quality power to consumers, he said. "We have gone through the proposed amendments. Some suggestions have been made and now we hope to place them before Parliament in the Monsoon Session," he said.

While the amendments to the Electricity Act will require Parliament's nod, the introduction of the new tariff policy will only need the Union Cabinet's approval. Singh also said that the new tariff policy will be implemented under the existing Electricity Act. "The Act says that the Centre will come out with the tariff policy. We have one already; now, we are coming out with changes to it. The policy will also provide for Direct Benefit Transfer of power subsidy."

Need EV Policy for India-Specific Transportation Model

Dr. Rajiv Kumar

Niti Aayog Vice Chairman Rajiv Kumar said recently that there is need for a policy to promote electric vehicles (EVs) in India and the think tank is well-placed to develop it. India cannot completely depend on market or ministries working in silos to deliver a transportation model for future that meets the country's ground reality, he added.

"We need a policy to put in all together (charging infrastructure, battery swapping) and we can't just have people running around on their on their own and ministries working in silos," Kumar said here at the India Energy Forum-ORF.

He further said, "I think Niti Aayog will be well-placed to develop this policy, and I hope that will be the task we will fulfil going forward." "There has been a lot of work in the government, cabinet note has been prepared... We are close to identifying principal driver of this policy," he added.

Stating that India needs to move to zero-emission vehicles as soon as possible, the Niti Aayog vice chairman pointed out that India can be a leader in electric mobility going forward as the country produces lots of car.

"We have vehicle manufacturing capabilities. We are the strongest software producing economy in the world, it can help us in making modern, efficient, shared electric mobility transport system," he said.

Noting that nearly 90 per cent of the vehicles on roads were two-and three-wheelers, Kumar said, "We will have to focus first on how to get our major transport vehicle segment, which is two/three-wheelers and public transport buses, to shift to electric mobility and not worry too much about cars."

He also insisted that the government will have to play an important role in encouraging EVs. "The government can be big aggregator of electric vehicle demand... I think municipality and state governments should also encourage electric vehicles," Kumar observed. He further said that EV movement or zero-emissions vehicle movement can also be a driver of innovations in this country.

Zero-Emission Vehicles

NITI Aayog has submitted a draft Cabinet note on developing a strategy for zero emission vehicles and ancillary technology, Parliament was informed. By Minister of State for Planning Rao Inderjit Singh that committees, to be headed by the respective secretaries, will decide issues pertaining to finalisation of non-fiscal incentive; promotion of last mile connectivity; electric mobility in public transport; technology development of R&D electric mobility; charging infrastructure for electric mobility, and demand and supply side incentive.

"Niti Aayog has also submitted a draft cabinet note on developing a strategy to scale up transformative mobility for uptake of zero emission vehicles and ancillary technology," he added. Replying to a separate query, Singh said that NITI Aayog has prepared a report titled 'Roadmap for Make in India in Body Armour'. He said the major recommendations made in the report covered issues such as promotion of indigenous manufacturing of

body armours including raw material, creating more testing facilities, adoption of Indian Standards in Body Armours, setting up of Centres of Excellence for pursue of R&D in nano-technology materials for lightweight armours and simplification of permanent process.

Power Sector Woes

Is UDAY a Panacea?

The belief that Ujwal Discom Assurance Yojana (UDAY) is an all-encompassing solution for power sector woes has now been shelved. As the recent central bank circular triggered fears of more bad loans tumbling out of banks, stakeholders are taking a closer look at the resolution process. State Bank of India chairman has told that the kind of improvement which was envisaged under UDAY has not taken place. Launched in 2015, UDAY is aimed at reviving electricity distribution companies (discoms), improving demand and, in the process, resolving the woes in the sector.

It took off well, with a large number of states joining the scheme. Several states took over the debt of their utilities, improving their liquidity situation, even as progress on other key parameters such as reduction in aggregate technical and commercial losses lagged. Anecdotal evidence also suggests an improvement in the power supply situation.

Still, with the stuck projects remaining sizeable and the threat of bad loans looming large, questions are now being raised about the efficacy of the UDAY scheme. With the benefit of hindsight and more data, analysts are realizing that UDAY's ability to resolve the sector's woes may well have been overestimated.

To be sure, UDAY can smoothen the power offtake distribution process. But it cannot drive demand beyond a certain point. In fact, electricity generation continues to track the long-term trends—generation till February this fiscal year (FY18) is up 4%, close to the 5%-plus growth seen in the decade from FY07 to FY17. Muted demand from the industrial segment, a large consumer segment, is said to be weighing on generation growth.

India to Attract Massive Investments in Power Generation

India is likely to attract a massive investment of Rs 11,55,652 crore in power generation sector in the five-year period between 2017 and 2022 in setting up projects across thermal, hydro, nuclear and renewables segment.

"A total capacity addition of 58,384 Megawatt (MW) from conventional sources has been envisaged for the period 2017-2022, consisting of 47,855 MW of coal-based power stations, 406 MW of gas-based power stations, 6,823 MW of hydropower stations and 3,300 MW of nuclear stations," Central Electricity Authority, the power ministry's planning wing, said in its National Electricity Plan (NEP) report.

Fund requirment for Generation projects (Mode-wise) during 2017-2022 (₹Crores)

Year	Thermal	Hydro	Nuclear	Renewable	Total
2017-18	76,781	15,622	9,479	1,19,931	2,21,813
2018-19	73,376	19,465	9,728	1,38,218	2,40,787
2019-20	52,915	23,461	8,088	1,43,422	2,27,885
2020-21	55,846	26,431	11,912	1,44,218	2,38,406
2021-22	63,991	29,546	16,127	1,17,096	2,26,761
Total	**3,22,908**	**1,14,524**	**55,334**	**6,62,885**	**11,55,652**

In addition, the government is also targeting ramping up the country's renewable energy capacity to 1,75,000 MW by 2022. Of this, 1,17,756 MW is expected to be set up during the period through 2022. The report also said that no additional fund will be required for gas-based generation capacity as the construction of these plants has been completed and could not be commissioned so far due to non-availability of domestic gas.

The total fund requirement of Rs 11,55,652 crore for 2017-22 includes Rs 8,52,804 crore investment in projects likely to be commissioned during this period

and Rs 3,02,848 crore expenditure needed with respect to advance action for projects likely to be commissioned in the next five year period (2022-27). Of the Rs 8,52,804 crore to be spent through 2022, Rs 1,42,566 crore would be needed for central sector projects, Rs 92,889 crore for state sector projects and Rs 6,17,349 crore for private sector projects. In this estimation, it is assumed that all the renewable projects will be implemented by private developers, the CEA said.

In order to assess the fund requirement for generation projects, CEA considered the year-wise phasing of expenditure. It estimated the cost per MW for the year 2017-18 based on present day cost and escalated it further at an annual escalation rate of 4 per cent. "However, in view of the recent trend, the capital cost per MW in case of solar, wind and biomass-based power projects has been pegged at present day level without any escalation in subsequent years," the report said.

"It is also expected that funds including foreign funds from private players would also be invested through Infrastructure Investment Trusts (InvIT). The Subordinate Debt or grant from the government may also be available to some projects to be developed by PSU or States," CEA said.

The government also estimates that an investment of around Rs 9,56,214 crore will go into setting up the targeted 1,65,220 Mw generation capacity between 2022 and 2027. This consists of 46,420 MW of thermal projects, 12,000 MW of hydro projects, 6,800 MW of nuclear projects and 1,00,000 MW of renewable energy projects. This estimate does not include investment related to advance action for projects likely to be commissioned in the next five-year period (2027-32).

National Electricity Plan Revised

The Central Electricity Authority (CEA) has revised the National Electricity Plan (NEP) after getting feedback from more than 30 state-owned and private institutions, mostly questioning the redundancy of coal. From retiring coal-based power completely, the CEA has said India would need 6,440 Mw thermal power during 2017-22. In the earlier version of the NEP, which was out in 2017, the CEA had said the country did not need coal-based capacity addition till 2022.

However, the CEA said coal-based power projects of 47,855 Mw were likely to yield benefits during the period 2017-22. They are currently under different stages of construction. This translates into a likely capacity addition of 176,140 Mw in the next five years, according to the plan.

The plan has made capacity addition assumption based on projected growth in power demand of 6 per cent annually till 2022. Growth will, however, slow to 5.5 per cent till 2027. The plan has discounted the effect of electric mobility on the electricity demand in the coming years, indicating no significant change in government policy for promoting of electric vehicles.

The CEA also said the coal-based capacity of 22,716 Mw is considered for retirement during 2017-22. These are the units which cannot be retrofitted with emission control technology for various reasons. Additionally, a coal-based capacity of 25,572 Mw, has been considered for retirement during 2022-27, which will be completing 25 years of operation by March 2027. Capacity addition assumes renewable capacity addition to be 1,17,756 Mw during the same period. It is estimated that about 268 mt of CO2 emission will be avoided annually by the end of FY22 due to the addition of renewable energy sources.

India, UK Launch Joint Research Projects

"The Ministry of Science and Technology have announced that India and UK have launched joint research projects on Water Quality Research and Energy Demand Reduction in Built Environment" Sharma said.

"Eight projects to be supported under the Water Quality Research programme relate to optical sensor platform for water quality monitoring, fate and management of emerging contaminants, rainwater harvesting and its impacts, Vembanad lake rehabilitation, remediation of ground-water arsenic in Ganga river basin among others," he said. They also include sensors and treatment technologies for freshwater systems, pathways and evolution of pollutants, and antimicrobial resistance and pollutants.

"Besides, four projects to be supported under the Energy Demand Reduction in the Built Environment programme relate to residential building energy demand reduction, zero peak energy building design, integrated urban model for built environment energy research and community-scale energy demand reduction in India," he said. He pointed out that these projects will be supported by India's Department of Science and Technology in collaboration with UK's Natural Environment Research Council, Engineering and Physical Sciences Research Council and Social Research Council.

The Water Quality Research Programme would provide better understanding of the sources and fate of different pollutants, which would enable development of appropriate technologies and management strategies, he noted. "These projects would also enable development of effective techniques to address water quality issues and securing the provision of clean water, rejuvenation of rivers and other water bodies, and should bring benefits to both people and the environment" he said.

Rescue Scheme for Stressed Power Projects

Three states have come forward to participate in the bidding process, wherein cheap power will be procured from stressed assets as part of a new power ministry scheme. Gujarat and Maharashtra have asked for 500 Mw each under the programme while Uttar Pradesh is set to procure 1,000 Mw.

The scheme was launched as one of the measures to provide relief to stressed power generating assets. The new centralised bidding for 2,500 Mw will be held, which would invite quotations from power developers for a lump sum tariff. This would also involve power aggregation and disbursement according to the cost and the states' demand.

The lump sum tariff would have to be quoted with a "very nominal" fixed cost portion. Officials said power developers will bid against the cap offered on fixed cost. Power tariff for coal-based power plants comprises fixed cost and variable cost.

Fixed cost is the capital cost of the power plant and variable cost comprises cost of fuel, transportation, etc. If a state has signed a power purchase agreement (PPA), it has to pay the fixed charge even when not procuring power.

The government will also set a power aggregator, which would call for tenders and collate all bids and power supply. It would then disburse power to states that wish to procure low fixed cost electricity. Sources said state-owned Power Trading Corporation (PTC) will be the aggregator and the bid document is being drafted by Power Finance Corporation (PFC).

RBI's new NPA norms may hit 50,000 Mw power capacity

Power companies fear that two-thirds of private thermal power capacity is at high risk of being declared as non-performing assets (NPA), following the new norms on stressed assets issued by the RBI last month, according to industry executives.

Severe impact is expected on 51,000-Mw existing power generation capacity set up with investments of more than Rs 4 lakh crore, and another 28,000-Mw plants are under construction, executives said on condition of anonymity.

The notification issued by RBI on 'Resolution of Stressed Assets — Revised Framework', mandated

banks to classify even one-day delay in debt servicing as default. Experts said that even power projects that are better off in terms of realisations and debt servicing will fall under the 'special mention accounts category' mentioned in the RBI circular. Power plants pay for coal in advance to state-run monopoly Coal India, but it takes them 90-150 days to recover dues from state power distribution companies.

Besides, already stressed assets that do not have coal and power purchase tieups or both, the RBI notification also impacts power projects which have been repaying debt so far. Projects of most companies including Lanco Infratech GMR Energy, Hindustan Power Projects, ILFS, RattanPower India and GVK Energy may be hit, according to the executives.

"Planet Will Warm Beyond Key Limit" UN Climate Report

A draft United Nations climate science report contains dire news about the warming of the planet, suggesting it will likely cross the key marker of 1.5 degrees Celsius, or 2.7 degrees Fahrenheit, of temperature rise in the 2040s, and that this will be exceedingly difficult to avoid.

Temperatures could subsequently cool down if carbon dioxide is somehow removed from the air later in the century, the document notes. But that prospect is questionable at the massive scales that would be required, it observes. The 31-page draft, a summary of a much-anticipated report on the 1.5 degrees Celsius target expected to be finalized in October, was published by the website Climate Home on Tuesday, which said the document had been "publicly available on the US federal register over the past month." Last month, several news outlets including Reuters quoted from the draft but did not publish it in full. The 1.5 C target is crucial to small island nations worried about rising seas, and other nations particularly vulnerable to warming, and was explicitly included in the Paris climate agreement as the more ambitious of two climate goals, the other being 2 degrees C (3.6 degrees Fahrenheit).

The draft document states that there is a "very high risk" of the planet warming more than 1.5 degrees above the temperature seen in the mid to late 19th century. Maintaining the planet's temperature entirely below that level throughout the present century, without even briefly exceeding it, is likely to be "already out of reach," it finds. Jonathan Lynn, spokesman for the United Nations' Intergovernmental Panel on Climate Change, which is producing the study, cautioned that the draft is a work in progress. "The text is highly likely to change between this draft and the final approved summary for policymakers," he said.

Duke University climate expert Drew Shindell, who is listed as one of the drafting authors of the document, also noted that the draft summary was a very early version of the full report. "It's much rougher and much more preliminary than even the underlying document," he said. Although worrying, the conclusion will not be surprising to those who have followed a growing body of research on just what it would take to stop warming short of 1.5 degrees Celsius. The planet has already warmed by 1 degree Celsius or more. In some places, the report notes, the temperature increase has already exceeded 1.5 degrees Celsius. In general, warming is more intense over land than over the oceans and is already particularly intense in the Arctic.

Global Energy Demand Rose Fastest in 2017

CO2 Emissions at Historic High: IEA

Global energy demand increased by 2.1 per cent in 2017, growing at twice the rate recorded in the previous five years, International Energy Agency said, adding the growth in energy demand led to global CO2 emissions reaching a historic high of 32.5 Gigatonnes (Gt) last year after three years of flat emissions.

The Paris based agency said in its Global Energy and CO2 status report 2017 that energy-related CO2 emissions growth in 2017 is a strong warning for global efforts to combat climate change and

demonstrates that current efforts are insufficient to meet the objectives of the Paris Agreement.

According to the IEA report, a decrease in global energy efficiency was another driver of the increase in carbon emissions. Energy efficiency slowed down dramatically in 2017, broadly caused by an apparent weakening of efficiency policy coverage and stringency, and by lower energy prices.

"The increase in carbon emissions, equivalent to the emissions of 170 million additional cars, was the result of robust global economic growth of 3.7 per cent, lower fossil-fuel prices and weaker energy efficiency efforts. These three factors contributed to pushing up global energy demand by 2.1 per cent in 2017," IEA said.

Over 40 per cent of the growth in energy demand last year was driven by China and India and Asian economies accounted for two-thirds of the global increase in carbon emissions.

The overall share of fossil fuels in global energy demand remained at 81 per cent, a level that has remained stable for more than three decades despite strong growth in renewable energy. "Fossil-fuels met 70% of the growth in energy demand around the world. Natural gas demand increased the most, reaching a record share of 22 per cent in total energy demand. Renewables also grew strongly, making up around a quarter of global energy demand growth, while nuclear use accounted for 2 per cent of the growth," IEA said.

The report also said the trend of growing emission was not universal, with countries like United States (US), United Kingdom (UK), Mexico and Japan experiencing a decline in their carbon emissions. The biggest decline has come from the US, where emissions dropped by 0.5 per cent to 4,810 million tonne of CO2, marking the third consecutive year of decline. The decline in emissions came on the back of higher renewable-based electricity generation, coal-to-gas conversion and decline in electricity demand.

"The share of renewables in electricity generation reached a record level of 17%, while the share of nuclear power held steady at 20%," IEA said.

While China and India accounted for 40 per cent of the growth in energy demand in 2017, China's carbons emissions only increased 1.7 per cent to 9.1 Giga tonne, 1 per cent higher than their 2014 level. This was due to continued renewable energy development and faster switch from coal to gas. However, energy-related emission have increased because of rising oil and gas demand.

According to IEA, in India, economic growth bolstered rising energy demand and continued to drive up emissions, but at half the rate seen during the past decade. India's per-capita emissions last year stood at 1.7 tonne CO2, well below the global per capita average of 4.3 tonne CO2.

HYDRO TIES BEYOND BORDERS

by
B. Bhambhani
Former ED, BHEL
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With constantly evolving energy needs and increasing environment consciousness, the focus is shifting away from coal-based generation to cleaner sources of power. While renewables promise a clean future, the inherent variability of this source poses a challenge to reliable grid operations. In this scenario, the development of hydro power is gaining momentum while ideas is in the process of formulating new policies to revive hydropower development in the country, it has simultaneously entered into strategic agreements to develop hydropower in neighbouring countries. Nepal & Bhutan have been at the forefront of these

bilateral agreements. Both countries have huge hydro potential that is yet to be tapped. A well drafted power sharing agreement with these countries can also help reduce fossil fuel consumption in India, while boosting economic development in the neighbouring countries. Further, greater policy and regulatory clarity, in the wake of the cross border, trading guidelines released by the Power Ministry (in December 2016) and the associated draft regulations and final rules issued by the CERC (Feb. 2017) and the CEA (October 2017) respectively is expected to provide a fillip to cross-border trade. This will help create a larger regional electricity market in South Asia. In fact, such trade compliments the electricity demand and resources endowments in the region.

BHUTAN

The abundance of water resources in Bhutan offers huge scope for Hydro power development. The country has a hydro power potential of 40,000 MW, most of which is still untapped. As of 2014-15 Bhutan's installed hydro power capacity stood at 1606 MW. In addition, projects aggregating 3658 MW are currently in the pipeline as part of the collaborative initiatives of the two countries.

Bhutan has had a long association with India and has signed several agreements enabling both countries to mutually benefit. India has been importing hydro power from Bhutan since the mid-1980s. Currently, four plants, aggregating a capacity of 1542 MW and with a total design energy supply of 6676 MUs, are operating in the country under the Indo-Bhutan energy cooperation agreements. These include:

i) 336 MW chukha HEP
ii) 60 MW Kurichu HEP
iii) 1020 MW Tata HEP
iv) 126 MW Dagachhu HEP

During 2015-16 and 2016-17, India imported 6133 MUs and 5585 MUs of power respectively from Bhutan.

The collaboration on hydro power between the two countries has been evolving over the years. In addition, to the four operating HEPs , four plants totalling 3540 MW and entailing a cost of Rs.246.36 billion are under construction under the same agreement. Of the total under-construction capacity, 2940 MW is being developed in the Intergovernmental trade mode, which involves financial support from both governments. These include:

i) 1200 MW Punatsangchhu I – Project
ii) 1020 MW Punatsangchhu II – Project
iii) 720 MW Mangdechhu II – Project

In addition, the 600 MW KHOLONGCHHU HEP, entailing a cost of Rs.39.49 billion, is being developed by KHOLONGCHHU Hydro Energy Ltd. a joint venture company between India's SJVN Ltd. and Bhutan's Druk Green Power corporation.

Several other hydropower projects have been proposed by the Bhutanese government in association with Indian developers, including the

i) 2640 MW kuri Gongri Project
ii) 2560 MW Sankosh Project
iii) 1120 MW Dorjilung HEP
iv) 770 MW (HAMKHARCHU I – HEP)
v) 590 MW CHAMKHAR CHU II – HEP
vi) 570 MW Wangchhu, HEP
vii) 442 MW NYERI AMANI HEP
viii) 180 MW BUNAKHA HEP

NEPAL

Nepal has a hydropower potential of about 83,000 MW of which 43,000 MW has been identified as economically viable. Against this, its installed capacity is only 968 MW as of 2016-17. The country has been exporting power to India the rough multiple hydropower plants. Plants aggregating 5 MW of capacity have been installed in Nepal under the Indo-Nepal energy cooperation agreement.

These include the 21 MW Trishuli HEP, the 15 MW

Western Gandak HEP, the 14 MW Devighat HEP and the 1.0 MW Pokhara HEP.

Of late the Indian private sector has been participating actively in Nepal. Number of projects involving the private sector are currently in the pipeline. The 300 MW upper Karnab project is being implemented by a consortium comprising the GMR group and the Italian - Thai Development Project Company on boot basis. The consortium is also developing the 600 MW Upper Marsyangdi HEP SJVN Ltd. is developing the 900 MW Arun III HEP on a boot basis. As per the MoU signed between SJVN and the Government of Nepal, the company will provide 21.90% power to Nepal for a concession period of 25 years and will pay 7.5% of the total income as royalty to the Nepal Government after this period. In addition, Tata Power and SN Power have postured with the Nepal Government for developing the 650 MW Tamakoshi III HEP.

Hydro power development is also taking place through intergovernmental cooperation. The 5600 MW Pancheshwar HEP is one of the biggest projects to be developed in Nepal. The project, being built on the river Sarada known as Mahakali in Nepal, is being spearheaded by the Pancheshwar Development Authority. The Pancheshwar Project also has a 240 MW re-origilaty dam at Rupaligad, which is expected to yield significant benefits. Recently, an expert panel of the ME&F and climate change waived the requirement for a joint mechanism to assess the environment impact of the project. This is expected to fast-track its development.

Another key inter-governmental project is the 3300 MW SAPTA KOSHI high dam. The dam is expected to yield irrigation and flood control benefits. The concerned authorities are currently in the process of preparing the DPR.

Developing the hydropower potential of Nepal and Bhutan can significantly alter the energy dynamics in South Asia. Developing strategic partnerships with these countries will enable India to strengthen its position both economically and geographically. As hydropower gains traction, these bilateral ties will serve an important purpose – India's Energy Security.

India Must Lead the Transition to Green Energy

India has always been torn between an urge to sit at the high table of global negotiations and being seen by the rest of the world as a deal breaker on issues such as global trade and climate change.

The International Solar Alliance (ISA), which recently met in Delhi is thus a breakthrough in our global positioning. Prime Minister Narendra Modi has been a driving force ever since he first announced the idea at the India-Africa Summit in October 2015 and followed this up with more concrete moves during the United Nations climate change talks in Paris in November 2015, with France being an important partner at a time when the US decided to renege on its climate change mitigation commitments. India has suddenly became a catalyst in the global attempts at capping climate change. This is important in a geopolitical sense when China is clearly expanding its global footprint.

There are now 121 countries which have signed up for the global solar alliance. Central to this new role in global affairs is the domestic commitment to generate 100 gigawatts (GW) of solar energy by 2022, part of the broader 175GW target for renewable energy. The strategic thought behind this is clear: India has to push towards mass prosperity at a time when climate change is a huge concern. The context of what India will have to do in the next three decades is quite different from what developed countries or Asian success stories such as China faced.

However, just unilateralism will not do. Fighting climate change cannot come at the cost of halting the urgent fight against poverty. Global initiatives should always be seen through the lens of national interest. That is why an international alliance based on credible commitments is important. The key issues that India raised at the Copenhagen climate change talks is still important. The rich countries that are responsible for most of the stock of excess carbon in the atmosphere as well as the high current levels of per capita carbon emissions (as against national aggregates) still need to be pushed to provide asymmetrical funding for climate change mitigation and technology transfers, especially given the recent drop in the prices of photovoltaic batteries. That will continue to be an important challenge for the global solar alliance.

The shift to solar energy should not be seen only as a defence mechanism. It can also be an opportunity. Here is why we say so. Economic historians have identified five long waves of technology since the Industrial Revolution. The chronological order of these technology waves is as follows—the steam engine and cotton ginning; steel and railways; electrical and chemical engineering; automobiles and plastics; and information technology. These waves of innovation have broadly moved in sync with long economic cycles.

The interesting thing is that the same set of countries need not dominate each wave. There are huge opportunities for upstarts to get into the game. This is generally recognized to be true in the corporate sector, where established companies get replaced by innovators. Countries do not crash and burn like companies do. But a similar process works for countries during periods of discontinuous technological change. Think of how Japan gatecrashed into the big league in the age of automobiles and plastics, or how India managed to make a global mark in the age of information technology.

The fight against climate change—and the broader move to low-carbon economies—is likely to create the next big technological wave. Almost all countries are at the starting block right now. A few have a historical head start over India, though China is using its state power to get ahead early in the race. India

needs to grab this opportunity as well. The shift to a new economy with a low carbon footprint need not mean reversion to poverty. New technology will be the critical factor in the transition to a green economy which also grows rapidly, and India should take a shot at global leadership. Coal will continue to be a key part of the Indian energy mix in the immediate future. But the push for solar energy is welcome if a longer view is taken. ISA thus offers many opportunities — from geopolitical advantages to economic benefits in the next wave of global innovation.

Indian Industry Should Set Up Projects in ISA Member Countries:

RK Singh

The government will encourage domestic solar players to scale up their business abroad in a bid to demonstrate leadership in promoting the International Solar Alliance (ISA), an international alliance of 121 solar-rich countries situated fully or partially between the tropics.

"We will make sure that the benefits of our experience will be shared with those who do not have access to energy. We invite our industry, our people to go and set up projects there (in ISA nations)," RK Singh, minister of state for power and new and renewable energy said at the signing of Host Country Agreement between Ministry of External Affairs and ISA.

ISA, which was jointly launched by Prime Minister Narendra Modi and France's then President Francois Hollande in November 2015 on the sidelines of COP21, became a legal entity in December last year.

Singh said that the government will ensure measures to de-risk solar projects in these ISA member countries. "That should be the primary goal of ISA, to de-risk projects," he added. ISA is looking to mobilise over US $ 1000 billion of investment into the Solar Sector and deploying over 1000 GW of Solar capacity in its 121 member nations.

NDB, ISA Tie up to Promote Solar Energy

New Development Bank and International Solar Alliance have joined hands to promote solar energy across the globe. "The New Development Bank (NDB) and International Solar Alliance (ISA) signed in New Delhi, India a Joint Declaration for the Promotion of Solar Energy Globally," an NDB statement said.

The Declaration was signed by K V Kamath, the NDB President and Upendra Tripathy, Interim Director General of ISA, in the presence of Finance Minister Arun Jaitley. The NDB and the ISA agreed to consider a roadmap for the mobilisation of financing to promote solar energy in countries of common interest and to explore mechanisms for supporting solar energy development. The parties will mutually support the implementation of the NDB's and ISA's plans for solar energy development and deployment through technical assistance and knowledge transfer. The NDB was established by Brazil, Russia, India, China and South Africa to mobilise resources for infrastructure and sustainable development projects in BRICS and other emerging economies and developing countries.

International Solar Alliance (ISA) is a treaty-based international inter-governmental organisation which was launched on November 30, 2015, in Paris, France, and headquarters at Gurgaon, Haryana.

ISA Aims to Mobilise $1Trillion

The International Solar Alliance (ISA) aims to mobilise $1trillion to shore up 1terawatt (TW) of solar energy by 2030, with 61countries signing the agreement and 32 ratifying to date. With innovations, favourable regulatory frameworks and robust energy policies,

ISA intends to bring about multi-actor support to this ongoing climate movement.

The alliance is also the first intergovernmental organisation headquartered in India. This, coupled with India's ambitious target of 100 gigawatts (GW) of solar energy capacity, brings out GoI's commitment to actualising India's 'time under the Sun'.

However, the main challenge of the lack of affordable and innovative financial mechanisms deters countries from fulfilling the quantum of investment requirement. Improving affordability and access to finance across the global market, greater cooperation on improved technology and increase in solar energy access for agricultural applications and mini-grids will not only move the needle, but also impact the performance of countries aiming to achieve the aggregate solar power capacity of 1TW by 2030.

The success of ISA will largely depend on how it influences the formulation and implementation of policies within its member countries' governments and addresses the gigantic financial requirement. Key to success are the following:

Policy evolution: A clearly articulated policy roadmap, like the one done by India, will provide confidence to developers and investors alike. This has unfolded in India, which is now the third-largest solar market in the world. This was facilitated by timely policy mechanisms, such as establishing agencies, like the Solar Energy Corporation of India, to promote solar power, and encouraging public power companies to bundle renewable energy power with base load.

Facilitating project execution: Land acquisition and uncertainty on grid connectivity result in cost and time overruns. This, in turn, translates into rising risks of financial unviability of solar projects. Creating single-window clearances and plugand-play facilities for installations of solar power plants will mitigate these risks. In turn, benefits in the form of lower tariffs can be passed on to end consumers.

Strengthening payment mechanisms: Weak credit quality and delays in payments, even for projects with power purchase agreements (PPA), exert tremendous pressure on financial returns. Securing cash flows through centralised payment contracts or long-term payment guarantees to developers, undertakings by sovereign agencies as PPA counterparties, enforcement of PPAs, and efficient dispute resolution mechanisms will have a significant impact on project bankability. They can also spur markets, especially for countries like India, where off-taker risk is often triggered.

Managing currency risks: There has been an unprecedented rise in green bond issuances globally, with 2017 global issuances reaching $155 billion. As seen in India, domestic markets can be fuelled by policy mechanisms that incentivise green bondsin local currencies, and also by enabling built-in hedging products for foreign investments.

Aggregation and securitisation: Small-scale and distributed assets with weak or limited credit history — such as off-grid and rooftop solar —can be leveraged for accessing financing from capital markets through aggregation and securitisation. This would free up the capital lent, which can be redeployed for scaling up other projects. It would also ensure an increase in capital flows from investors such as development finance institutions (DFIs).

Though green bonds and securitisation showcase enormous potential in tapping into capital markets for sustainable financing, their efficacy will depend on the reforms in the nascent capital markets of ISA member countries. These enablers are vital in creating bankable solar markets, unlocking the solar potential across ISA member countries.

Grid Infrastructure, Policy Framework

Key To India's Renewables Aim – Irena

India should strengthen its power grids and put an emphasis on a clear policy framework to bring down the cost of capital investments, the head of the International Renewable Energy Agency (Irena) said,

as the nation aims for ambitious renewable energy targets.

Prime Minister Narendra Modi has set a target of raising India's renewable power generation to 175 gigawatts (GW) by 2022. The South Asian nation, which currently has installed renewable power capacity of about 60 GW, is one of the world's most important growth markets for renewable energy, and as it aims to generate more renewable power, the more it needs to have a robust grid infrastructure.

"I think the main constraint in India is not going to be investment for renewables. The main constraint in India right now is whether they can strengthen their grid," Adnan Amin, director general of Irena said on the sidelines of the launch of Singapore International Energy Week 2018. "Because in order to take a large share of renewables into the grid effectively, you need a robust infrastructure." Amin said renewables have a "huge future" in India but currency and policy-related risks priced into the cost of capital tends to be a problem. "If investors can be given a very clear sense of reliable policy framework, and hedging mechanisms that allow them to draw down the cost of capital, I think that'll make a big impact," he added. India is aiming for renewable energy to make up 40 percent of installed power capacity by 2030, more than double the current level.

KUSUM Scheme Soon for Solar Farming

The KUSUM scheme, with over Rs 50,000 crore government support to promote the use of solar power among farmers, is likely to get the Cabinet nod by this month end and will be rolled out in the first half this fiscal, a senior official said.

"The KUSUM (Kisan Urja Suraksha Evam Utthaan Mahaabhiyan) Scheme is likely to be placed before Union Cabinet for consideration and approval by this month end. We would be able to implement the scheme in first half of this fiscal," New and Renewable Energy Secretary Anand Kumar told reporters here at the launch of TERI year book. He said that under the revised draft of the scheme to be placed before the Cabinet, the amount of central government assistance has been enhanced from earlier proposal. Under the scheme, the government plans to incentivise farmers to run solar farm water pumps and use barren land for generating power for extra income -- up to Rs 60,000 per acre every year.

At present, farmers earn about Rs 30,000 per acre annually from conventional wheat and paddy rotation, after deducting input costs. As per the initial proposal the total cost of the capacities under this scheme was estimated at Rs 1.4 lakh crore. The Centre's contribution was proposed at Rs 48,000 crore under the scheme to aid total solar power generation capacity of 28,250 MW over the next 10 years.

Kumar said India's renewable energy capacity excluding large hydro has increased to 68 GW by the end of March this year compared to 57 GW last year around this time. On this occasion, Kumar also said that TERI and Ministry of New and Renewable Energy would develop a portal to provide online data about renewable energy on real time basis and modalities for this would soon we worked out.

National Wind–Solar Hybrid Policy

The government has formulated draft national wind–solar hybrid policy with the objective to provide a framework for promotion of large grid connected wind-solar PV hybrid systems for reducing the variability in renewable power generation and optimal and efficient utilization of transmission infrastructure and land and thus achieving better grid stability and energy security.

The government is making all efforts to promote the growth of renewable sector and the Rs 48,000-crore KUSUM scheme announced in the Budget to promote the use of solar power among farmers by Hon'ble Finance Minister Arun Jaitley is a step in this direction. KisanUrja Suraksha Evam Utthaan Mahaabhiyan

(KUSUM) is aimed to incentivise farmers to run solar farm water pumps and utilise barren land for generating solar power to have extra income. Under the scheme, farmers will have to bear 10 percent of the cost of solar pumps and the rest of the payment can be taken in loan from banks. The total cost of the capacities under this scheme would be Rs 1.4 lakh crore. The scheme is expected to aid total solar power generation capacity of 28,250 MW over the next 10 years.

The initiative will also pave way for income generation for women farmers in the far flung rural areas and empower them by providing energy security. It would provide economic opportunities to women besides opening up ways to get essentials of life from cooking, water pumping, food processing etc saving their time and energy.

The sector has seen remarkable contributions by women in all spheres in their unique ways to make the sector more attractive not just for stakeholders, but also bringing a difference in lives of women in rural areas by providing them energy access with renewable resources.

70% Solar Safeguard Duty to Dampen Investor Sentiment

Parliamentary Panel

A Parliamentary panel has flagged the proposed 70 per cent safeguard duty on solar equipment saying there is no valid ground for it and would affect the viability of existing projects and dampen investor sentiment.

Parliamentary Standing Committee on Energy in its 39th report tabled in Parliament also advised the Ministry of New and Renewable Energy to take up the issue of confusion over good and services tax (GST) on renewable energy sector and refund of input credit with Finance Ministry.

“Custom Duty on Solar Cells/Modules/Panels should not be levied and they should continue to enjoy exemption from custom duty as before. Safeguard Duty should not be of the tune (70 per cent) that will hamper our own programme and it should not affect the bids which have already taken pace,” the panel said.

It stated that there is a need to encourage domestic manufacturing, but it is hard to believe that domestic manufacturing will reach the production and efficiency level required to meet the target of 100 GW of Solar Energy in the next 2-3 years.

So, in the opinion of the Committee, there are no valid grounds to take such emergency measures which having the potential to cripple the entire Solar Sector.

At present customs duty on Solar Cells/Modules/Panels is levied at the rate of 7.5 per cent. Further, a Safeguard Duty to the tune of 70 per cent has been recommended. The Committee opined that because of the imposition of Safeguard/Custom Duty, project developers will suffer, though it may be good for domestic manufacturers. It said that such a duty will result in steep rise in input cost, thereby affecting the viability of existing projects and dampening investors’ sentiments.

The Committee noted that the GST rates for the renewable energy sector differ from 5 per cent on solar modules to 18 per cent on inverters to 28 per cent on batteries.

It also observed there are apprehensions that applicable rate of GST on Solar Power Generating System, which is not a Good bought and sold in the market, would actually be 18 per cent under “work-contract” rather than intended 5 per cent.

Similarly, in case of solar power developer himself being an EPC contractor, he will not get the benefit of 5 per cent GST on Solar Power generating System as his final product is “Electricity” which is exempted from GST. There is also an issue of refund of input tax credit leading to higher working capital requirement, it noted.

Govt to Amend Solar Bid Rules to Safeguard Industry

Allaying fears of an adverse impact on India's solar energy programme due to the proposed 70 per cent safeguard duty, Power Minister R K Singh said the government will amend bidding rules to allow pass through of duty hike.

The government will ensure that the rules are not implemented retrospectively, he said. With pass through of any hike in duties, solar power developers will be allowed to increase the tariffs based on which they have bagged the projects, so as to recover the extra cost.

"The duty structure prevailing on the day of bid shall be implemented. Any change in taxes and duties would be passed through. Current bidding document provides for passing through taxes only. We would provide for passing through taxes and duties," Singh told reporters recently. He also assured that the amendment in the bidding rules can be done by his approval and does not require Parliament nod. He said an inter-ministerial committee headed by commerce secretary will finalise the recommendation on the proposal of Directorate General of Safeguards (DGS).

Acting on an application filed by an association of five domestic cell and module makers including the Adani Group, the DGS recommended "a provisional Safeguard Duty be imposed at the rate of 70 per cent ad valorem on the imports of solar cells whether or not assembled in modules or panels."

Govt Pushes BIS Norms Implementation

Citing urgency in the need for maintaining quality of solar equipment being deployed in the country, ministry of new and renewable energy (MNRE) has brought forward the implementation date of a quality control order that requires sellers and manufacturers of solar photovoltaic modules to have their products registered under parameters set by the Bureau of Indian Standards (BIS).

Last year, MNRE issued the Quality Control (Requirement for Compulsory Registration under BIS Act) Order 2017 which was supposed to come into effect a year from September 5, 2017, when it was published in the Gazette. The order applies to both domestic and international solar manufacturers selling their products in India.

"We have pushed ahead the date because we want to ensure that whatever comes into the country is of quality," said a senior government official. The date for enforcement of the order "should be brought forward in order to ensure that quality control benefits the industry at the earliest possible." For supplies from April 1 to June 30 this year, the representatives of the manufacturers would submit samples to an authorised lab for testing and give give a self-certification that the modules adheres to the prescribed standards, the order said. Solar developers and manufacturers will be liable to penalties as per the provisions of the order if they are not keeping up with the BIS specified quality standards. "If the developer himself buys sub-standard product, he will come into the picture and be liable to penalty," said another official on the condition of anonymity.

World's Largest Solar Park Launched In Karnataka

The world's largest solar park set up at an investment of Rs 16,500 crore at Pavagada in Karnataka's Tumakuru district was launched by Chief Minister Siddaramaiah. The 2,000 MW park, named as 'Shakti Sthala', spans across 13,000 acres spread over five villages and is a benchmark in the unique people's participation in power model put on ground, according to officials.

The park's development is anchored by the Karnataka Solar Power Development Corp. Ltd (KSPDCL), an entity formed in March 2015 as a joint venture between Karnataka Renewable Energy Development

Ltd (KREDL) and Solar Energy Corp. of India (SECI). The project has been executed within a record time of two years, with zero land acquisition, Siddaramaiah said. Moreover, the farmers who have leased out their land are reaping greater benefits with Rs 21,000 per acre being offered as rental, an amount which has the scope to grow by five per cent every two years, he said. The beneficiaries of this project were 2,300 Pavagada farmers, he said.

The chief minister said Karnataka has emerged as the third largest producer of renewable energy in the nation and was taking "bold strides" towards emerging as an energy surplus state. "We have set the goal to source at least 20 per cent of people's power requirements from renewable projects," he added.

The park will create employment and act as an incentive for natives and farmers to explore new opportunities of socio-economic growth in the region, state Energy Minister D K Shivakumar said. "This ambitious project, spanning five villages, looks at farmers as the key partners, as also beneficiaries. Shakti Sthala is creating new job opportunities and economic growth leading to the prosperity of the people of Pavagada," he said. The state has witnessed an overall increase in capacity to 2,3379 MW as on January 2018, he said. Shivakumar said 600 MW solar power generation has been commissioned during December 2017 and balance capacity of 1400 MW will be available by December this year. Earlier, a 648-mw power project set up by the Adani Green Energy, part of the Adani Group, in Tamil Nadu in 2016 was billed as the world's largest solar plant.

IREDA & European Investment Bank Sign Loan Agreement for Renewable Energy Financing In India

"The strengthened partnership between IREDA and the European Investment Bank reflects the joint commitment of India and the European Union to implement the Paris climate agreement. Investment in new solar energy and wind power schemes will improve access to clean energy for millions of Indians and create many new jobs," said Dr. Werner Hoyer, President of the European Investment Bank.

The loan agreement was signed by **Kuljit Singh Popli, Chairman and Managing Director, IREDA** and Dr. Hoyer in the presence of R. K. Singh, Minister of State Power and New & Renewable Energy and Shri Anand Kumar, Secretary, MNRE.

"The significant new European Investment Bank support signed will strengthen expansion of clean energy generation across India. I welcome the continued cooperation between IREDA and the European Investment Bank that builds the clear success of new renewable energy and energy efficiency investment over the last four years," said R.K. Singh.

The European Investment Bank is currently is working closely with public and private sector partners to support new renewable energy projects across India. Cooperation with the India Infrastructure Finance Company will support a number of renewable energy shemes, including projects in Tamil Nadu, Telangana State and Anantpur.

A few weeks ago the EIB agreed a new initiative with Yes Bank that will support new solar energy investment across the country. "The speed with which the second line of credit was negotiated shows the mutual confidence and comfort that EIB and IREDA had developed after working with each other for last 4 years. Moreover, the EIB has extended this line of credit without insisting for sovereign guarantee from Government of India, which also shows their commitment and confidence in the sector," said Kuljit Singh Popli.

WEF's Energy Transition Index

India Ranks 78

As countries across the world transition towards a more sustainable energy system, India, one of the world's largest energy consumers, was ranked 78 among 114 countries on **World Economic Forum's Energy Transition Index 2018.** The index listed countries based on their ability to balance energy security, environmental sustainability and affordability. The report titled "Fostering Effective Energy Transition" lauded India for 'bold measures' to improve energy access, energy efficiency, and to improve the deployment of renewable sources of energy. It takes into account both the current state of energy systems of various countries and their structural readiness to adapt to future energy needs. Between 2013 and 2018, India improved its performance score by 5.6 percentage points, mainly with improved energy access, reduced subsidies and reduced import costs, the report said. India's largest government-mandated renewable energy programme with a target of 175 GW renewable energy capacity by 2022 also found a mention in the report. The report hailed Prime Minister Narendra Modi-led government's push for 100 per cent electric vehicles sales by 2030.

Renewable Energy Target India Needs $125 bl. Investment

India needs $125-billion investments to more than double its renewable energy to the targeted 175 gigawatts in four years as the nation looks to move to cleaner energy. "A lot of it ($125-billion) will come from the government," Anand Kumar, secretary in the Ministry of New and Renewable Energy, said. The Indian renewable sector has been largely supported by private players and now state-run companies will also invest, he said. Coal India Ltd. and NTPC Ltd. are among the public sector units planning to invest in renewable energy. Kumar said 32 GW solar capacity has been installed by March 31 against the targeted 100 GW by 2022; 34 GW of wind capacity is on-stream against the 60 GW target. India will end the year through March at 68 GW of renewable capacity, he said."We will now engage in innovative ways of financing renewables," he said. "We, last year, raised $300 million through masala bonds and plan to do at least a similar number this year." The government bid out 12,500 megawatts of wind and 20,000 MW of solar capacity in the just-concluded financial year. "To achieve the 175 GW by 2022, we need to finish bidding by March 2020," Kumar said. India will auction 30,000 MW each of solar capacity in 2018-19 and 2019-20, according to its plan released last year. For wind, the target is 10 GW each in two years.

India's Largest Floating Solar Power Plant Ready at Wayanad in Kerala

The construction works of the largest floating solar plant in the country have been completed at the Banasura Sagar reservoir in Wayanad. The 500 kWp (kilowatt peak) solar plant of the KSEB floats on 6,000 square metres of water surface of the reservoir. The outlay for the project is Rs 9.25 crore. The solar photo voltaic panels of the floating solar farm have been installed on 18 floating platforms made of ferrocement floaters with hollow insides.

"The installation works of the floating solar panels is over and the plant will be ready for inauguration soon," said Manoharan P, assistant executive engineer at the KSEB research and dam safety sub-division, Thariyode. He said the 500 kWp project is the largest floating solar project to come up in the country. The work of the project had begun on March 2016. KSEB sources said that they were waiting for the availability of chief minister to inaugurate the plant possibly by next month. Officials of Thiruvananthapuram-based Adtech Systems Ltd, which set up the plant, said that the plant would be able to generate 7.5 lakh units of power annually which will be fed to the KSEB grid using underwater cables.

"We have used high efficiency solar panels for the project as per KSEB stipulations. Also, we have set

up a floating substation on the reservoir to convert the output into 11kV considering economic and safety aspects," said Raveendran T Nair, vice-president (projects) of Adtech Systems Ltd. He said that the floating solar plants had higher efficiency compared to ground-mounted installations due to the moderating effect of water bodies on panel temperature. "Also, when compared to ground based units, the floating panels will accumulate lower concentration of dust," he said. The 500kWp project is a scaled up version of the 10kW floating solar project which was commissioned in Banasura Sagar reservoir in January 2016.

Record Energy Sector Emissions in 2017 - IEA

The increase in carbon emissions "was the result of robust global economic growth of 3.7%, lower fossil fuel prices and weaker energy efficiency efforts", the IEA said in its newly-published Global Energy and CO2 Status Report 2017. Fatih Birol, IEA executive director, said: "The robust global economy pushed up energy demand last year, which was mostly met by fossil fuels, while renewables made impressive strides. The significant growth in global energy-related carbon dioxide emissions in 2017 tells us that current efforts to combat climate change are far from sufficient. For example, there has been a dramatic slowdown in the rate of improvement in global energy efficiency as policy makers have put less focus in this area."

Energy demand worldwide increased by 2.1% in 2017, according to IEA preliminary estimates. This compares with 0.9% in 2016 and 0.9% on average over the previous five years. Global energy demand in 2017 reached an estimated 14,050 million tonnes of oil equivalent (toe), compared with 10,035 million toe in 2000. Fossil fuels met 70% of the growth in energy demand, with natural gas demand increasing the most, reaching a record share of 22% of total energy demand. Renewables made up about 25% of demand growth, while nuclear use accounted for 2% of the growth. The overall share of fossil fuels in global energy demand in 2017 remained at 81%, "a level that has remained stable for more than three decades despite strong growth in renewables".

Most of the growth in global energy demand was in Asia, with China and India together representing more than 40% of the increase. Overall, Asian economies accounted for two-thirds of the global increase in carbon emissions. China's economy grew by almost 7% in 2017 but its emissions increased by just 1.7% to 9.1 billion tonnes. "The growth in energy-related carbon dioxide emissions in 2017 is a strong warning for global efforts to combat climate change, and demonstrate that current efforts are insufficient to meet the objectives of the Paris Agreement," the IEA said.

The IEA's Sustainable Development Scenario charts the path towards meeting long-term climate goals. Under this scenario, global emissions need to peak soon and decline steeply to 2020. This decline will now need to be even greater given the increase in emissions in 2017, the IEA said. The share of low-carbon energy sources must increase by 1.1 percentage points every year, more than five-times the growth registered in 2017, it added. World electricity demand grew by 3.1% to 25,570 terawatt hours (TWh) last year, significantly higher than the overall increase in energy demand. Together, China and India accounted for 70% of this growth in demand, with another 10% coming from other emerging economies in Asia.

Renewables accounted for almost half of the global additional generation required to meet increasing demand, bringing their share in global generation to a record high of 25%. Output from nuclear plants increased by 26 TWh in 2017, as a significant amount of new nuclear capacity saw its first full year of operation. Nuclear generation accounted for 10% of global power production last year, up 3% relative

to 2016, with Japan contributing 40% of this growth. Nonetheless, nuclear capacity additions globally only just exceeded retirements in 2017, the IEA noted.

Biggest Waste-To-Energy Plant to come up in Gurugram

The city is going to get the country's biggest waste-to-energy plant with a power generation capacity of 25MW, which is being developed as part of the integrated solid waste management plant in Bandhwari. Chief Minister Manohar Lal Khattar is expected to lay the foundation stone for the project around mid-April even as green activists and local residents are worried about its impact on the environment and viability of the model that has not been very successful anywhere else in the country. The greens claimed a decentralised model of segregation and composting was a better way to deal with the city's thrash.

Officials of Ecogreen Energy Pvt Ltd, the company hired by MCG to implement the integrated solid waste management system, claimed the energy plant coming up on Gurugram-Faridabad road would be bigger than the one (with 24MW capacity) located in Delhi's Bawana. "We are ready to start construction of the plant. We expect the Chief Minister to kick it off sometime in April. The process to get the approval from the ministry of environment and forest (MoEF) is also underway," said Ankit Agarwal, CEO, Ecogreen Energy Pvt Ltd.

He said they were expecting to receive the ministry nod in a few months. MCG sources said the plant was likely to be operational by the middle of 2019 and process up to 2,500 tonnes of waste daily. Gurugram currently generates around 850-900 tonnes of solid waste while another 600 tonnes come from Faridabad on a daily basis.

The project cost of the full-integrated waste management plant is estimated at Rs 502 crore but Ecogreen officials have not given the details of expenditures to be incurred on account of the energy plant separately. Recently, Haryana State Pollution Control Board (HSPCB) held a public hearing in Bandhwari as part of an environment impact assessment as mandated by the MoEF.

Wind Energy Capacity to Cross 60 GW Target, Ahead of 2022 Deadline

The Indian Wind Turbine Manufacturers Association (IWTMA) announced that the wind industry is poised to meet the Government's target of 60 GW ahead of the 2022 deadline. The domestic wind market is on a growth path in the competitive bidding regime and there is an increased demand for clean energy, which has now become a reliable, affordable and mainstream source of energy.

The industry has regained momentum and there is a clear business visibility of 10-12 GW even before the start of this financial year with announcement and plan of bids by the Ministry of New and Renewable Energy (MNRE).

Tulsi Tanti, Chairman, IWTMA, in a statement said, "In FY18, the wind industry witnessed a transition from the Feed-in-Tariff (FiT) to the competitive bidding regime, hence there was a temporary drop in volumes. The industry is now on a growth trajectory with a healthy order pipeline, owing to auctions by Solar Energy Corporation of India (SECI) I, II, III, IV (6,050 MW) and state level bids in Tamil Nadu, Gujarat and Maharashtra (1500 MW)."

"With SECI IV, V and NTPC bids coming up, another 4 GW is expected to be auctioned in this month. Volumes are set to grow exponentially with 10-12 GW auctions each year from SECI and state bids combined, as well as from projects less than 25 MW based on a determined tariff. At the current rate, the wind industry is on course to add 30 GW of new capacity in the next three years, thereby taking the cumulative total capacity to over 60 GW by FY21," he said.

There is a gradual stabilisation of tariff, and the scale of projects is going up to 200–300 MW capacity. This brings advantages of scale at project level and cost optimisation.

"The next-generation turbines from leading manufacturers can deliver around 35-40 per cent PLF in high-wind States, which is almost twice the PLF compared to solar," he added.

India's First Offshore Wind Project

The government has invited the industry to explore India's first offshore wind energy project proposal, following its plans to achieve 5 GW project capacity by 2022 in this area which has not yet been explored in the country. The offshore wind resource base in India makes for a strong case, but such projects involve higher upfront investment, and the success of this venture will depend on whether the government decides to subsidise the sector, industry experts say.

"The global expression of interest (EoI) is intended to shortlist prospective offshore wind energy developers for a 1000 MW offshore wind energy project in Gulf of Khambat, off the coast of Gujarat," an official statement from the Ministry of new and renewable energy said. Power from wind and solar sources in India have reached grid parity after tariffs fell to as low as Rs 2.43 per unit in the wind auction conducted by solar energy corporation of India in December last year. Even as tariffs have seen some northward movement in recent solar and wind auctions, they still hover below Rs 3 per unit.

While MNRE maintains that offshore wind has become globally 'competitive and comparable' in terms of tariffs, some developers raise concerns. "At this point, tariffs for offshore wind would be around Rs. 7 per unit. Now the question is whether the government will allow such tariffs," said an industry player who did not wish to be quoted. The government should take the feed-in-tariff (FiT) route to get at least the first offshore wind tender going, the person added. "Development of offshore wind is a timely progression for India. The resource offers much higher PLFs that position it closer to base load generation, and now with larger sized turbines (from 4 MW to 8 MW range) it is much more viable," said Kameswara Rao, leader-energy, utilities and mining, at PwC India.

Chennai-based national institute of wind energy (NIWE) is the nodal agency to carry out the necessary studies and surveys before final bidding and will act as a single window for facilitating necessary clearances required for development of offshore wind project in India, the statement added.

Book Release - CARBON UTILIZATION: Applications for the Energy Industry

From left: Dr. M. Sudhakar, Dr. K. J. Ramesh, Dr. M. Rajeevan and Dr. Malti Goel

The Secretary, Ministry of Earth Sciences Dr. M. Rajeevan releasing the book **Carbon Utilization: Applications for the Energy Industry** by Malti Goel (Former Scientist 'G' & Head STAC, DST and Convener, Renewable Energy, IEF), and M. Sudhakar (Director, CMLRI, Cochin) on 15 January 2018 at the NCUI Auditorium, New Delhi. Dr. K. J. Ramesh, Director General, India Meteorological Department and Dr. S. C. Bhan Scientist, IMD are present on the Dias. The function was attended by dignitaries and distinguished guests in large number.

The book on Carbon Utilization focuses on the science and technology of anthropogenic carbon dioxide removal processes as a low carbon growth strategy. With the growing threat of climate change resulting from increasing accumulation of greenhouse gases, CO2-sequestration technology is seen as an assurance for continuation of fossil fuels use in coal based economies. There is a wide coverage of interdisciplinary topics in the nineteen chapters of the book, grouped into four parts. Green technology perspectives for the aluminum, steel, cement and fertilizers industries are covered. The book is published by Springer under the Special Series on Green Energy and Technology.

Coal Based Power Projects

See Steep Drop

In a step towards a cleaner environment, the number of coal-based fired power plants under development have seen a steep decline, especially in India and China, a report said. The report, however, warns that despite a global coal phase-out trend in new coal plants, emissions from operational plants will still keep the 2015 Paris climate agreement goals at bay. The landmark Paris climate agreement aims at reducing global warming by 1.5 degrees Celsius.

In India, the economic pressure and retreat from coal financing by private capital are hailed as reasons that about 16 GW of India's operating coal plants currently lack a power purchase agreement, the report said.

"At 17 sites, the coal plant construction in India is frozen primarily due to a lack of financing," said the report "Boom and Bust 2018: Tracking The Global Coal Plant Pipeline", released by Greenpeace, the Sierra Club and CoalSwarm.

For China, the world's second largest emitter, the report credits tightening restrictions on new coal plant projects by Chinese central authorities as the reason for the continued decline in coal expansion. Currently, India has an installed power capacity of 334.44 GW, of which 214.91 GW is from coal, 62.8 GW from renewable (solar, wind and small hydro), 44 GW from major hydro projects and 25 GW from gas-based power plants. However, the power generation is much less than the installed capacity. In 2017, India's peak power demand was 167 GW.

According to the report, as on January 2018, India has about 87.73 GW of coal-fired power plants under planning and about 43.62 GW under construction. Of this, about 82.35 GW has been stalled. Referring to the report, senior Greenpeace India campaigner Sunil Dahiya advocates the replacement of expensive and polluting coal-fired power plants in India with cheaper renewable energy.

"It's now widely accepted that the new coal power plants are not financially competitive with new renewables in India. Our analysis shows that significant cost savings can accrue to the country and cash-strapped discoms through a planned phase-out of the most expensive coal power plants already in operation and their replacement with cheaper renewable energy," said Dahiya.

In 2017, only seven countries initiated new coal power construction at more than one location, of which India is one. "From a climate and health perspective, the trend towards a declining coal power fleet is encouraging, but not happening fast enough," said Ted Nace, Director of CoalSwarm. In 2017, the Ministry of Power reported that 89 per cent of the existing coal plant capacity, or 166 GW, was not following sulphur dioxide emission norms. Over 300 coal plants nationwide have missed their December 7, 2017, deadline to install pollution controls.

India's ambition to achieve 275 GW of total renewable energy by 2027, the report points out, shows that prospects for future coal power are also dimming, with no coal plants needed beyond those under construction. Speaking of phasing-out coal-power, the report named the UK, the USA and China. In the UK, the electricity provided by coal dropped from 45 per cent of overall generation in 2012 to just 2 per cent in 2017, the report pointed out.

Mr. Suresh Kumar to Head CIL

The Coal Ministry appointed Suresh Kumar, Additional Secretary, the Ministry of Coal, as the part-time Chairman and Managing Director of Coal India Ltd. with immediate effect.

Coal India Hampered by Logistics but FY19 will be Good

Mr. Gopal Singh, Acting CMD

Coal India is producing about 2.3 million tons per day whereas the offtake on best effort basis is about 1.9 million tons because of logistics, says **Gopal Singh,** in an interview with ET,

Edited excerpts:

Slowing offtake When we talk about offtake of coal, there are two-three issues. One is of course the coal should be available at the mine head. Second is logistics, how much of this available coal can be transferred to the power plant and third is demand. Right now, there is demand and there is sufficient coal at mine head.

Meeting Output Targets I don't agree with the statement that Coal India is not able to meet the target. We have the coal and as I told you, offtake depends on three factors – coal availability, logistics and demand. Coal is available, demand is there but the logistics problem is always there. Coal is transported from the mines to power plants by road, belt conveyors, merry-go-round (MGR) track and rail. All the four modes have to perform right.

Some very good decisions have been taken by the government and that will really improve the offtake in financial year 2018-19. It was discussed and decided that all the power plants located within a distance of 100 kilometre from the mine head will take coal through roads. So this is one step which will really improve the offtake from Coal India mines and will help Coal India achieve its target.

Rake unavailability Historically speaking, Indian Railways is doing its best. The number of rakes being loaded probably is the highest ever and because coal and rail fall under the same ministry, there is real synergy taking place. About 320-325 rakes are despatched every day. We never thought that so many rakes can be despatched but that is happening now.

E-auction prices basis. If you compare with the imported price ex-port, it is much more than 20% because our priority is to supply the coal at the minimum price. We have always been trying to reduce our cost of production so that coal price can be low and in that we have succeeded.

Changing its pricing policy to one based on total energy content. We have taken that step to make the system completely transparent and simpler for everyone -- Coal India officers, employees or consumers. Whatever will be the gross calorific value (GCV) of the coal being supplied to the consumer, we will be charging on that basis.

Coal India has been asked to do SWAT analysis to open up coal mining. We have already started the preparation and the third quarter results are a reflection of that. We have been able to reduce our cost of production by Rs 53 a ton! If you look at the past, whenever there has been need, Coal India has always risen to the occasion. We supplied 18% more coal to the power sector in October and thereafter the momentum continued.

CIL and NTPC Plan Joint Venture

Coal India Ltd is considering floating a joint venture with the country's top power producer NTPC to set up plants at mines that do not have transportation access and acquiring private stressed assets.

The two state-run companies have held talks and are

in the process of finalising terms of the joint venture after which a memorandum of understanding is likely to be signed, sources close to the development said.

The proposed joint venture will look at setting up power plants close to mines that do not have coal evacuation infrastructure. “There are coal mines like Pachra and Sanghamitra in the Central Coalfields Ltd (CCL) area that are read to produce but cannot be operationalised since there is no evacuation facility. The planned joint venture with NTPC will help set up power plants at mine mouth for optimum utilisation of the mines. A team from NTPC has already conducted site survey. The joint venture will also look into the possibilities of acquiring stressed private assets on the block,” a senior company official said. Coal India is sitting on a cash reserve of over Rs 40,000 crore.

An NTPC official confirmed the development. The contours of the joint venture are likely to be finalised soon, he told ET on the condition of anonymity. NTPC has in the last three months floated two tenders calling private developers and lenders to offer their stressed coal-based and hydro projects.

The company is evaluating three projects — Jaiprakash Power Ventures 1320-mw, Nigrie power project in Madhya Pradesh, Jaiprakash Power Ventures 1980-mw Bara plant and the 1,200-mw power project at Angul in Odisha promoted by Jindal India Thermal Ltd.

NTPC is also considering to be part of a proposed joint venture with Power Finance Corp and Rural Electrification Corp that proposes to bid for stressed assets that will go to bankruptcy courts. While power plants with a combined capacity of about 20,000-mw are already at various stages of bankruptcy proceedings, the new norms of Reserve Bank of India on ‘Resolution of Stressed Assets – Revised Framework’ issued on February 12 that mandate banks to classify even one-day delay in debt servicing as default are expected to impact about 80,000-mw capacity.

Mahanadi Coalfields Achieves Highest-Ever Coal Production at 143 MT

A K Jha, CMD of Mahanadi Coalfields Ltd (MCL)

said it has recorded highest-ever coal production in 2017-18 which is 2.8 per cent higher than 139.21 million tonne dry fuel mined during the previous fiscal. “MCL has been able to produce more than 143 million tonne (coal) despite several operational constraints. It is a result of cooperation we have got from all stakeholders.

The company, which operates 15 open cast and 5 underground coal mines in Angul, Jharsuguda and Sundergarh districts of Odisha, has supplied 138.27 million tonne dry fuel to consumers, 112 million tonne of which was dispatched through eco-friendly mode like railways, Merry Go Around (MGR) belt, Jha said. The company has registered 12 per cent growth in over burden removal at 138.17 MCuM, which will add to its future growth in coal production, Jha said.

The CMD told reporters in Sambalpur that MCL had made Rs 1,300 crore capital expenditure during the last fiscal, which would be a foundation for its future growth plans. Stating that the 53-km Jharsuguda-Barpalli-Sardega railway line and Sardega Siding would be commissioned shortly, Jha said, The new rail link will have a capacity to evacuate 30-35 million tonne coal annually.

On the company’s diversification plans and thermal power venture in Sundergarh district, he said 2x800 MW Super Critical Thermal Power Plant of Mahanadi Power Basin Limited (MBPL) was progressing well and modalities of setting up the plant were being finalised. MCL is also setting up 10 MT annual capacity coal washers, two each in Ib Coalfields and Talcher

Coalfields, Mr Jha said, asserting that the company is committed to reduce the impact of air pollution in its operational zones.

Commercial Coal Mining Can Cut Import Bill by Rs 30,000 Cr

CRISIL

The move to allow the private sector to commercially mine coal will boost both production and mining efficiency. Substitution of imported non-coking coal with domestic production could save roughly Rs 30,000 crore of coal imports, CRISIL estimates.

The Cabinet Committee on Economic Affairs (CCEA) recently approved the methodology for auction of coal mines/ blocks for sale of coal. Under this, the highest bidder will be given mining rights and there are no restrictions on end-use. Currently, about 94% of the mining is being done by government-owned entities Coal India Ltd. and Singareni Collieries Company Ltd. Despite the recent increase in domestic coal production, India still meets a fifth of its annual requirement through imports, which costs about Rs 1 lakh crore.

Participation of private miners, if allowed, would increase much-needed competition, enhance productivity by facilitating the use of latest equipment, technology and services through higher investments. Considering that almost half of the domestic coal reserves of 300 billion tonne, mostly non-coking coal, are yet unallocated, commercial mining can have far-reaching impact.

Says Sachin Gupta, Senior Director - CRISIL Ratings, “Coal imports, especially of the non-coking variety, should reduce once the proposed regulatory changes to admit private sector companies in coal mining materialise. It will also help the country come closer to its vision of producing 1.5 billion tonne of coal annually by 2022.” Power, cement and steel sectors will gain the most being the largest consumers of non-coking coal. In fiscal 2017, India imported 150 million tonne (MT) of it costing Rs 59,000 crore. As much as 90% of this was by imported-coal-based power plants, independent private thermal power plants and captive power plants. For imported-coal-based power plants, coal imports will continue due to their specific requirements.

Heartiest congratulations to Mr. N N Gautam for Receiving Dr. A N Saksena Memorial Life Time Achievement Award 2018

The Award was presented by Mr. Piyush Goyal, Hon’bel Minister of Railway & Coal, Government of India Present on the occasion were Mr. Sushil Kumar, Secretary Ministry of Coal, Mr. Anil Razdan Chairman, Energy and Environment Foundation, Mr. S.K. Srivastava Co-Chairman Steering Committee World PetroCoal Congress and Dr. Anil Garg, CEO Energy and Environment Foundation

Nuclear Fuel Production to Rise 10-Fold in 15 Yrs: Govt

The Department of Atomic Energy (DAE) will achieve a ten-fold rise in uranium production in three phases by 2031-32, the government informed the Lok Sabha. In a written response to a question in the Lower House, Jitendra Singh, the Union minister of state in the Prime Minister's Office that directly looks after the DAE, sought to assuage concerns by saying there is no shortage of nuclear fuel for atomic plants in the country.

"As per the vision plan prepared in order to fulfil the requirement of uranium to fuel nuclear power plants, the DAE will achieve nearly ten-fold rise in uranium production in next 15 years (by 2031-32). The uranium projects have been planned in three phases," Singh said. After completion of the first phase, it is expected to produce 3.5 times the existing uranium production by the 12th year (2029), he said.

On completion of the second phase, uranium production is expected to achieve seven times the existing production. And, after the last phase is complete, uranium production of the country is expected to record a ten-fold rise by 2031-32, the minister added.

India has 22 operating nuclear power plants. Ten foreign reactors -- six in Jaitapur, Maharashtra, and four in Kudankulam, Tamil Nadu -- have been approved. The government has recently approved 10 more indigenous reactors. The move is also expected to fuel these new reactors. The DAE mines uranium ore from Jaduguda mine in Jharkhand and Tummalapalle mine in Andhra Pradesh. It also imports uranium from Canada, Russia and Kazakhstan.

Jaitapur Project: France will Supply Nuclear Fuel if Needed, Says EDF Chief

France's EDF Group hopes that the terms of the deal to build a nuclear power plant in Jaitapur will be finalised by December 2018. EDF and Nuclear Power Corporation of India Ltd signed an Industrial Way Forward Agreement to develop the power plant during French President Emmanuel Macron's visit to India.

Chairman and CEO of EDF Group, Jean-Bernard Levy, said: "The French government is supporting EDF with some financing and also by giving some assurance regarding fuel delivery so that India will have what it needs to burn in a reactor when it is needed."

What components of the Jaitapur project will be developed by EDF is yet to be confirmed. According to Levy, the estimated tariff for power generated from the project will be determined subsequently.

He also said France will supply nuclear fuel to India if the latter is unable to source it to run the proposed 9.6 GW project. While India is sufficiently capable of sourcing fuel on its own, there will also be support from the French, he said. "What we have requested from the French government is that considering their ability to source uranium, there will be a sort of back-up from France in order to support India in its sourcing policy."

"The agreement defines the project's industrial framework, the roles and responsibilities of the partners, as well as a planned timetable for the next steps," said an EDF statement.

There have been concerns globally regarding nuclear power generation technologies after the Fukushima Daiichi nuclear disaster in 2011. Concerns magnify in the case of the EPR (European Pressurised Reactor, also called Evolutionary Power Reactor) that EDF is offering, since there are no operational power plants in the world using it.

Allaying fears, Levy said: "This technology has been acquired by four countries — China, Finland, UK and France. So India will be the fifth country to adopt this technology…Those in China and France are very close to initiating operations."

But the Industrial Way Forward Agreement that has been signed is just a stepping stone before the long fleet of stairs. Levy also said the company hopes that the finer terms of the deal with NPCIL will be finalised by the year-end.

"The joint target between the two governments is that we should be ready by the year-end. This does not mean we will be, but we are targeting to be ready (with more concrete terms of agreement). This is the objective," Levy added.

Atomic Energy should be tapped for Meeting Fuel & Electricity Needs of Country

Former Atomic Energy Commission chairman and noted nuclear scientist Anil Kakodkar said that keeping in mind the growing energy needs of India, special attention must be given to techniques developed in the country so that dependence on importing energy is reduced. Kakodkar who was delivering the annual 'National Science Day' lecture at Raj Bhawan stressed on the need to develop techniques like solar energy, atomic energy and biomass. "India had begun its atomic energy programme with creative objectives. It is important to spread the message that atomic energy is as safe as any other energy," he said.

Adding that the country needs to make judicious use of its limited resources for fulfilling energy needs, the scientist who is also a Padma Vibhushan awardee, said, "Solar energy, atomic energy and biomass are important in the context of India. These can be converted and utilized for electricity and fuel needs. Hydrogen can be obtained from atomic energy and fuel can be obtained by a combination of hydrogen and biomass." He said that energy utilization had a direct relationship with the quality of life and therefore, "energy resources need to be developed on a long-term basis."

Westinghouse Emerging from Bankruptcy, Capable Of Delivering India Nuclear Reactors: Rick Perry

US Energy Secretary Rick Perry said today that Westinghouse Electric Co is emerging out of bankruptcy and is now capable of delivering the planned six nuclear reactors to India on time. On his first visit to India, Perry said India must look at "broad portfolio" of energy sources to deliver reliable electricity to its growing population and not just at affordability. Civil nuclear cooperation has been a cornerstone of US-India relations. The 2016 deal, under which Westinghouse was to build six AP1000 reactors in Andhra Pradesh, was concluded after more than a decade of diplomatic efforts. But it was in limbo after Westinghouse in March last year filed for bankruptcy following an estimated USD 13 billion of cost overruns at two US projects.

"The most important development is that Westinghouse is coming out of its bankruptcy" by shedding problematic parts of the company, Perry said. "Westinghouse is exceptionally good at building reactors. They are the best reactor manufacturer in the world. Their technology is the best in the world. So they are now ready to go, build reactors." Asked if Westinghouse is capable of implementing the project on time, he said: "Absolutely." Perry said the Trump administration thinks nuclear energy is very important and it would use it for 'leaning forward' in its partnership with various countries. "India is on top of that list." He rejected doubts being raised on spending millions of dollars on large and expensive foreign-built nuclear plants when dropping renewable power prices had provided with a surfeit of electricity generation, saying sustainable reliable power is key to meeting growing energy needs.

"Having a diverse portfolio (of energy sources) is really important. Does that mean that every one of those sources of energy will be cheaper than other, probably not. What is more important - reliability or

affordability"," he asked. India, he said, is growing rapidly and there is a need for a million new jobs every month. "Having a broad portfolio of energy is really important to do that," he said.

"The argument I am making is that if this is just about the cheapest form of electricity that you can get here, you are going to have problems, you are going to have some challenges because at some point of time just relying on cheapest form of electricity will not address the economic challenges that you are going to have, the growth that you are going to have," he said. Giving an example of his Texas state, he said the state deregulated the electrical industry, made it very competitive, kept low rates and had a broad portfolio.

"Everybody wants to buy whatever they buy at the cheapest price they can get it. But you have to keep in mind that you may be putting in jeopardy your reliability at the altar of affordability," he said. India has one of the world's oldest nuclear power programmes, having built Asia's first research reactor in 1954. But electricity generated from nuclear remains a small part of the energy basket. The country has 22 reactors providing up 2.1 per cent of the country's overall capacity, compared with 17.7 per cent from renewable sources and 58.7 per cent from coal. Perry said India and US are leaders in the non-proliferation while "China and Russia don't care about non-proliferation." "India and US should be very close partners. Our historic structures of democracy, following the rule of law, our constitutional freedoms, all of those would be a signal that these are countries that share a lot of same values," he said.

Mr. R Chidambaram, Chief Scientific Adviser Retires

Chidambaram's were seminal contributions to crystallography, and to India going nuclear. He held the position of Chief Scientific Adviser to the Govt. for a long time and heavily contributed to the growth of India's nuclear sector.

Edited and Printed by **Mr. Amarjit Singh, MBE** Secretary General

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URJA VICHAR MANCH

6th March, 2018; Shriram Hall, PHD House, New Delhi
Theme: "Role of Nuclear Power in Electricity Mix of the Country"

We had a very constructive meeting. The Chief Guest was the distinguished Scientist Dr. R.B. Grover of Homi Bhabha National Institute.

Mr. Mahajan in his introduction said that Dr. Grover is an encyclopaedia of the Atomic Energy.

Mr. Anil Razdan welcomed the Chief Guest and said that the topic of Dr. Grover's presentation was most relevant as the future of our energy requirements can be secured only if explore all the energy resources. The Nuclear Power is vital for securing base load requirements.

Dr. Grover gave a comprehensive presentation. The highlights are:

- For the past one decade, electricity generation has been growing at a CAGR of close to 6%. Looking at the trend, generation will be ~ 8600 TWh by the middle of century.
- This is six times the generation in 2016-17. In per capita terms, it is about 4.5 times of the generation in 2016-17.
- Issues to be considered to meet the demand
  - Availability of energy resources,
  - Technologies for their efficient utilization,
- Security, reliability and resilience of supply

Conclusions:

- From health, safety and environment considerations, nuclear and renewable such as solar, wind and hydro outperform fossil fuel sources.
- The relative advantages and drawbacks of nuclear and renewables are perceived differently by different technical, experts and stakeholders.
- One should support all low carbon sources that is renewable and nuclear. Also coal with carbon capture and sequestration.
- Fission based nuclear reactors have been around since the middle of the previous century, deployed on large enough scale for providing base-load electricity and subjected to much deeper scrutiny with regard to safety than any other electricity generating technology.
- Nuclear fuel has high energy density; nuclear power plants have large enough EROI, lowest external costs, low GHG emissions and competitive generation costs.
- India's electricity needs are very large and we need all technologies. 'Technology versus technology' debate has to stop as different electric power sources provide different elements of a balanced energy mix.
- India has multiple technology options at its disposal and can make a judicious selection based on economics and ease of implementation.

There was lovely discussion after the presentation.

16TH ANNUAL GENERAL MEETING

25th March, 2018; India International Centre, New Delhi

16th Annual General Meeting of the Indian India Energy was held on 25th March, 2018 at India International Centre, New Delhi.

Mr Anil Razdan, President, IEF welcomed the Members and gave an overview of the energy sector in India and briefly touched on the programme organized during the last year by IEF.

Mr Amarjit Singh MBE, Secretary General, IEF gave a detail report on the activities of the India Energy Forum during the 2017-18 and expressed his gratitude to all the Members of the National Advisory Board, Board of Management and Executive Committee for providing their support in making another memorable year.

Mr Y R Mehta, Treasurer, IEF presented the Accounts for the Year '2016-17'. He mentioned that the sponsorship for the events are shrinking.

A new Board of Management consisting of 22 Members was unanimously elected for the year 2018 19.

This year the **IEF Meritorious Energy Service Award 2017** was presented to **Shri M A Pathan, Former CMD, Indian Oil Corp. Ltd** for his exemplary services and contribution to Indian energy sector. The Award was presented by **Dr Kirit Parikh,** Former Member (Energy), Planning Commission.

Many members paid rich tributes to Mr Pathan for his services to the energy sector. Mr Pathan thanked the IEF and its member for the honour.

As a new initiative, the Forum honoured its members who had reached Golden Age of 80 Years.

The meeting was followed by family Get together. A large number of members and their spouses participated.

Undersea Natural Gas Pipeline from Iran to India

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 Iran to Gujarat coast in India, through the Arabian Sea.
(A route via Oman is also being explored).

Gas Qty: 31.1 mmscmd under a 20/25 years Long-Term Gas Supply Contract with Iran.
Pipeline tariff: USD 2.5 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.

Meeting needs of Power/Fertilizer Industry for affordably priced gas, while moving to a low carbon economy, after Paris Climate Change Deal.

Alternative & safer route to bring/swap Turkmenistan/Russian & other region's Gas to India Gujarat coast.

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).

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

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Deepwater Gas Pipeline

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