Upstream Ahead

PROCEEDINGS REPORT

UPSTREAM AHEAD SUMMIT 2021

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MESSAGE FROM THE MINISTER

Shri Dharmendra Pradhan
Minister, Petroleum & Natural Gas; Steel
Government of India

February 2021

India is among the fastest-growing large economies of the world. Energy remains one of the most critical elements for ensuring India's sustainable economic growth. India is currently the third largest energy consumer in the world. Oil and gas will continue to remain important elements of India's energy mix despite system-wide energy transition measures which will play a prominent role in adoption of cleaner forms of energy.

Government's attention is on adapting and aligning its strategic initiatives with global oil and gas trends, harnessing technological innovation, fostering collaboration and providing a stable and simplified policy regime. We have taken an ambitious target to increase the share of natural gas from existing 6.2% to 15% by 2030 to transform India into a gas-based economy. To give thrust in this mission, several path breaking reforms and initiatives have been taken including in the upstream EP sector. Focus has shifted to production enhancement from revenue maximization. A future-focused and strategic approach aligned with nation's expectation of ensuring sustainable energy security, is driving the domestic E&P sector.

I am glad to know that first edition "Upstream Ahead - Oil & Gas Exploration & Production - Towards Vision 2050" Summit is being organized under the aegis of MoPNG and DGH. This summit is very relevant and offers an excellent opportunity for all stakeholders to deliberate vital technical, commercial and policy aspects with new ideas and knowledge dissemination towards achieving the full potential of domestic EP mission aligned with India's goal of sustainable energy security.

I wish the summit every success.

Dharmendra Pradhan

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ACHIEVING ENERGY INDEPENDENCE BY 2050

EXECUTIVE SUMMARY

With the world at the threshold of a new energy era, the oil and gas industry is sure to play a more pivotal role than one may expect. As we move towards reducing greenhouse gas emissions in line with the international climate targets, we could aspire for the oil and gas industry to make a substantial contribution towards a healthy energy transition. It is, therefore, crucial to reimagine the industry as a part of the solution and not just the problem.

Over the decades, rebound and reform established the industry as an engine of the world economy. Historically, the resilient industry has managed to overcome volatility fuelled by economic uncertainty, market disruptions and geopolitical risk. From coping with the 2014-16 downturn caused by increased production of OPEC and non-OPEC oil to capitalizing from the gains of decreased global oil inventory levels till 2020, it has stood the test of time by constantly adapting to change and building capacity.

This brings us to an interesting question - how has the oil and gas industry been dealing with the global pandemic? Since the report of the first case of COVID-19, the world has seen a drop in oil demand. The price war over proposed oil-production cuts amid the pandemic resulted in oversupply, followed by a drop in oil prices. By early March 2020, the prices drastically declined to one-third, over just two months.

The pandemic further impaired an already-stressed oil and gas industry. Lockdown and social distancing were the response across the globe, that resulted in an unprecedented demand disruption. Nearly 60 per cent of crude oil demand comes from 12 countries that were locked down for months. Closure of business across the divisions of upstream, midstream and downstream has resulted in a fall in oil demand from 100 to 73 million barrels per day in April 2020 alone and a 4 per cent drop in natural gas demand compared to its pre-crisis projections.[1]

Meanwhile, the excess supply has filled up more than three-fourths of crude oil storage facilities in the USA. The consequent lack of storage and pipeline transmission capacity escalated the storage costs compelling a sale of crude oil at negative prices. Also, plugging wells temporarily to curb the unneeded supply was not possible owing to the technical complexities and costs involved, besides the intense impact on the health of the reservoir. The operational and economic limitations have pushed the operators to continue operations at losses. Thus, the resulting lower crude oil prices have drained the oil exporters of their revenues, while neither the oil importers could gain due to lower demand caused by the pandemic. The prices of gas and LNG, often closely linked to that of oil, have also seen a significant drop.

With an import dependence of 85 per cent in oil and 53 per cent in gas in 2019-20 that constitutes nearly one-fourth of its import bill, India, the third-largest contributor to global oil demand, had undergone a prolonged lockdown of about 10 weeks. This brought the domestic oil consumption down by 38 per cent, in April 2020 alone.[2] The widespread demand disruption associated with labour and equipment shortages and downturn of crude oil prices has curtailed production. The adverse impact on the financials of the oil and gas companies has put a check on the extent and scope of capital expenditures. Furthermore, the pandemic-induced decline in natural gas demand has led the fourth-largest consumer of LNG, India, to defer some LNG cargoes. The lockdown has substantially brought down domestic natural gas production, hindering the growth of LNG in India in the short term.

As of August 2020, the ongoing COVID-19 pandemic was expected to drastically lower India's demand for petroleum products – primarily jet fuel, gasoline and diesel – with it peaking during the second quarter of 2020.[3] India has seen positive signs of demand recovery in the last quarter of 2020. However, as construction and heavy industries still struggle with their recovery, the recovery in diesel demand is lagging behind gasoline, and the trend is likely to persist through most of the first half of 2021. On the other hand, crude oil production was lower by nearly 6 per cent during October 2020, while natural gas production was about 8 per cent lower compared to the same month the previous year.[4] This lag in production arose out of difficulties in moving essential equipment and delay in the installation of new platforms imposed by COVID-19 restrictions and lockdowns.

The oil and gas industry at a macro-level has been highly sensitive to COVID-19 and suffered a revenue decline of 10-20 per cent across all sectors[5], to say the least. But soon after, as the world has started unlocking, the demand has started to pick up, however, still below the pre-pandemic level.[6] The global oil & gas demand is expected to resume an upward trajectory with the retreat of the pandemic and revival of the global economy.

Certainly, the pandemic has opened Pandora's box of persistent market volatility, uncertain business environment, geopolitical complexity and ambiguous future of fossil fuels thrusting pervasive changes in the fundamentals of the oil & gas industry. The future of energy in a post-pandemic world is a synthesis of elements from three scenarios - a strong rebound to the projected levels had the pandemic not hit, a boost to the domestic oil & gas industry, and greener growth based on accelerated energy transition.[7]

Oil & gas will continue to be a dominant source of energy, contributing about 50 per cent to the global energy mix by 2050.[8] Even in the Indian scenario, oil & gas will remain relevant till 2050, with a doubling oil demand of 10 million barrels per day and a 338 per cent increase in gas demand from the current level.[9] It is a crucial element for ensuring India's sustainable economic growth towards a $5 trillion economy.

As part of the efforts to stimulate the economy hit by the pandemic, the clarion call of our Hon'ble Prime Minister for Atmanirbhar Bharat (Self-Reliant India) encourages indigenous development of the industry, to reduce import dependence and ensure energy security. All the stakeholders of the industry are getting operation-ready and contributing to the green shoots of economic revival already visible through the backward and forward linkages, said the Ministry of Petroleum and Natural Gas (MoPNG).

India's energy plan ensures energy justice for all within sustainable boundaries. The fast-paced policy and fiscal reforms by the government in recent years are aimed to achieve the full potential of domestic exploration and production while adhering to global commitments. As the Indian oil & gas upstream industry endeavours to manage the prevailing uncertainties and ensure business continuity in the near term, it needs to envisage the longer-term opportunities from the vantage point of energy security and sustainability.

In view of the above, the first edition of 'Upstream Ahead – Oil & Gas Exploration & Production – Towards Vision 2050' summit was recently held under the aegis of MoPNG and DGH, providing a platform for all key stakeholders to come together and drive powerful solution-based dialogues for charting the way forward. The summit provided a platform and an opportunity to find the next normal in the oil & gas industry with an agile mindset while balancing the short-term and long-term priorities in the face of energy transition, decarbonization and digitalization.

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[1] *"Gas 2020 Fuel Report"*, IEA, June 2020
[2] *"Impact of COVID-19 on the O&G Industry"*, Deloitte, 2020
[3] *"Country Analysis Executive Summary: India"*, EIA, 2020
[4] *"Monthly Production Report"*, Ministry of Petroleum & Natural Gas, October 2020
[5] *"Industry Top Trends 2021: Oil And Gas"*, S&P Global Ratings, 2020
[6] *"Oil Market Report"*, IEA, September 2020
[7] *"The Future of Energy After Covid-19: Three Scenarios"*, Wood Mackenzie, 2020
[8] *"Energy Transition Outlook 2017: Oil And Gas Forecast To 2050"*, DNV, 2017
[9] *"BP Energy Outlook 2020 : India"*, BP, 2020

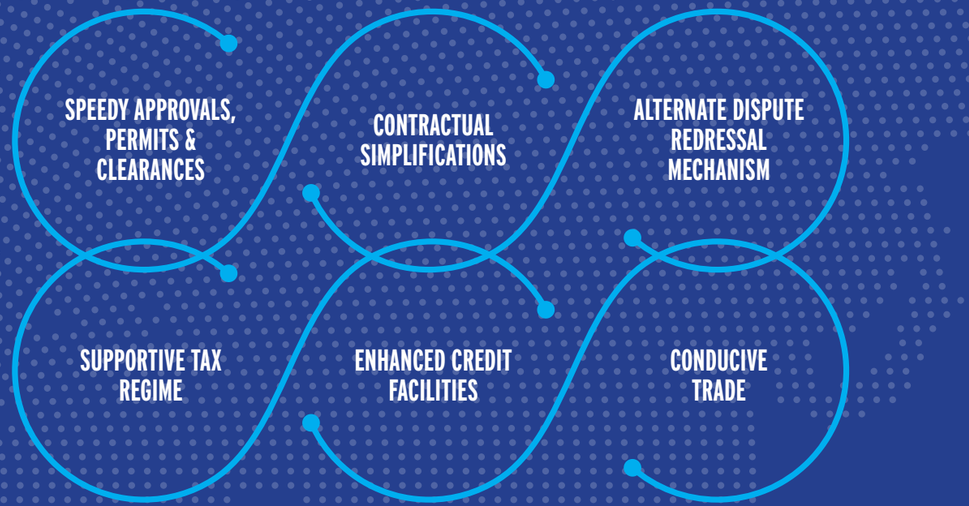
LEVERS FOR ACHIEVING VISION 2050

- INTENSIFIED EXPLORATION
- ENHANCED RECOVERY
- MONETIZATION OF DISCOVERIES

GOVERNMENT INITIATIVES FOR BOOSTING EXPLORATION & PRODUCTION

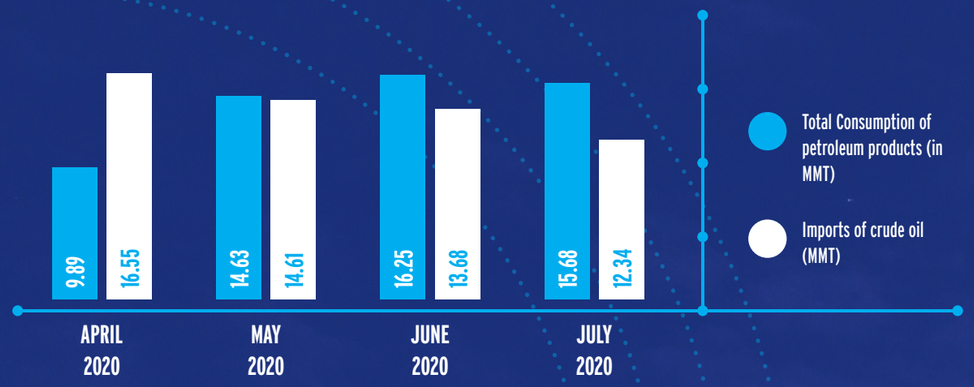
- OPEN ACREAGE LICENSING POLICY (OALP)
- DISCOVERED SMALL FIELD POLICY (DSF)
- NATIONAL SEISMIC PROGRAMME (NSP)
- PRODUCTION ENHANCEMENT SCHEME
- ENHANCED RECOVERY POLICY
- PRODUCTION SHARING CONTRACTS (PSC)

FOCUS AREAS FOR EASE OF DOING BUSINESS IN UPSTREAM OIL & GAS INDUSTRY



CHALLENGES FACING THE UPSTREAM OIL & GAS INDUSTRY IN INDIA

CONSUMPTION VS IMPORT



VALUE (BARRELS/DAY)

INTRODUCTION

“With a growth-centric, investor-friendly and environment-conscious energy sector, a self-reliant India will also be a force multiplier for the world economy. Energy security is at the core of the country’s policy planning.

~ Hon’ble PM Shri Narendra Modi

With a growing population of 1.4 billion and one of the major emerging economies in the world, India has a promising future in the global energy mix. Being one of the fastest-growing energy markets in the world, its share in the global energy demand is expected to double by 2050. The government of India has committed itself to the goal of energy justice for all its citizens. For this, oil and gas will be a crucial element of India’s energy security despite clean energy sources gaining momentum.

Reducing import dependence of oil and gas by enhancing domestic production has been the cornerstone of recent revolutionary reforms by the government of India to improve energy security and self-reliance. The persistent efforts towards production maximization for the ever-increasing energy needs of the country coupled with a facilitating business environment defines the government’s upstream mission. Intensified exploration, enhanced recovery and monetization of discoveries are determined to be the three levers to achieve this substantially.

India has 26 sedimentary basins covering an area of 3.36 million square kilometres. The conventional hydrocarbon resources are estimated at approximately 42 billion metric tonnes of Oil & Oil Equivalent of Gas, which is almost double the previous estimate owing to the recent hydrocarbon resource reassessment study.[10] However, nearly 93 per cent of the total sedimentary area remains unexplored, offering a huge scope for exponential growth in prospectivity of Indian sedimentary basins in the coming years. This resource potential is useful in advancing the objectives of programmes like OALP, DSF and NSP. The Production Enhancement Scheme, Enhanced Recovery Policy and Production Sharing Contracts are some recent transformative initiatives to promote exploration and production activities. The sector envisages an ambitious target of increasing acreage under award to 1 million square kilometres by 2024 and 1.7 million square kilometres by 2030.

To leverage this untapped potential, the government is adopting a progressive approach to liberalize the upstream sector. Major policy and administrative reforms such as Empowered Constitution Committee for expediting approvals, exemption from Environmental Clearance for exploratory drilling, Alternate Dispute Redressal mechanism, contractual simplifications through self-certification and online contract management system in recent years have encouraged Ease of Doing Business in the sector. By further enhancing the conduciveness of policy and fiscal framework, it is creating huge investment opportunities and a pro-business environment for Exploration & Production players.

Although the relevance and dominance of oil and gas in the next three decades is undoubted, the roadmap for the upstream sector from business as usual to a sustainable world in 2050 entails a multitude of challenges. While the geopolitical uncertainty and the price volatility impact the revenues and overall risk assessment, the complexities in operation and technological implementation add to the costs involved.

Operational challenges arise out of logistically complicated drilling sites owing to their geology and also, lack of adequate surface logistics in case of frontier explorations. The non-availability of fit-for-purpose technologies and requisite service providers hinder the exploration and escalate the operational costs (OPEX) involved in high-risk, high-cost exploration projects. On the other hand, technological challenges in drilling operations while optimizing production, hike the CAPEX in exploration impacting the techno-economic feasibility of the project.

The economic viability of E&P projects is driven by the size of the reserve. However, the long gestation period calls for financial endurance from the O&G companies fighting all the odds. Additionally, non-adherence to contract timelines furthers the financial burden on the cost-intensive projects. The very nature of projects makes it difficult to find feasible project funding options. Regulatory issues on land acquisition and approvals not only incur cost due to delays in execution but also limit the ease of doing business in the E & P sector.

The spirit of cooperative federalism is an integral part of our country’s governance. It requires both the Centre and States to be guided by the broader national concerns of utilizing rich natural resources for the common good of the people and also building a prosperous nation. Like any other sector, upstream also calls for a harmonious relationship between the Centre and States and amongst States. Establishing synergy and bringing the States on board in a coordinated way for realising the potential of upstream is a challenge in itself.

The Exploration and production of hydrocarbons presumably harm the natural environment. The environment and safety protocols are not mere obligations but requisites for de-risking production plus the successful development of reservoirs. Ineffective water management and gas evacuation can compromise health, safety, environment and optimal production.

The entire energy transition phenomenon has imposed a set of challenges to the upstream sector arising from within as well as externally. While there is a growing need to fulfill the commitments of reducing carbon and environmental footprint from E&P activities, the competitive threat coming from clean energy alternatives puts the sector’s share in India’s energy mix at risk.

Given the oil and gas industry has a big stake in the overall growth of the country, there is a need to envision a resilient strategy towards a commonly shared belief about the future. This was made possible by the first edition of ‘Upstream Ahead – Oil & Gas Exploration & Production – Towards Vision 2050’ summit under the aegis of the Ministry of Petroleum & Natural Gas and Directorate General of Hydrocarbon. The summit was well structured to collate perspectives of all the stakeholders and sustain our future with adaptive changes.

This first-of-its-kind virtual summit hosted intellectual panels of more than 70 speakers and 7000+ registered participants. The discourses as part of the two-day event focussed on a wide range of aspects of the E&P sector, leading to a holistic approach of engagement. It witnessed industry-wide global participation of technocrats contributing to the discussions around enhancing the sector capacity. Some of the crucial issues that are potentially impeding the sector’s growth and its share in the country’s energy basket were addressed to suggest a way forward. The purpose was to generate actionable and measurable outcomes that can act as short, medium and long-term milestones for all stakeholders involved, on the road towards Vision 2050.

The event brought together all stakeholders to embrace new technologies for scaling up E&P activities. It provided a platform for collaborative and constructive dialogue complementary to both the industry and the government. The need for enhanced policy support, increased participation of competitive companies, digitalization and innovation across the value chain was acknowledged by most of the eminent speakers.

Emphasizing diversity and inclusion as part of sustainable development, the conclave set the stage for enriching discussions on gender diversity and the role of youth in the future of the energy sector. Brainstorming ways to secure economic prosperity while achieving sustainability, the pathway is set to keep this dialogue going, encouraging oil & gas companies to rethink their business models and suitably revamping the policy and fiscal framework.

[10] *“India Hydrocarbon Outlook”*, Directorate General of Hydrocarbons, 2019-20

CLICK HERE TO WATCH SESSION

INAUGURAL SESSION

The first edition of the 'Upstream Ahead – Oil & Gas Exploration & Production – Towards Vision 2050' summit was inaugurated on Feb 11, 2020, under the aegis of MoPNG and DGH. The summit was hosted by ONGC, OIL, Cairn Oil & Gas (Vedanta Ltd.), and HOEC. It composed of six Insight sessions, five Spotlight sessions, two High-Intensity Discussions on Environmental Regulations and Vision 2050 for the E&P sector, and two Special Interactive Sessions on Gender Diversity & Inclusion, and Youth in the Energy Sector.

The one-of-its-kind virtual summit hosted intellectual panels of more than 70 speakers from the Oil & Gas Industry across the globe, along with experts from Financial/Academic Institutions, Regulatory authorities & Central Ministries, Service providers, Consulting firms, and Institutions like NITI Aayog, World Energy Congress, MNRE, DPIIT, FICCI, etc. with registered participants reaching a grand number of 7,000 (+).

With ever-growing energy demand and aspirations for a $5 trillion economy, the oil and gas industry has a big stake in the overall growth of the country. Shri SCL Das, DG, DGH, in his opening remarks, highlighted the contextual importance of the summit for delivering in short packages as part of a continuum, embedded in the goal of commonly shared belief about the future. It can help build a resilient strategy toward a vision for the next three decades and make adaptive changes aligning with the global climate change, according to him. Mr Das suggested some fulcrums of sustainable growth in the E&P sector viz. Resource Conversion, Enhanced Recovery Factor, Digitalization Initiatives, Broadened base of Industry and an Enabling Policy Framework.

Referring to the summit as well-structured, he opined that the perspectives of eminent speakers on key aspects and themes can be collated to convert them into actionable outcomes towards Vision 2050. These outcomes can act as input for a Monitoring Committee established for this purpose. Thus, in his words, the summit is a platform for serious engagement among all stakeholders together and has brought a 'Thinking Element' to the whole exercise.

With the large unexplored resource potential along with ongoing onshore and offshore surveys and data availability, the sector provides a wide scope for enhanced exploration and production activities. Shri Tarun Kapoor, in his inaugural address, called for all stakeholders who can make a difference in the E&P sector to come together in ramping up the production of oil and gas as part of the Vision 2050 – meeting 50% of the demand from domestic production by 2050.

Talking about the key levers to increase production levels, he briefed that while there is a need to enhance production in already working basins, the new players/ investments can be directed towards left out basins that provide larger areas of exploration. Also, more acreage can lead to more production, he added.

He also envisioned a boost in private sector participation in E&P either individually or through a joint venture, such that there is an adequate number of competitive companies in the sector. On clearances, he stated that all wings of the Government have a clear objective to support faster clearances.

Shri Amar Nath, Joint Secretary (Exploration), MoPNG presented an overview of the Indian E&P sector. He underscored the transformational policies such as OALP, NDR and RSC introduced by the government of India in the last 5 years. The whole ecosystem of policies in a maturing stage when connected with EODB defines a hallmark of E&P development, according to him. In his speech, he noted that 2050 is a benchmark year in many aspects such as climate change, sustainable development etc. Upstream is going to play a vibrant role in the next 30 years. For this, a long-term vision till 2050 can be implemented in milestones focusing on the short-term. Thus, the event is complimentary for the Government as well as the Industry to innovate and move towards Atmanirbhar India said, Mr Amar Nath.

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POLICIES AND REGULATIONS IN EMERGING BUSINESS ENVIRONMENT

The Oil & Gas Industry requires a conducive business environment to thrive and emerge stronger for dealing with uncertainties of the global economy. For the upstream sector to realize its full potential, the encouraging policy framework formulated by the Government act as a quintessential enabler in this regard. It provides a stable and supportive regulatory regime, an efficient governance mechanism and a strong enabling infrastructural ecosystem.

A spotlight session was held for discussing the 'Policies and Regulations in Emerging Business Environment'. The session was chaired by Shri Amar Nath, JS (Exploration & CVO), MoPNG and co-chaired by Shri Sanjay Chawla.

The session witnessed intellectual communication between eminent speakers. Anand Gupta, ADG (Development), DGH had set the stage by presenting on the topic 'Incentives for Giving Impetus to the E&P Sector'. Shri R.K Dhasmana, ONGC elaborated on the support required for stimulating the deepwater exploration. While Shri Rajeev Kumar, British Petroleum dwelled upon some innovative solutions to surmount the challenges of the E&P Sector, Shri Pinakadhar Mohapatra, Antelopus Energy voiced out the need for an impetus to exploration through reforms.

The panel made relevant comments and suggestions for a rewarding policy framework to support the upstream sector. The Government of India has offered support and incentives whenever the industry was reeling under a low-price regime and global competition. With RSC and reduced statutory levies coming into play, India is expected to improve its fiscal regime in terms of average government take, against globally competing jurisdictions.

Owing to the key reforms of HELP, DSF and geoscientific initiatives, substantial progress was made against the Committed Work Programme at the time of OALP bid rounds – i.e., 30,000 lkm of 2D seismic, 45,000 skm of 3D seismic and 380 exploratory wells. And a fast-paced monetization of DSF was observed and is expected to achieve anticipated production of 1.32 MMT of oil and 2.91 BCM of gas from DSF, by 2024-25.

Accelerating production is at the core of government initiatives for the sector. The projected value of Oil production is 31.9 MMT and 40.1 MMT by 2021-22 and 2024-25 respectively. For Gas production, it is expected to reach a projected value of 37.6 BCM and 52.4 BCM, by 2021-22 and 2024-25 respectively.

For the Indian E&P industry to sustain itself, Deepwater areas will have to be kept in focus. A more attractive fiscal environment and Ease of Doing Business are essential for significant investments in deepwater exploration and production. There is a need for an improved knowledge base for investors in deepwater areas to evolve a more confident Risk-Reward perception. This is achieved by drilling parametric wells in basin deeps to remove uncertainties about petroleum systems in deep waters. A broad grid 2D dataset calibrated with drilled wells is a necessity. Key parametric wells in basin deeps are required to remove the uncertainties associated with petroleum systems in deepwater. Thus, a comprehensive technical assessment document for east and west coast deep-water basins separately is the need of the hour. Participation in programmes like the Ocean Drilling Program, Deep Sea Drilling Program or Margins can offer an opportunity to enhance our knowledge base and thereby the coverage of the Indian Ocean and the Arabian Sea.

Front end technologies in deep/ultra-deep waters and HP-HT domain are extremely costly if implemented in isolated cases. A production revenue stream attained after the use of state of art expensive technologies can be demolished by a price fall like 2014 or 2020. The industry needs to be encouraged to use technology to tackle difficult play and reservoirs by providing lower benchmark protection.

An improved policy framework is intended to safeguard the exploration risk money and big spending on frontend technologies. A provision to hedge, compensate or ensure operator from the huge loss of risk money in case of failure in deepwater drilling needs to be formulated. It is recommended to

incentivise the operator for the risk before discovery in deepwater drillings, like an extension to the existing post-production enablers, to attract investors.

The panel suggested some possible policy modifications to make India an obvious choice of investment compared to other investment destinations. Delinking of deepwater areas from contiguous onland or shallow water producing areas for basin categories or complete abolition of revenue share for deepwater areas in Category - I basins is one such recommendation to distinguish and do away with revenue sharing for deep offshore operations. Moreover, exploration expenditure can be treated as R&D for the tax benefit of at least 100%. Ring fence with onland / shallow water blocks is suggested for cost recovery.

To boost the ease of doing business in deepwater exploration, it is imperative to bring about "All Cleared Licenses" and "Fixed Timelines" for granting clearances including the correspondence. Additionally, the formulation of milestone linked Easy Exit Policy with an associated discount on LD is also important. A precondition of a "fixed-notional" penalty for time compensation only can ensure seriousness.

Innovation based business models and policy support can help the E&P sector surmount the challenges on its way towards Vision 2050. The panel suggested infrastructure sharing as the way forward to improve commerciality of the discoveries, fast track development and avoid under-or un-utilization of existing infrastructure. While delays attract penalties, it is suggested to incentivize operators and/or investors on due performance early in time.

The discussion included the demand for action towards bringing Oil & Gas under the ambit of GST and handling tax distortion. Also, the sector is looking forward to the implementation of a unified pipeline tariff and One Nation One Grid in the coming future. The panel also stressed innovation to reduce and minimize carbon footprint from oil and gas upstream operations such as usage of crude oil that is carbon neutral.

The shift of focus towards production enhancement rather than revenue maximization in the E&P sector has called for an impetus to exploration through policy reforms. Focus on play extension to realize the potential of 12 high impact plays discovered in the last 20 years is expected to give promising outcomes.

It is recommended that to improve prospectivity recognition through new ideas, plays and fit-for-purpose technology. Startup companies comprising of experienced persons can be encouraged to conduct Prospectivity Analysis by providing easy data access to them. Joint Industry study groups- "JIPs", can be constituted as an arrangement for experience and knowledge sharing. Further, a "Study License" can be created for experts abroad to take part in collaborative study groups and contribute to enhancing the promotional efforts of the Indian upstream industry.

The panellists called for significant acreage promotion efforts by all stakeholders. There is a need to put a check on the entry barriers for small but innovative companies to take up E&P activities by removing the financial criteria like Net Worth, Bid Bond, etc. The possibility of activity in "No Go Areas" can be explored with a well-defined SOP. However, in the case of North Eastern States, security and permit issues need to be addressed for ease of operation.

For an industry reeling under a low price regime and global competition, fiscal incentives enhance the economic viability of the exploration activities. Exploration benefits and fiscal incentives to deeper objectives exploration in Category-I basins are bound to encourage more players and de-risk exploration. Also, the benefits of Category – II/III basins can be extended to deepwater areas / tight oil and gas reservoir in Category – I basins to ease the fiscal pressure on the high-cost deepwater domain in a low commodity price regime.

In line with the focus shift towards augmenting production, a joint study group is recommended to be constituted to prepare an action plan in yet-to-produce discoveries, aiming at "Zero Idling of Reserves". Production linked Incentives can be provided for monetizing non-producing fields. Bid parameters can be designed accordingly, for example, Lowest Ask "LA" bids.

Besides, Tight Oil & Gas reservoirs can be unlocked with a separate staged developmental approach, exclusive to unconventional reserves It needs to be supported by collaboration amongst operators for lesson learning and resource sharing. A special dispensation to improve the commerciality of Tight oil and gas reservoirs is a requisite for realising their potential. Joint study groups can be constituted to study the Shale gas/Shale oil potential integrating the data from recently drilled wells by NOCs and also the earlier drilled wells. The 10% increase in profit oil share for producing unconventional hydrocarbons in acreages awarded under NELP and PSC regime needs to be removed.

Leveraging innovation and technology is suggested as the way forward to improve recovery and production in producing fields. EOR needs to be considered in the early stage of development. Reducing cycle time from pilot to commercial-stage for EOR can improve the productivity and efficiency of E&P activities. Signature Bonus and Revenue share mechanism can be employed to improve the PEC model to attract more players. It is necessary to promote effective Industry-Academia collaboration for skill development required for EOR that can drive the industry to achieve the goals of a sustainable future.

EXPLORATION OPPORTUNITIES AND CHALLENGES

India has 26 sedimentary basins covering an estimated area of 3.36 square kilometers. Increasing oil and gas production is crucial to reduce its import dependency. Enhancing domestic production by promoting Exploration and Production activities by providing more exploration and discovered acreages has always been among Government's highest priorities.

The resource potential revealed with the recent reassessment study presents the true potential of the Indian sedimentary basins. Over the last few years, there has been a significant drive for exploring the untapped hydrocarbon potential. Exploration facilitates identifying and locate potential reservoirs and evaluating the risk inherent to the project itself, and hence, a crucial part of the E&P sector value chain.

Given the growing impetus on exploration, a spotlight session was held to deliberate upon the opportunities and challenges faced in exploration. The session was chaired by Shri Rajesh Kumar Srivastava, Director (Exploration), ONGC and co-chaired by Shri K.S Shaktawat. Eminent speakers representing DGH, and leading exploration businesses participated in the deliberations.

Dr C. Laxma Reddy, ADG (Exploration), DGH presented the state of appraisal of sedimentary basins from a policy perspective. Shri CSV Sandilya, ONGC elaborated on the scope for achieving the reassessed hydrocarbon resource potential. While Shri Indrajit Barua, OIL explained the challenges faced in frontier exploration, Shri Neeraj Sinha, RIL elucidated the challenges involved in offshore exploration and production activities. Shri Biswanath Ghosh, Cairn Oil & Gas (Vedanta Ltd.) detailed the significance of realizing the hydrocarbon potential in Indian basins. Dr M.K Sharma, OIL highlighted the opportunities and challenges in exploration in mature basins.

Play-based exploration is the way forward for a comprehensive basin evaluation to finally zero in on prospect identification, as necessitated given the Resource Assessment Study (2017). Basin-wise identification and prioritization of prospective corridors can be carried out for each play for maximum realization of YTF potential. Identification of wells based on prospectivity, structural style of prospects, entrapment mechanisms is important to conclusively assess the plays with a minimum number of wells. G & G studies are required for aligning the exploration priorities of basins considering future thrust areas.

An intensive seismic survey is required for mapping and appraising the basin area. The latest technology in imaging sub-basalt Mesozoic sediments with advanced processing and interpretation tools needs to be leveraged. New state of the art technologies such as Gravity Gradiometry, Multi-Component Survey and 4D Seismic Technology, can be deployed for better subsurface imaging. This can help in finding missed opportunities and cost reduction in the long run. Alternate geophysical techniques, such as Airborne Gravity Gradiometry, Cableless seismic survey, Satellite-based EM Technology, Magneto Telluric Survey, Stress Field Detection and passive seismic tomography can be deployed as investigation tools. Also, subsurface risks need to be mitigated by continuously reviewing exploration stage gates. Advanced data analytics can be employed to create exploration values. A significant recommendation was to formulate a National Reprocessing Program on the lines of the National Seismic Program to benefit from better imaging – revealing and de-risking missed opportunities.

In line with the maximization of production, prospective resources (YTF) can be targeted through aggressive exploration in established, known and new plays. Undertaking more aggressive exploration efforts in Category – I basins while testing and gathering information on play in Category –II and Category –III basins is a step towards this. The latter with a longer Exploration Phase need adequate incentive to take up exploration. The volume capture needs to be maximized considering exploratory performance and effectiveness during the last decade play-wise prospectivity perception and YTF potential.

There is a need to strategize exploration activities to maximize resource conversion and economic recovery of oil and gas resources both in mature and frontier plays across different basins. It is also vital to offset the natural decline in production from existing fields.

In the case of frontier exploration, an additional dispensation of exploration time can be provided for challenging blocks based on surface logistics primarily related to topography. For instance, a special dispensation of 3 additional years is provided for exploration blocks where surface elevations of areas/ blocks are above 150 masl. This is meant for investing in overcoming logistic challenges for operations and preparatory services, an efficient management plan for the fragile natural environment, and the deployment of unconventional exploration tools and techniques for risk reduction measures in the frontier exploration process.

A frontier exploration model is a requisite to gain in terms of operational efficiency and commercial viability. It can shorten the time required for G&G information to be acquired. It allows risk reduction measures to be applied to the exploration process and thus, lowers the overall cost. Furthermore, given the challenges involved in frontier exploration, a Service Providers Hub needs to be developed by pooling resources of operators in the manageable vicinity at the site.

Digitizing the data on integrated petroleum system models for all the basins with access open to operators and academia is a step towards ensuring data access for assessing reservoirs. Also, all types of data can be integrated with National Data Lake to help de-risk plays into prospects at a basin scale. The availability of complete data can also enable interpreting Fluid Inclusion studies and identifying sweet spots. A data liberation policy for the E&P sector is the need of the hour.

Under the Early Monetization strategy, the cycle time to get the first oil can be reduced significantly by parallel rather than a sequential approach to retain motivation on investment and returns. Recovery can be improved further by finding new resources/ reserves in a safer and sustainable yet commercially viable manner with low finding cost. Creative and innovative exploration thinking is required based on integrating basin modelling, temporal and spatial variation of reservoir and source, redistribution of old oils and providing late migration pathways. Monetizing high pour point oil/ heavy oil encountered in many established wells with suitable technology can improve returns and profitability in exploration.

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PRODUCTION CHALLENGES - CONVENTIONAL AND UNCONVENTIONAL HYDROCARBONS

There is an emerging need for the E&P sector to align with the national objective of Energy Security. Accordingly, the government shifted its focus towards production enhancement. In this backdrop, the significance of mature fields is increasing over time. Techniques like EOR & ASP are paving the way for improving recovery and optimizing mature fields. Recovery from conventional as well as unconventional hydrocarbon reserves is crucial in our journey towards a sustainable future and Vision 2050.

A spotlight session was held to facilitate discussion on overcoming the challenges involved in production from conventional and unconventional hydrocarbon reserves in a sustainable way. The session was chaired by Shri Anurag Sharma, Director (Onshore), ONGC and co-chaired by Shri Yash Malik. The session hosted distinguished speakers who are associated with the value chain of E&P.

Shri O.N Gyani, ONGC highlighted the importance of optimizing production from mature fields to monetize their discoveries. Shri Sai Subramanian, Cairn Oil and Gas (Vedanta Ltd.) illustrated the benefits of Enhanced Oil Recovery and Alkaline Surfactant Polymer when employed in production activities. Dr R.K Vij, PDPU advocated for robust dynamic reservoir management which is essential to handle uncertainty. Shri Vilas Tawde, Ex-Essar elaborated on the development of unconventional reservoirs and associated challenges.

The EOR projects starting from concepts to laboratory studies to field pilot implementation and finally large-scale field implementation is capital and time-intensive and has a long payback period. Here, the support of the Government /regulator in the form of a policy and regulatory framework is required. Moreover, if eco-space is created, collaboration amongst the operators, the technology providers, service providers, the government and regulators is essential.

The field of Mangala was discovered in 2004. Very early in the development of Mangala, a pilot Chemical EOR was done and by 2012, a full field development was put in place. The same is the case with Aishwariya and Bhagyam too. In nutshell, an early start of EOR always helps improve recovery and economics.

In the case of Chemical EOR, degradation of polymer happens from the time it is prepared till such time it reaches the well-bore inside a well. This needs to be monitored and improvised to ensure degradation losses are kept at a bare minimum and optimum viscosity reaches the wellbore. Partially Hydrolysed polyacrylamide (HPAM) – used in Chemical EOR is currently produced outside India and transported as polymer powder for ease of transportation. In India, SNF has just started the production of HPAM. A policy framework for setting up polymer plants next to oil fields will provide an opportunity to manufacture in liquid form (eliminate costly powder) and supply at the wellhead. More fields can undertake polymer flooding at a competitive cost. Similarly for ASP, huge quantities of chemicals are required that are currently procured from outside India only. Appropriate policies are needed to promote such industries for producing oil from tertiary recovery methods in a cost-effective way.

Mature oil fields are significant for improving/ maintaining oil and gas production. However, there are certain operational challenges associated with optimizing these fields. The panel discussed some possible solutions to overcome these. The bypassed oil in mature fields can be located using saturation logs, numerical simulation, seismic techniques and tracer tests. Comprehensive Surveillance and Monitoring techniques such as Capacitance Resistance Models (CRM), Streamline Simulation and AI/ML based algorithms can be employed to understand and evaluate the efficiency of Water Injection into the fields. Water production management techniques like Profile Modification/Water Shut-Off in Injectors/ Producers and Well Completion can be adopted with ease of intervention. The produced water can then be treated to address environmental concerns and adhere to stringent legislation on produced water discharge.

Monetization of discoveries is an important aspect of realising the hydrocarbon reserves. An empowered body involving industry, regulators and policymakers need to be constituted for field / cluster-specific action for early monetization. Further, it is anticipated that the incentive criteria for IOR projects be brought down to beyond 40% recovery from the current 60% for oil fields and to beyond 60% from the current 80% for gas fields.

There is a need for revamping the EOR policy for smooth implementation and maximizing the gains of ER. The EOR Pilot is suggested to be made necessary rather than mandatory and also incentivized as they are economically non-viable. Fields where EOR Pilot concluded before the Policy notification, may be considered for an incentive for commercial application. An incentive for EOR schemes approved before the policy notification is awaited to be implemented. The immiscible gas injection process can be included under Enhanced Recovery schemes. A move towards sustainable EOR can be made possible by special treatment for CO2 EOR as CCUS.

Industry and Academia must collaborate to develop expertise, setting up world-class research laboratories, train youngsters in large numbers, to bring innovation in the field of EOR. Partnership with technically and financially robust companies will be a game-changer and will benefit everyone. Joint ventures can help to reduce risk and can bring out the external technology needed for the implementation of EOR. There is a need for a multiprong activity to reduce EOR implementation time. A supportive policy for EOR from the government can give a win-win situation for the Government and the operator.

A dynamic development plan is the need of the hour that can be obtained by integrating field data (geological, geophysical, reservoir and production data) with laboratory data (core, fluid, PVT, rock and fluid property, geological/seismic/drilling data) to feed into reservoir simulation software. It is essential to incorporate data into redevelopment strategies through simulation-based development planning based on performance analysis. Online modelling for better reservoir management can be facilitated to involve continuous monitoring of the field for lifecycle planning and incorporating any mid-course corrections. It requires assimilation of different exploration strategies for the same field based on the E&P operator being dealt with – NOC/MNC/Pvt. Enterprise.

A data-driven dynamic reservoir management process that integrates human skills, smart technologies, automated tools and Big Data is vital for optimizing recovery, offsetting production decline and thereby maximizing economic benefits in existing matured oil fields. Progress towards a digital oilfield with minimal human intervention is the way forward to enable real-time monitoring and implementation of corrective actions for achieving higher levels of production. At the same time, the induction of relevant technology and implementation of IOR & EOR technologies is required for maximizing profits. Thus, it is important to synchronize the business objective of E&P operators with organizational and country's objective for maximizing hydrocarbon recovery.

In a concerted effort towards Atmanirbhar Bharat, there is a need to recognize the role of unconventional hydrocarbons. A separate policy framework for CBM and Shale gas needs to be envisaged. The world today is on the crossover of a new age of unconventional energy. Shale gas has surged up supply economics and upturned the weakening hydrocarbon industry in North America. Today, the world is building on the US model of unconventional gas which is set to secure a bigger position in the primary energy pie.

As of now, shale gas has been abysmally explored in India and exploitation is a dream. Exploration and exploitation of shale gas may be a plausible solution to India's natural gas scenario. The global experience may provide a workable solution to this endeavour. Invoking global technological revolution will unleash shale gas production and will revolutionize traditional thinking about India's shale gas scenario.

To help increase awareness about Shale Gas, workshops drawing leading edge E&P professionals, academicians and students to delve upon all aspects of the play including, geological and geophysical exploration and development challenges, completions and fracturing, production performance and optimization, and water management is required. Thus, collaborative knowledge sharing is essential to bring shale gas to the surface and making it commercially viable.

Further, it is important to revisit CBM activities in India as only 7 blocks are in development while most of the rest are relinquished. Techniques such as drilling multiple wells from a single pad and 45 degrees inclined wells can be employed as they enable a more cost-effective gambit of unconventional hydrocarbon exploration at similar productivity.

CBM and Shale gas projects should be encouraged

to earn carbon credits in near future for their clean development mechanism, which can then be monetized for a clean energy transition. Cost-effective treatment of co-produced water with high TDS can be adopted. Co-produced water is drained out from the targeted coal seams as part of CBM extraction, like multistage RO treatment and filtration system. Treated water is discharged to use for irrigation/ fisheries and drilling/ fracking/ dust separation etc. On the other hand, a gas evacuation network can be established to ensure monetization of every single molecule of CBM gas, preventing flaring of the precious unconventional resource.

IMPORTANCE OF DIGITAL TRANSFORMATION

With continuous technological innovation being core to the Oil and Gas industry, global E&P players have been swift to adapt and harness the power of digital in creating a competitive advantage in the industry. Digital transformation will allow the Indian E&P industry to reconstruct the core business models and operations through data-driven decision making. Organisations should view this as an opportunity to improve the functional capabilities and efficiency of their facility.

Highlighting the importance of Digital Transformation in the E&P sector, an insight session was held that was chaired by Shri Pankaj Kumar Goswami, Director (Operations), Oil India Limited and co-chaired by Shri K.K Nayak. The policy perspective for accelerating the growth of digitization was elucidated by Shri Anoop Sharma, ONGC. Certain applications of AI & ML in the oil and gas industry were illustrated by Shri Indradyumna Datta, Cairn Oil & Gas (Vedanta Ltd.). Shri P.K Painuly, UPES Dehradun gave his insights on preparing the next generation workforce and organizational culture for digital transformation.

Considering data as the new oil, it is crucial to develop global data standards and policies related to data sharing and security. This is required to promote public sharing of data, use of Public cloud and sharing machine data online with OEMs. It can ensure transparency in operations and help deal with issues surrounding data security and data residency. A vision for National Data Lake needs to be fostered for providing easier and faster access to new technology and standardized data. This paves way for data liberation through Cloud platforms. Cloud technologies can enable real-time data transmission and access and relax data residency. Thus, a national data market for structured digital data can be created that is openly accessible on the cloud.

Collaborating knowledge platform to crowdsource knowledge allows sharing/trading of information enabling more multi-client data and reports. A nationwide high-end multi-client data acquisition program from FTG, CSEM, Satellite, Broadband, Drones can be developed on these lines, using wireless technologies and IoT.

An ecosystem for innovation of new digital solutions and digital adoption needs to be fostered allowing to run a pilot using new ideas. Clear regulatory frameworks are required for leveraging technological advancements that can further promote the shift towards a low-carbon economy. It is recommended to develop an incentive-based policy to invest in digital technologies across the value chain of E&P. This is required to ensure minimum investment commitment and relax procurement. An inter-ministerial group needs to be actively involved to expedite approvals and help progress identified digital initiatives.

Prediction and accuracy in realizing the hydrocarbon potential can be improved by enabling quick access to data and faster computation and analysis through digital transformation. The use of Big Data Analytics and AI/ML in exploration can drastically reduce the time and cost to produce the first oil/gas. The feasibility of AI/ML applications in upstream activities, such as Predictive Analytics based Asset Health Monitoring, Data-driven Water Flood Optimization, Hydraulic Frac Screen out Prediction, FBHP prediction and Fault Line detection can be explored in the Indian scenario.

Additionally, a dedicated portal can be created for the E&P industry to access and share ideas and best practices. It is important to develop digital capabilities continuously by upskilling the workforce through collaborations for skill development. Further, incorporating the skills of creativity, critical thinking, communication and collaboration into the curriculum architecture is key to prepare the next-generation workforce.

The value creation from digital transformation can be evaluated as a function of financial performance (profitability) and customer (savings), environmental (reduced emissions) and social (workforce safety) value. Contemplating on these lines, a digital smart oil field needs to be envisaged to gain from real-time field data, data processing and operations monitoring, better HSE and faster decision making. To enable digital across the Indian E&P industry, all key stakeholders (government, regulator, operator, and oil field service providers) need to come together and work collaboratively to drive a partnership-driven model for digital transformation to embed and flourish.

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FINANCIAL CHALLENGES FACED BY THE UPSTREAM INDUSTRY

The upward trajectory of global energy demand presents enormous opportunities for the upstream sector in years to come. Realizing the relevance of the sector, the Government has ironed out several rigidities related to various regimes to push investments in the exploration & production sector. These initiatives are largely directed towards early monetization of resources and focus on ramping up exploration activities in future.

An insight session has been conducted on this theme of financial challenges faced by the upstream industry. It was chaired by Shri N.K Singh, Secretary, OIDB and co-chaired by Shri A.R Patel. The session discussed the existing policies and key focus areas in need of intervention with the inputs from distinguished speakers.

Shri Ranajit Banerjee, DGH highlighted certain financial challenges commiserating the risks and uncertainty involved at each phase of E&P activities. Shri P. Elango, HOEC presented some of the challenges in the financial evaluation of E&P projects. Shri Rakesh Agiwal, Cairn Oil & Gas (Vedanta Ltd.) explained the significance of contract management with financial prudence. Shri Deepak Mahurkar, PwC provided certain funding options that can help overcome the financial challenges faced by the sector.

The upstream projects are characterized by high risk - high returns and high capital intensity. Certain funding mechanisms prevalent in developed markets such as Venture Capital, Private Equity, Equity financing and Mezzanine debt financing can be introduced into Indian market exploration to facilitate high-risk financing opportunities. Venture Capital and Private Equity Window for Exploration and Early Development Funding that funds exploration or appraisal projects can be floated with a portfolio approach to mitigate risk. Robust certification Standards based on international best practices need to be established to enhance due diligence of development projects. Effective regulatory frameworks are essential for Reserve Based Lending and Asset Based Financing during the development stage.

Enhancement of funding for future receivables on a cash-flow basis is dependent on recoverable reserves, production profile, prices of oil & gas and future CAPEX. To overcome this limitation, an independent evaluation of reserves by a certified agency can be undertaken. Further, evaluation of the development plan and post-production CAPEX programme can provide a better assessment for funding. Due diligence on offtake contracts and price and a minimum reserve tail of 25 per cent can be emphasized for an effective production monetization process.

The suggestions for phase-wise funding were provided as part of the discussion. Vanilla Corporate Debt and more bank lending need to be encouraged for future revenue securitizations. Long term ECA Credit can financially support large development projects. Tweaking security and assignment protocols is necessary to avail funding options in the production stage. Also, ease of enforcement of Bank Security needs to be ensured in case of default through divestitures/recovery.

An enabling and well –developed Oil Field Services ecosystem is the need of the hour to reduce uncertainty and risk in drilling wells and constructing facilities, particularly in offshore exploration. Besides, common carrier access to infrastructure developed by public and private sectors over the years is a way forward to reduce the costs of development.

A time-bound and efficient regulatory system is vital to reduce project delays in terms of investment decisions and implementation and also the costs involved. Addressing legacy issues of Product Sharing Contracts based on the Cost Recovery Model by providing an optional migration from PSC (NELP) to RSC (HELP) Regime can be of great consequence to an already stressed industry. It is also recommended by the panel to work towards bringing the Oil & Gas sector under the GST regime.

Indian oil & gas industry is attempting to attract more investments to become Self-Reliant. And, effective management of existing contracts is critical to get new players. A plan regarding the key provisions, timelines, SOPs, roles & responsibilities, simplified standard templates and organizing regular training needs to be developed. An organizational structure/system including digital platforms, document management, resource allocation and authorizations is required for the execution of the contract. Reporting on Contract Performance Indicators, progress against plan, performance against budget, cost/revenue sharing and other issues is key to the effective management of the contract.

Defining the roles and responsibilities of operation and contractor is a prerequisite to avoid overlapping. Resolving differences in the interpretation of contract clauses is of high importance to ensure ease of doing business. Periodic review meetings between contract parties can be arranged to enable an exchange of ideas and clarification of issues. The dispute resolution mechanism needs to be more robust by allowing equal representation from all parties – government and company, and constructive dialogue. It is important to provide an option to select a neutral seat in arbitration. Appropriate Standard Operating Procedures (SOPs) need to be developed to implement the provisions of the contract and enable self-certification.

Micromanagement of petroleum operations is better avoided to reduce delays in seeking approvals and implementation. A monitoring protocol can be devised for contract compliances. Furthermore, automation and digitalization can be leveraged to ensure effective contract management with minimum government and maximum governance. Employing skilled and competent resources with a solution-oriented and decisive mindset is required for effective contract management. Teams comprising of such resources with the right skill set, competencies and experience are expected to be empowered to take timely decisions.

Talking about enablers to attract more investments in the coming years, exploration by removing "ring-fencing" of cost recovery is anticipated to attract investments to the tune of $2billion. There is an immediate need for expediting decisions on ER/IR incentives that is pending for the past two years. Fast-track approvals and clearances through appropriate SOPs are small steps towards self-certification that not only benefits in terms of ease of doing business but also early monetization. Adequate policy reforms and uniform fiscal levies are essential for making projects viable and attract investments.

Certain innovative financing options for overcoming the financial challenges in the upstream oil & gas sector were part of the deliberation. Volumetric Production Payments (VPP) is one such option for dedicated wells and DSFs. Commodity Indexed Bonds are encouraging financial instruments for de-risking of cash flows concerning commodity price movements. Reserve Based Lending with liability limited to project-specific reserves are a viable option for development. Carrying Partner Financing is also a funding option that is recommended specifically to the oil & gas industry.

Other general funding options suggested including Catastrophe Bonds for de-risking partial amount of funds raised; PE Investments in exploration and development phases and mature basins; InvITs for upstream oil and gas infrastructure; and Multilateral and Bilateral Lending on combining with carbon negative projects.

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NEW TECHNOLOGIES IN THE E&P SECTOR

Advances in technologies for well drilling and completion have been enabling the energy industry to reach new sources of oil and natural gas to meet rising demand around the world. In the era of the energy transition, the role of new technologies in the E&P sector is crucial to reduce global emissions.

The emerging new technologies enable the effective and efficient discovery of new resources, optimization of existing mature fields, access to harsh or remote locations, development of challenged reservoirs that previously were not economic to produce and most importantly, a safe, responsible and cost-effective decommissioning.

Taking this into account, a spotlight session was organized under the theme - New Technologies in the E&P sector. The session was chaired by Dr Anand Gupta, ADG (Development), DGH and co-chaired by Shri Sudhir Kumar. It involved eminent speakers from leading global and national companies of the sector.

Mr Javier Franquet, Baker Hughes presented before the panel some of the state-of-the-art technologies for Drilling and Completion, while Shri Padam Singh, Sun Petro introduced some cost-effective innovative solutions in small fields that can prove to be transformative for sustainable operations. Shri Gautam Reddy, Schlumberger elaborated on the scope for development and re-development of mature fields in a low commodity price regime. Shri Shobhit Tiwari, Cairn Oil & Gas (Vedanta Ltd.) explained the significance of multistage fracturing employed in a tight reservoir in Western India. Mr Rob Jansen, Shell put decommissioning of offshore production facilities into perspective.

New drilling and well completion technologies need to be employed in the oil & gas upstream sector to deliver 50% of the oil energy supply and contribute to CO2 reduction by leading carbon capture utilization and sequestration projects all over the world. It can be promoted to influence geothermal technology in terms of production and underground storage.

The relevance and feasibility of some of the new drilling technologies like Ultra-high temperature geothermal drill bits, Self-adaptive depth-of-cut drilling technology, Downhole closed-loop of continuous proportional steering, Extra-deep reservoir navigation illumination and Drilling automation and remote operations can be examined in the Indian scenario.

Also, new wellbore completion technologies such as Conformable sand management completion system, All-electric flow control valve with fiber-optic monitoring, Autonomous inflow control device system, Fiber-optic distribute strain sensing and 15-Kpsi Multistage HPHT fracturing system can be appraised for their applicability in Indian basins.

In the case of tight reservoirs, it is essential to allocate sufficient time and resources to build, calibrate and validate the fracturing model not only during the injection but also during the production stage. Any compromise in initial investment in time for data gathering and modelling processes need to be avoided as this pays back well during reservoir development. It is suggested to focus on operational efficiencies that reduced the cost/frac by 50% in RDG for all future projects in tight reservoirs. The post-job treatment history matching temperature surveys are recommended to be combined with production logs to verify that the treatment designs are covering the desired pay intervals. This can be used to optimize cluster placement in future treatments.

A key component for developing a tight sands reservoir is a complete understanding of the geo-mechanical model and its calibration. Geo-mechanical model is used to characterize mechanical rock properties, pore pressure and in-situ stress, mechanical stratigraphy, formation elastic properties, dynamic and static young's modulus, Poisson's ration, unconfined rock compressive strength, the azimuth of minimum horizontal stress, the magnitude of vertical stress, minimum and maximum horizontal stress.

There is a difference between conventional and unconventional reservoir development. In a conventional reservoir, hydraulic fracturing is a production accelerator tool, whereas, in an unconventional reservoir, hydraulic fracturing is an enabler. And therefore, to avoid any disappointments, it is very important to have calibrated Geo-mechanical model for the development of tight sand or unconventional reservoir. A clear understanding of geo-mechanical properties and their seamless integration with petrophysical interpretation is the key to achieving long-term sustainable production.

Construction of a 1D geo-mechanical model and its validation through diagnostics fluid injection tests is essential in the appraisal stage. It is important to build a petrophysical model which identifies the reservoir zones correctly. This is essential for facies classification to characterize permeability and define pay zones in the tight rocks. Also, the completion requirement and accordingly well plan should be emphasized for the appraisal and development stage. Most importantly, it is not advisable to be limited by the available tools or imagination as there is always a better frac design.

Implementation of new technologies that bear the potential to revolutionize the Indian E&P sector can catalyze our efforts towards a sustainable energy future. Some of the technologies that were brought into the discussion can up the game in operational efficiency. DELFI cognitive E&P environment can be employed to host workflows on a cloud-based offering for improved efficiency and cost reduction. Agora platform can be leveraged to combine the traditional domain knowledge of an operator with the cutting-edge technologies like AI/ML and IoT to lower costs and adopt agile technologies. Pulsar service in wireline cased-hole environments provides comprehensive reservoir rock and fluid content data that is comparable to data acquired during open-hole logging to improve drilling efficiency and well productivity. Broadband tracking can be implemented to increase the reservoir coverage and efficiency of fracking, thereby lowering the total service cost and eventually increasing production by 40, to 50% from appraisal to development.

There is an urgent need to address the challenges around contracting to smoothen the process of industrialization and commercialization of breakthrough technologies and their deployment. Deployment of the latest technologies needs to be enabled for all players of the service industry within India in a commercially viable manner. Given this, it is recommended to pave way for new contracting models that enable remote operations.

The panel had explored the cost-effective solutions that are indigenously developed for exploration in small fields. The expediency and viability of these innovative technological solutions need to be evaluated for deployment in Indian small fields. Besides the field activities, certain innovative solutions were recommended for civil works, to save cost and time. Indigenously developed initiatives such as Rate Contract System for civil works, Warehouse/storage facility, Precast RCC slabs designed for drill sites in place of cast-in-situ foundation, Change in Design of Tank Foundation from RCC to CC block masonry and Optimization of Land for Drill Sites can go a long way in making small fields remunerative and efficient.

Certain cost-efficient recommendations regarding the well in small fields pertain to planning wells from a single location to save the cost of land, construction, recurring cost of security, lease rent etc. The land area of a new drill site can be optimized to 80m x 70m x 65m from 110m x 110m x 80m of old sites. Also, material cost can be saved by using old inventory available with other operators to reduce casing and tubing prices significantly. For instance, contingency bits from all over the world can be procured for drill bits, thereby reducing their cost by more than 50%.

The session also examined the scope for decommissioning to emerge as a growing industry.
It is suggested to allow a new set of contractors with a demolition mindset. New tools and technologies need to be adopted based on a better understanding of the requirements. Trusting the contractors and maximizing the use of their assets with a more hands-off approach is a prerequisite. It calls for collaboration with service providers and learning from international best practices to take advantage of the wide execution window for decommissioning.

Deployment of innovative and new technology in decommissioning can save costs to the tune of 30 per cent. Pioneering Spirit – a purpose-built vessel for decommissioning activities, Catamaran lifting with hydraulic shears, and Concept of Claw to reduce offshore exposure are some of the illustrations that were part of the discussion. They shift the hours spent on decommission from offshore to onshore, making logistics and labor cost and the availability of vendors a lot cheaper. Thus, it is recommended that leveraging technology is the way forward for ensuring mandatory decommission in a safe, responsible and cost-effective manner.

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INDIANIZATION AND SELF-RELIANCE

In tune with Atmanirbhar Bharat Abhiyan, Govt has decided to incentivize the growth of local content in goods & services while implementing oil & gas projects in India under its Global Tenders Policy, PP-LC Policy and MSME Policy. Indigenization in the Upstream sector, however, has been unable to match the rising demand and E&P activities. Sustained efforts are being undertaken by the Govt. of India to promote an ecosystem for domestic manufacturing.

A spotlight session held in line with the Indianization, and Self-Reliance of the E&P sector was chaired by Shri Om Prakash Singh, Director (T&FS), ONGC and co-chaired by Shri Jeetendra Tikku. The session hosted eminent speakers associated with the Indian oil and gas industry.

Shri A.P Tripathi, ONGC had set the stage with his insights on Indianization efforts in place so far and the way forward. Shri Subramanian Sarma, L&T Hydrocarbons voiced out the need for rejuvenation of the service industry for the E&P sector. The role played by local goods and services in this sector was elucidated by Shri Manas Majumdar, Partner, KPMG. The significance of Aatmanirbhar North East for leveraging its hydrocarbon potential for gas-based economic development was brought to light by Shri Arun Modi, IGGL.

In the current E&P business scenario, there is a need to develop a win-win business model for the sustenance of both the E&P operators and the Service industry. Bridging the gap between operators and service providers through value addition is imperative while promoting Atmanirbhar policy. Conducive and healthy partnership models and incentives can be devised, aligning their business interests. Measures to reduce the cost of production can make it economically viable to operate on a partnership basis. It is important to exclude the impact of external factors – oil prices, supply & demand and geopolitics while evaluating a prospective alliance. Thus, a robust risk-reward sharing model between E&P operators and service providers can be developed to combine efforts for value-added solutions.

An impetus to the service industry is of utmost importance to augment production indigenously. Service providers need to be encouraged to focus on innovation, technology and digitalization and also a revival of mature fields. The use of automation, digitalization and mechanization robotics) with local expertise in E&P execution can be promoted to bring consistency in quality and reduce cycle time. Thus, it is recommended to leverage the cost advantage of localization in the service industry.

The development of E&P sector equipment in India by domestic industry is crucial to make the country self-reliant in E&P equipment. Indian service providers need to be allowed to quote based on the technical experience of the supporting company to support localization in the indigenous tender. A five-year procurement plan can be devised to allow visibility of opportunities to indigenous manufacturers so that they can plan and participate in the procurement process. A comprehensive Start-up policy can be formulated to promote domestic start-ups. Also, domestic vendors can be promoted for onboarding on GeM.

While advocating localization with Make in India and Atmanirbhar Bharat for Oil & Gas industry, it is very important to keep the focus on high OFSE spend potential areas for localization such as stimulation and completion services, chemicals, seismic services and subsea equipment. Potential targets in the form of services and equipment for localization can be identified to be achieved in short, medium and long terms over the next 5 years.

Short Term (0-2 Years)	Medium Term (2-4 Years)	Long Term (4-5 Years)
Localized efforts with small and incremental investments	**Require capability development and handholding**	**Technology transfer and global partnerships are required**
Synthetic Oil-based mud services	Seismic Services	Rigs - Onshore and Offshore
Chemicals and Drilling Fluids	Completion Equipment	Subsea Equipment - Xmas Trees, Subsea Spool, Mandrel
OCTG Equipment	Coil Tubing	Logging Units & Well Services
Mud Handling Equipment	Marine-related Equipment	Well Stimulation Services
Rotating Equipment - API Multistage Pumps, Frac Pumps, Sucker Rod Pumps	Control Systems and Instrumentation Equipment	
Onshore and Offshore Logistics	O&M services for Equipment	
Marine and onshore safety equipment		

A structured action needs to be initiated across the E&P ecosystem to focus the efforts & accelerate localization. From the government's end, a conducive market providing a level playing field for local production needs to be ensured.

It is suggested to harmonize tax rates across local production (18-28%) and import (5%) of the same equipment. Investments in technology and R&D production facilities can be incentivized with the help of innovative financing options such as collateral-free lending. Further, localization of Product Validation Protocols like Testing and Certification can help overcome a major cost constraint in the value chain.

At the same time, the role of E&P companies in boosting indigenization cannot be overlooked. They can formulate a focused spares development policy for local production of OEM spares and the growth of MSMEs. Long term orders i.e., a minimum of 3 years are required to help increase investments by vendors. Changes in clauses such as Past Track Record (PTR) and local sourcing/offset clauses can help localization.

The focused development of Eastern India is imperative to harness the untapped potential of this region to fuel the next wave of national growth through a gas-based economy. For smooth and accelerated completion of E&P projects, it is crucial to address the issues around land acquisition, environment and forest clearances in the North East from time-to-time. The pipeline capacity needs to be increased to ensure a consistent supply. It is essential to connect demand centres in northeast India by extending and modifying the national gas grid (currently spanning Barauni-Siliguri-Bongaigon-Guwahati). New areas for the City Gas Distribution (CGD) network are required to be identified to create a market for natural gas in the Northeast. Also, the substitution of LPG with natural gas is suggested to meet the excess local demand.

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OIL AND GAS E&P AND ITS IMPACT ON GLOBAL WARMING

The world moving towards net-zero GHG-emission entails two major changes. First, GHG emissions from all sources would be required to be reduced, especially from fossil fuels given their prominent contribution to global warming. Oil and gas E&P companies can join forces with the stakeholders across the spectrum of the energy sector to reform and transform by building adequate capacities. The industry can leverage its resources and capabilities to prioritize, strategize and align its operations with the goals of low carbon emission and sustainable development.

The growing concern of global warming necessitated engaging in a dialogue with esteemed speakers in an insight session. The session was chaired by Dr C Laxma Reddy, ADG (Exploration), DGH and co-chaired by Shri Indrajit Barua, OIL. In view of this, a resilient strategy for low carbon emission from Oil & Gas E&P Activities in Indian Sedimentary Basins was recommended by Dr S.K Bajpayee, JS, MoEF&CC. Adhering to our commitment to SDGs, the role of upstream in achieving them was elaborated by Shri K.D Bhardwaj, National Productivity Council, DPIIT. Shri M.A Patil, FICCI provided an overview of the ongoing efforts and opportunities towards reducing carbon and water footprints in Oil and Gas E&P Sector.

The concept of sustainability needs to permeate into every aspect of operations in oil & gas companies. It is highly important to make everyone in the organization responsible for sustainability to benefit from a more engaged and productive workforce as well as profitability in the long run. Integrating environmental protection in strategy development is the need of the hour for a sustainable future. Further, the scope of metrics of competitiveness needs to be broadened by incorporating indicators on resilience, inclusivity, environmental and social protection, climate change, etc. Shifting the approach from reactive environmental compliance to proactive environmental protection standards is essential to go beyond ethical and moral obligations.

Integration of SDGs in core business practices of Oil & Gas companies by incorporating them into their corporate systems, policies and processes is of utmost importance. An index can be formulated at the company level assessing the performance of the company against the SDGs based on industry-specific relevant parameters.

SDG	Relevance to Oil & Gas companies
SDG 1	Taking steps to alleviate poverty and zeroing hunger by focusing on Local Development and Energy Access.
SDG 2	
SDG 3	Ensuring good health and well-being through measures regarding Health Impact Assessments, Road Safety, and Worker & Community Protection.
SDG 4	Providing learning opportunity through Local Content Strategy, Workforce Education, Technology Training.
SDG 5	Promoting Gender-Sensitive Policies, Inclusive Decision making, Women's Employment Opportunities and eliminating gender inequality.
SDG 6	Adopting Water Strategy, Water Risk Management, Water-use efficiency & best approaches to manage water resources.
SDG 7	Increasing the substantial share of renewable energy and advanced cleaner fossil fuels technology, Natural Gas and Alternative Energies.
SDG 8	Protecting labour rights and promote a safe and secure working environment for all workers through policies regarding Skill Assessment, Local Employment, and Workforce & Supplier Development.
SDG 9	Building resilient infrastructure, achieving sustainable industrialization and promoting scientific innovation and research for a Sustainable Infrastructure supported by collaborative Technology Transfer
SDG 10	Access to equal opportunities and promoting inclusion of all, irrespective of age, sex, etc through Impact Assessments and steps towards Transparency and Engagement.
SDG 11	Developing Disaster risk reduction framework, Cultural & Natural Heritage Protection, Operational Risk Assessment to ensure a sustainable urbanization
SDG 12	Promoting a sustainable citizen community through efficient use of natural resources, adoption of technologies with a focus on natural resources, efficient Waste Management, Supply Chain Sustainability and Product Stewardship with the help of digitalization.
SDG 13	Integrating climate change measures into policies with steps taken for Resilience & Adaptive Capacity, Emission Mitigation and Strategic Planning.
SDG 14	Adopting Accident Prevention & Response, Environmental Assessments, Ocean Acidification Minimization to safeguard to handle spillages, protect life below water and promote the blue economy.
SDG 15	Enhancing efforts in protecting life on land from soil remediation to combating desertification and ecosystem management.
SDG 16	Promoting the rule of law at the national & international level concerning community engagement and protection of human rights.
SDG 17	Strengthening the means of implementing and revitalizing global partnerships with innovative and technology-driven leaders in the global oil & gas industry.

Most of the Oil & Gas E&P Organisations have been conducting studies intending to reduce Carbon and Water Footprints. Gas Turbines of Process Gas Compressors can be operated in Combined Cycle for reducing carbon footprint thereby saving the entire present gas consumption of 4.987 million scm/annum for the existing Gas Turbine Generator (GTG). Thermic Fluid Heaters can be tuned to reduce the %O2 from the existing level 6.2% to 3.0%, resulting in a reduction of the excess air level from the existing level of 41.89% to 16.67% and improvement in efficiency by 2%. Also, compressed air demand from a Variable Speed Compressor of 449 cfm capacity can be delivered very efficiently with an average power saving potential of 10.57 kW.

Suggestions made to reduce water footprints include recovering flash steam (about 119 TPD) by condensing and collecting condensate (263 m3/day @ < 100 TDS) to send it for some useful purposes. Effective energy and water audits by experienced & reputed agencies are imperative to reduce overall carbon and water footprints and thereby energy and water consumption.

Further, certain solutions were suggested for the efficient use of water. RO-Stage 1 rejects (@749m3/day) can be reused for reinjection water to wells after sulfide treatment. The fire hydrant testing water in mobile tankers can be collected and recycled after settling & filtering. Optimizing/reducing lpm flowrate of utensil washing taps from existing 20-25 lpm to about half, i.e 10-13 lpm is a recommended solution to save RO water. This can be implemented by installing nozzle type fixtures on taps in the kitchen utility area.

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ENERGY TRANSITION AND CLEAN ENERGY ALTERNATIVES

The world has committed to shifting towards affordable and clean energy by 2050. This transition entails switching to new clean sources of energy as well as progress towards net-zero GHG emissions in a sustainable manner.

India is committed to delivering cleaner, reliable, secure and affordable energy to all its citizens. It aims to achieve 40% of the total installed power generation capacity through non-fossil sources by 2030, as part of its NDCs. Also, it aspires for reducing the emission intensity of GDP by 33% to 35% from 2005 levels by 2030. It set an ambitious target to achieve 175GW of renewable energy by 2022 and 450 GW of installed capacity of renewables by 2030. The rising energy demand will be met through cleaner forms of energy. Renewables and alternate energy sources will play a major role in transforming the energy landscape.

In light of the joint efforts across the globe towards sustainable energy transition, an insight session was held to discuss the pathway for the future and the role of renewable energy as well as oil & gas. The session was chaired by Shri Rakesh Agiwal, Head Joint Venture Management, Cairn Oil & Gas (Vedanta Ltd.) and co-chaired by Shri Gaurav Moda.

Shri Seethapathy Chander, WEC India, had laid out an overview of energy transition and clean energy alternatives. While Dr P.C Maithani, Ministry of New and Renewable Energy elaborated on the need, progress and targets towards adopting renewables, Mr Jarand Rystad, Rystad Energy Norway had detailed the role of oil & gas in the energy transition. A policy perspective of moving towards the set agenda was brought to discussion by Shri Rajnath Ram, NITI Aayog.

The panel believed that for the sustainable energy transition, energy supplies need to balance between the "Trilemma" of Energy Access, Energy Security and Energy Sustainability. One way of moving towards transition is the optimal usage of energy by unlocking energy efficiency potential. This can reduce energy demand by 13% in 2030 thereby expediting a low-carbon transition. India's efforts towards energy-efficient cooking systems have made a perceptible impact at the household level. Infrastructure strengthening of LPG distribution, City gas distribution networks and electric induction cooking can be suitable steps ahead for widening access to affordable and clean cooking gas.

At the same time, the need was felt for an enhanced focus on substituting existing energy sources with those generating lower emissions. An increase in the share of renewable energy in a progressive manner is essential to achieve 21% of energy from renewable sources by 2022. India has been on track in actualizing its solar and hydroelectric potential. The next promising source is wind energy - onshore and offshore. Onshore wind energy has been well optimized and contributing to the country's energy mix over the years. However, government support is required for tapping the potential for offshore wind energy, especially in peninsular India, through hybridization with solar energy.

Another renewable source that is worth exploring is Green Hydrogen. Opportunities for using it as a blended fuel with diesel and as a primary fuel using fuel cells can be considered. The on-site production of green hydrogen can be promoted as an alternative clean energy source to offset diesel-fired electricity generation. A further study can be conducted on improving the efficiency of hydrogen production and combining it with other processes. Relevant research needs to be undertaken to develop systems for the storage and transportation of hydrogen produced. Its application in transport vehicles and package generators can redefine the current emission scenario. Aligned with these benefits, Hydrogen Energy Mission announced in Budget 2021 is a step towards long term energy storage, industrial processes and mobility.

Grid connectivity is crucial in ensuring a reliable energy supply. Efficient storage systems are required for 24x7 access to renewable energy. The green energy corridors and energy management centers need to be created to better integrate renewable energy with the grid. To further promote the consumption of renewable energy, initiatives such as incentivizing its utilization in off-peak hours can be introduced. The problem of intermittency calls for immediate attention to avoid blackouts in absence of solar and wind power. This can be addressed with the help of batteries and grid storage, making renewable energy competitive.

With new technologies emerging to change the way we operate; it is imperative to encourage and deploy them on both the generation as well as consumption side by replacing existing technologies and controlling emissions. Setting up advanced chemistry cell/ battery manufacturing facilities can be incentivized to support the transportation sector and energy storage systems. The ambitious vision of decarbonizing transportation through electric mobility based on cleaner fuels – hydrogen, CNG/CBG, LNG, ethanol/ methanol is of great importance. In this regard, the country is aiming to achieve 20% ethanol blending by 2025. The Voluntary Vehicle Scrapping Policy announced in the Budget 2021-22 is a sustainable way forward for encouraging fuel efficiency and reducing oil imports.

The panel of eminent speakers recommends the promotion of industrial decarbonization. It can be achieved by de-dieselization, especially in the MSME sector, and replacement with a cleaner version of electricity sources to become net-zero emission companies by 2030-2040. The Department of Science and Technology has planned to implement US$ 238 million on advanced ultra-supercritical technologies for cleaner coal utilization. It entails the establishment of two Centers of excellence and promotion of clean coal technologies such as coal gasification and coal to chemicals.

There is an evident push from the government to move to a gas-based economy. The policy initiatives are aiming to achieve a 15 per cent share in the primary energy mix by 2030 - a significant rise from the current 6 per cent. Robust infrastructure is key to boost India's efforts towards One Nation One Gas Grid, for making energy more available and accessible. To promote this greener fuel, it is necessary to ensure adequate marketing and pricing freedom and allowing price-discovery through an exchange.

Research and development can help in advancing energy transition and shift towards cleaner energy alternatives. The Mission-based Clean Technology R&D in India is one such initiative to scale up clean-tech R&D on a mission mode. R&D can prepare the energy sector in spearheading grand challenges to identify frontier digital technologies. Also, start-ups with smart energy technology interventions can be encouraged to bring competition and value to the industry.

The emerging sources of energy along with enhanced technological disruptions call for upskilling of the workforce. The Skill Councils need to be strengthened for imparting robust training and building the capacity of the workforce, especially the youth. Also, there is an indispensable need for establishing strong industry-academia linkages. New and relevant courses are required to be part of the curriculums in the academic institutions aligned with the skill requirements in the field of clean energy.

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HIGH INTENSITY DISCUSSION 1: CHALLENGES & WAY FORWARD IN OBTAINING CLEARANCES UNDER PREVAILING ENVIRONMENTAL REGULATIONS

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The oil & gas industry is subject to a persistent challenge of improving the environmental footprint to meet increasingly stringent standards. However, environment clearance means more than mere technical checks. It reflects our committed collective responsibility towards the protection and improvement of the environmental quality of life. Proactive Steps taken by MoEFCC to change the Regulations for ease of doing Oil & Gas E&P Activities have immensely helped the sector.

As part of a high intensity discussion session, an intellectual panel had focussed upon some of the challenges and way forward in obtaining the clearances for E&P activities under prevailing environmental regulations. The session was chaired by Shri Ravi Agrawal, Additional Secretary, MoEF&CC. The forum held detailed discussions for charting a roadmap for Vision 2050.

The Upstream Oil & Gas Industry is persuading since December 2018 for the required changes in the Environmental Regulations at Central/ State levels for Ease of Doing Oil & Gas E&P activities in Indian Basins, owing to the challenges faced by the National/ International Private Operators as well as National Oil Companies.

More than 200 blocks were relinquished by the contractors out of a total of 310 blocks allotted by GoI during the PSC (Production Sharing Contract) regime and 16 more are under the process of relinquishment. This is mainly due to abnormal delay in obtaining multiple Statutory Clearance/ Approval/ NOCs/ Certificates/ Licenses/Leases/ Permissions etc. required from various Ministries at the Central level as well as compliance with various Regulations prevailing in the individual State/UTs.

The Government of India has introduced various reforms to promote ease of doing business for Oil & Gas E&P activities in Indian Basins in recent years. To attract more investment, the Government of India is considering to develop some mechanisms in consultation with the Stakeholder Ministries/ State Govt for obtaining the basic Statutory Clearance/ Approvals of blocks in pre-hand so that same can be handed over to the Operator during the signing of Contract viz., PEL/PML grant from State Govt after allotment of the block by Central Govt, Environment Clearance for B2 Category Exploration Activities and Consent To Establish (CTE) from State/UT PCBs under the provision of Air Act- 1981 and Water Act- 1974. It will facilitate the operators to start activities in the block from Day-1 without waiting for years together as of present status.

The Oil & Gas E&P activities grossly differ from other mining activities carried out under the purview of MMDR Act, 157 in terms of operations and impact on the environment. In the onshore drilling rig site, only 2% to 3% of the land is used for Oil & Gas E&P Activities in a block. In the case of exploratory drilling (B2 Category EC) where the commercial viability ratio is 2% to 5%, the land is returned for Dry Wells after site restoration. For A Category EC, the site is restored to normalcy as per "Site Restoration Policy" after production.

On the other hand, Oil & Gas E&P Activities in North-East India is more challenging as compared to other parts of the country because of the high forest cover in this region. Most of the projects attract FC and approval from SC-NBWL due to consideration of 10 Km ESZ Area from the boundary of Protected Areas since December 2006.

One of the pressing issues is the statutory approvals required to start Oil & Gas E&P Activities in an Oil Block since its allotment by GoI. EC, (CTE, CTO & Hazardous Waste Authorization) from State Pollution Control Board and NOC from Central/State Ground Water Authority (CGWA/SGWA) for drawl of groundwater are mandatory for all E&P projects, requiring EC under EIA Notification, 2006. EC is kept on hold till Stage-I FC is submitted. Delay in submitting FC beyond 12 months (maximum extension by another 6 months) can result in the EC proposal getting auto delisted, forcing to start afresh on the de-novo basis. PESO License for the HSD Tank of the mobile Rig also needs to be obtained for each drilling locations as per the Rig movement/ Drilling Program. Additionally, 21 other approvals are required on a case-to-case basis for Oil & Gas Exploration & Production Activities.

MoEF&CC has taken many proactive steps to change the regulations for ease of doing business, which has immensely helped the sector. However, there is a need for more reforms to be considered.

There are many hurdles concerning Forest Clearance that is reflected in the time taken (minimum 3-4 years) in getting Stage-I FC approval against the maximum prescribed timeline of 180 days at State Level and 120 days at Central level. Similar obstacles are prevailing in the case of SC-NBWL Approval as well as Environmental Impact Assessment.

The speakers of the session urged to take the recommendations of the regional workshop titled "Recent Advances in Environment and Forest Laws with special reference to Oil, Petroleum and Gas Sector" held in October 2019 into consideration as "Base Note".

Regarding the FC related issues, it is suggested not to treat Oil & Gas E&P Activities at par with Mining activities carried out under the purview of MMDR Act, 1957 because the E&P activities are performed under the purview of Oil Fields (Regulation and Development) Act, 1948. A committee may be formed to look into the procedural changes required in FC Proposals and resolve persisting issues. It is recommended that FC should not be linked with EC application o as a grant of EC is kept on hold still Stage-I Approval is granted. Also, FC for mining proposals up to 5 ha of forest lands may be delegated to the Regional Office instead of present practices of its approval from Central Government, which is a very lengthy and time-consuming process.

A way forward action plan proposed for resolving CA land issues associated with Forest Clearance. CA land allotment for both PSU and Private Organisations can be undertaken from the GoI's 'Sustainable Land Management Program' and Forest & Tree Cover (FTC) Program planned till 2030 under the aegis of MoEF&CC. This is in line with GoI's plan to retrieve 26 million ha degraded land by 2030 for creating an additional carbon sink of 2.5-3.0 billion tons by 2030. CA land bank can be created in State/UTs (State Subject) considering those States having poor forest cover over the States with forest density of more than 75% of its geographical area. NOC from DC regarding the non-availability of the CA land needs to be relaxed to deal with the delay in FC approvals.

There is a prevailing delay in getting FRA, 2006 Certificate from the concerned DCs on compliance with Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA, 2006) for grant of Stage-I FC under Sec 2(ii) of FCA-1980. It takes 1.5 years on average against the stipulated timeline of 60 days as prescribed in FC Amendment Rule, 2014. A Standard Operating Procedure (SOP) needs to be prepared with a 60 days timeline and to be circulated Centrally to all State/ UTs. Further, MoEF&CC is suggested to issue a general guideline to all State/UTs for not insisting FRA, 2006 compliances for Exploratory Drillings and PML Grant under sec 2(iii).

Also, the FC Act should not be applicable for accessing the reservoir at 3-4 km depth using ERD technology. Thus, FC Exemption for such ERD proposals at 3-4 km below the forest surface without any activity over the forest surface or diversion of forest lands.

Based on the latest satellite imagery, the status of declared Protected Areas (PAs)/RFs in the North Eastern States, where ground reality has changed over the period since after their notifications, may be reviewed. Hence, digitized maps for forest and wildlife areas in the North East may be made available in the public domain for easy access and convenience of proactive action for User Agency. Digitized geo-referenced based Forest & PA Maps can be prepared based on latest satellite imagery to indicate physical boundaries of Forest/Wildlife/ National Park etc for the respective State/UTs accommodating the revenue land records with its updating time to time to ensure consistency of the data.

FC proposals are held up with Nodal Officer (FCA) despite repeated EDS queries and scrutiny of Form-'A' or 'B' application before its acceptance. It takes an average time of 1.5 years to approve the proposal by the Nodal Officer (FCA) against his/her prescribed

timeline of 10 days. DFO concerned can initiate his/her major field-level work/verification/ formalities only after that and forward the same to CF/CCF level Officials for their comments in Part-III of the application. The proposal starts upward movement accordingly thereafter.

An action plan was proposed for arresting delay in the Office of Nodal Officer (FCA) to the prescribed timeline. Nodal Officer (FCA) should be allowed to raise EDS query once for all against a single proposal within 10 days stipulated timeline and not repeated queries one after another. A timeline should be stipulated for acceptance of the FC application by the Nodal Officer (FCA). Online proposals can be processed instantly without waiting for the hard copy from PP. Nodal Officer on approving the proposal of FC be required to update the same in the online portal and NIC Div, HQ be given authority to override/rectify the same at a later stage in the online system.

While completing field level formalities at the DFO's end, prescribed timelines are nowhere followed while processing the proposal at the field level. To put a check on delays, a way forward action is suggested. The stipulated timeline needs to be strictly adhered to for completion of Joint site inspection with the PP and demarcation at the site. Field Level Formalities by DFO comprising of Tree counting and numbering / Remuneration calculation/ NPV and CA calculation based on the type of Forests, Forest Density/ Identifying Type of Forest Products for NPV calculation can be undertaken by surveying through a drone or accepting the available Forest density data of FSI, Dehradun, or similar such methodologies to be adopted and amending Part-II of FC application of Form- A or Form-B accordingly. PP can be directed to assist DFO in the preparation of a 1:50,000 scale map, which needs to be signed jointly with the Operator. DFOs are required to be given the right to access the DSS Map of FSI Dehradun to avoid the delay caused in the approval process due to returning of self-identified CA land by Nodal Officer or IRO, MoEF&CC or MoEFCC, HQ causing a delay in the approval process.

Taking into account the procedural changes suggested for faster Forest Clearances under FCA,1980, it is recommended to facilitate for parallel Submission/ Receipt of the proposal to the DFO concerned in parallel to Nodal Officer in the online PARIVESH portal. Also, auto shifting deemed approval mechanisms need to be developed to the next level after the lapse of the time limit prescribed at each level sequentially.

Wildlife Clearance also imposes certain procedural challenges. The related issues are evident in ESZ areas. The average time- taken to obtain the clearance is 3-4 years. Certain recommendations were made to curb the delays in this process. Early notification for site-specific ESZ areas for 11 cases in N-East/others can be an effective measure. It is essential for Oil & Gas E&P activities to not be prohibited in the final site-specific ESZ notifications (notified/ to be notified), and rather be permitted as regulated activities under prevailing regulations. In addition, the Oil & Gas Seismic Survey should be permitted inside the PAs rather than banning the same.

The report of the Central Empowered Committee (CEC) dated 20th September 2012 against IA-1000 with a due endorsement from the Supreme Court can be implemented. It recommends ESZ area from (100 m to 2 Km) in four categories against 10 Km as of now, depending upon the size of the PAs varying from 100 sq Km to more than 500 sq Km area. Further, a separate form can be prescribed for SC-NBWL approval to projects executed in ESZ areas instead of using the one used for land diversion inside PAs.

The speakers also recommended constituting a Standing Committee for the State Board for Wildlife (SC-SBWL) in all State/UTs in line with the Standing Committee of National Board for Wildlife (SC-NBWL) at the Centre. To reinstate Wildlife Division's guideline dtd 26.09.2014 - It permitted to apply directly to Centre for ESZ area proposals from SC-NBWL

The process of seeking Environmental Clearance has been crucial in determining the time involved in starting E&P activities in an oil block. It is imperative to address the roadblocks in this process. The timeline of 12 months for submission of Stage-I FC for EC proposals needs to be increased to 3-4 years to accommodate for completing the EIA Study data and PH proceedings as EC-FC are combined proposals. Timeline for EC Compliance Certificate from IROs can be introduced for Expansion Projects. EC validity needs to be made coterminous with PML validity instead of 7 years as of now. Further, the GSR 546(E) dated 30th August 2005 needs to be amended as it stipulates stringent conditions for the Exploration phase/others. Also, CTE and EC - a one-step process, needs to be implemented by linking with the PARIVESH portal on a priority basis to help E&P operators.

Public Hearing as part of EIA has caused significant delays in the process of seeking Environmental Clearance. Certain suggestions were made to minimize the delays in Public Hearing for A Category EC. Strict Compliance of timelines of 45 days for Public Hearings needs to be ensured as stipulated in the notification. Officers in the rank of SDO/BDO levels may also be permitted to Chair the PH Proceeding, as presently Officers below the rank of ADCs are not permitted to Chair the session and because of the busy schedules, ADCs can't give time. A stipulated timeline is required for releasing the final minutes of Public Hearing after due translation etc in local languages, after completion of Public Hearing.

The session also provided suggestions for streamlining the B2 Category Exploration per EC proposals. Varied interpretations from State to State, being a new subject for SEIAA/SEACs is a cause for concern. The CRZ Notification, 2011 need to be amended for accommodating the newly introduced B2 category Oil & Gas Exploration Activities. This was also agreed upon in the 3rd ECC meeting held on 14th September 2020. Form-2 for B2 category EC proposals in the Parivesh portal need to be either omitted or modified. Further, OM-J-13012/12/2013-IA-II (I)) dated 24.12.2013 need to be amended with specific reference to Oil & Gas Exploration activities under B-2 category, as it empowers SEAC /SEIAA to convert B2 category project into B1 project requiring EIA Study and PH if the same lies within 5 Km of Inter-State/ Inter National Boundaries.

HIGH INTENSITY DISCUSSION 2: EXPLORATION & PRODUCTION VISION 2050

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Recognizing that clean, affordable and reliable energy supplies are necessary parts of a vision of the future, the Exploration & production sector is required to re-establish its crucial role in this era of the energy transition. With 50% of the country's O&G demand estimated to be met indigenously by 2050, efforts to intensify exploration, monetize discoveries and maximize recovery are on high priority. This endeavor needs to be supported by innovation, conducive policy & fiscal regime and new business models. Innovation and collaboration is the key to overcome the execution & technological challenges and environmental and workforce limitations.

The scope of the industry in this direction has been elaborately discussed during a high intensity discussion that was chaired by Shri Tarun Kapoor, Secretary, MoPNG. The session saw the participation of leadership from some of the dominant domestic and international oil and gas companies.

The Vision 2050 entails the target to reach 50% of domestic Hydrocarbon demand indigenously by 2050. To achieve this, there is a pressing need to ramp up the production of oil by 3.9 times and of gas by 5.5 times. Owing to the untapped potential of Indian sedimentary basins, it was suggested to scale up the efforts and aim for 100% self-sufficiency in Energy by 2047 on the eve of 100 years of independence.

With an enhanced focus on augmenting production, it is necessary to venture into relatively unknown territories with challenging geology with the help of advanced technologies to intensify exploration. Recoveries from existing discoveries can be evaluated by benchmarking fields against analogous fields worldwide to compare and improve. It is an effective technique to analyze performance against metrics such as success rates of exploration, time taken from discovery to monetization, recovery factor etc. On the other hand, realizing the untapped potential of unconventional hydrocarbons – CBM, Shale Gas and Gas hydrate, is the way forward for greener alternatives and energy sustainability.

The feasibility of adopting a play-based model from the geo-scientific, technical, commercial and policy perspective under the E&P strategy continuum is worth evaluating. This model can emerge as a prospective way forward to provide impetus to exploration efforts, data gathering and optimization of mature fields, thereby receiving incremental returns.

Transformational business models that focus on increasing production with substantial exploration and recovery are the key levers to enable investments. Leveraging relevant technologies and a conducive policy framework can not only minimize the risk involved but also reduce the time taken to realize its commercial potential. A supportive ecosystem of operations thus enables exploration and recovery projects. Given this, the legacy issues need to be addressed with the help of an innovative model acting as an optional bridge for the E&P companies to bring old regime contracts of cost recovery model at par with the new regime of the revenue sharing model.

The strengths of international players need to be combined with the local skill base to deploy the best technologies. This can generate actionable insights based on data that can lead to potential investment. Further, the success rate in frontier areas is only about 7% globally. These involve high stakes investments upfront and a low likelihood of a payout. But, the returns are huge if and when the field gets monetized. The on-the-ground risks besides inherent subsurface risks are required to be tackled to better meet the higher return expectations that arise from higher capital flows. Appropriate investor protection measures and economic incentives are essential to attract more international investors who are focusing on three critical areas – contract stability standing the test of time, compensation at full market value in case of expropriation and dispute resolution in an international neutral venue for all parties.

Efficient collaboration between the industry players and segmentation in terms of domain expertise built over the years can go a long way in enhancing the capabilities of the industry.

A clear three-level system of operations in the E&P ecosystem was recommended to be developed. It comprises E&P operators, Service providers and an in-between layer for companies that can withstand financial risks in bidding for complete block and bridge the gaps in collaboration and operation. Further, in the current context, Government oil companies are not providing enough space for Service providers to grow, because of in-house services developed by them. In an open market, business enterprises develop when they have sufficient space for growth. Thus, Government oil companies need to create space by separating the services from core E&P Business to allow the entry of several service providers at competitive rates.

The present scenario conveys the necessity for more private operators to participate and more service providers to be available. The sector is expected to open out not only in terms of more acreage but also in terms of E&P players. This will require more options for the players in terms of technically experienced organizations, service providers and equipment suppliers also.

Looking at the prospectivity of India, there is a demand for some of the best technologies that have proven their worth in rolling out big discoveries and have been game-changing for other countries. The essential ingredient for replicating them in India is access to raw seismic data. The other challenge is a restriction on broader exploration in prospective areas on account of No-Go areas. This effectively reduces the scope for finding a big recovery eventually making exploration a lot harder. Thus, more exploration space in Indian Deepwater has to be made active. Also, certain cost reduction measures in extraction processes and cost-effective technologies specific to India can be adopted to augment production and expand into areas considered as unviable today, making the Indian E&P industry competitive.

The panel voiced out the significance of aligning technology, people with investments and regulatory framework to progress towards Vision 2050. It recommended the establishment of a major technology provider and more service providers – big and small. The huge talent pool of youth in the country needs to be motivated to pursue rewarding careers in the E&P sector. They must be provided space and opportunity to innovate and contribute to the sector's growth.

SPECIAL INTERACTIVE SESSION 1: GENDER DIVERSITY AND INCLUSION IN THE ENERGY SECTOR

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Gender diversity and inclusion in the energy sector is a timely discussion as decision-makers all over the globe are taking action now to build back better from the health emergency and economic shock spurred by the Covid-19 pandemic. Thus, Gender balancing, to create a diverse and inclusive workforce equipped with the knowledge and skills for a future-ready sector, is vital for driving more innovative and inclusive solutions for a sustainable future.

The business case for greater gender diversity in the Oil & Gas industry is compelling. Thus, a special interactive session (SIS) was held on the theme - Gender diversity & Inclusion in the Energy sector. The session was chaired by Dr Alka Mittal, Director (HR), ONGC and co-chaired by Smt. Tinku Nischal assisted by Dr Mridula Singh and Ms Bansuri Das. The eminent speakers of this enriching session were Smt. Pomila Jaspal, Director (Finance), MRPL, Smt. Madhu Srivastava, CHRO, Vedanta Ltd., Smt. R.S Borah, Ex-Director (Finance), OIL and Smt. Zainab Patel, Director (Diversity & Inclusion), KPMG India.

The essence of the discussion was that gender diversity is non-negotiable. There is an evident need for a more equitable workspace for women and more space for women in the workplace. Especially, the percentage of women in senior positions is aimed to reach 30% from the present 12.8% women at board level.

The current trend of women participation in the workforce of the Oil & Gas industry needs to improve. Incorporating gender balance as a criteria for recruitment drive, both on-campus and lateral entry is a crucial requisite. Recruitment drives exclusive to women can be conducted for improving the gender diversity ratio at the organizational level. However, encouraging more women students to enrol for courses related to the oil and gas industry is a prerequisite to channelize more women talent to rewarding careers in the oil and gas industry. It is important to envisage gender diversity as a concept for end-to-end talent management, from recruitment to integration, career growth and retention.

Thus, formulating a multi-pronged strategy to recruit a higher number of women employees, particularly in functions related to field operations where the strength is low, is of great consequence. It enables them to get adequate exposure which is a prerequisite for career advancement. To further improve the status quo on inclusion at the board level, a handpicked women talent at the middle management level can be mentored to groom and grow using feedback and propel them into decision making roles.

Women need to be encouraged to take up field challenging assignments and postings in various operational areas and to volunteer for filling duties at all levels of the organization. A policy framework aligned to the gender diversity and inclusion plan in terms of stronger ESG framework, upskilling of women workforce, pay parity and other international best practices are of utmost importance.

The cause of gender diversity and inclusion has to get not only female employees but the entire workforce on board. Sessions on gender sensitization for both male and female employees need to be conducted to encourage gender diversity and change the mindset from positive discrimination to inclusion and equal opportunity based on capabilities.

Discussions on gender diversity in the energy sector through appropriate forums are essential to allow effective networking. They pave way for a united and collective mutual mentoring and understanding within the women workforce. They also enable learning and sharing of good practices for ensuring gender diversity and inclusion. Women councils, special mentoring programs and special leadership development programs can be constituted to nurture women leaders. Negotiation and networking are key tools required for a supportive ecosystem for the women workforce.

A robust family care support system is crucial for ensuring the smooth return of women employees after their maternity and childcare leave. The leakage in the talent pipeline caused due to Marriage, Motherhood and Mobility (3Ms) need to be plugged through suitable HR policy interventions.

There is an immediate need to advocate greater inclusion by sector coalition of government, public and private sector. This can lead to collaboration, a collective vision and commitment towards gender diversity and inclusion. Also, women leaders presently part of the energy sector need to take charge of their agenda to walk the talk on this theme.

SPECIAL INTERACTIVE SESSION 2: YOUTH IN THE ENERGY SECTOR - A FRESH PERSPECTIVE

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Our efforts to meet SDG7 of affordable, clean energy by 2030 can be made holistic and productive with the innovation, commitment and drive of young leaders. The energy sector is a highly competitive sector with numerous opportunities for youth. It is also crucial for addressing persistent challenges of unemployment and poverty.

Today's youth is motivated and willing to work towards a sustainable energy future. We just need to empower them with opportunities and knowledge to become the world's energy professionals and leaders of tomorrow.

A special interactive session was held to envision the role and opportunities for young people in the energy sector. The session was chaired by Shri H Madhavan, ONGC and moderated by Smt. Varsha More. It also witnessed the participation of young graduates and research students who are willing to pursue their career in this sector.

The youth need to be trained to accept change in perception and different thought process in a knowledge-based industry like oil & gas. They need to be encouraged to contribute by thinking ahead and emphasizing local resource conversion.

Young people can foster the integration of new developments within current facilities. They can help in overcoming the challenges of legacy infrastructure and rising operational costs. For instance, the use of advanced technologies like Nano EOR involving nanoparticles is more economically feasible than existing options, as suggested by a young graduate.

There is a pressing need from the E&P sector to adapt to sustainable ways of operating in the era of the energy transition. A research student suggested promotion of CO_2 enhanced recovery to offset the CO_2 emitted from large point sources and make exploration operations sustainable. Also, robust CO_2 capture and transportation infrastructure can be devised and established in India.

The youth expressed their concern for the environment and sustainable development. They urged for implementing a favourable policy for CCUS and a stable Carbon Pricing agreement for a swifter transition towards a large scale sequestration process. A young student recommended the centralization of Processing Centers to reduce the carbon footprint.

An innovative idea for a cleaner energy transition that emerged out of this session was the creation of a solar farm to meet the energy requirements of various accommodations provided by the E&P industry at the basin or asset level.

The discussion echoed the need for deepening the industry-academia relationship for bridging the skills gap in the energy sector. It can enable the youth to explore career opportunities in the sector and emerge as drivers of change.

THE WAY FORWARD

Oil and gas has always played an instrumental role in global economic transformation. We have all seen the Age of Oil when it was fundamental to modern civilization. Today, it is an indispensable part of the global energy mix. Considering its economic contribution and rising consumption, oil and gas will continue to a major source of energy for decades to come. Even in India, the share of oil and gas is expected to be 30% of its primary energy basket.

The world is at the crossroads of growth and sustainability. India, too, is aspiring to become a $5 trillion economy by 2030, within the boundaries of sustainable development. To achieve this, a balance between energy sustainability and energy security coupled with self-reliance is of the essence. Thus, the Indian oil and gas industry has a defining task ahead in contributing to the country's growth trajectory.

The oil and gas upstream industry has set for itself a bold target of meeting 50% self-sufficiency by 2050. This Vision 2050 entails clarity on the future of the sector and a strategic approach in enhancing its capacity. It calls for collective and comprehensive action encompassing people, processes, technology and policy framework. The industry needs to efficiently venture into the unexplored potential of sedimentary basins of India leveraging advanced technologies and digitalization. On the other hand, with the energy transition gaining momentum, quickly adapting to sustainable ways of operations becomes a priority. And this journey of the E&P sector towards Vision 2050 needs to be inclusive with gender diversity and youth participation on the agenda and reflecting the same in action. In addition, the government is committed to providing an open and conducive business environment, encouraging more participation for a competitive industry. The government and industry coming together to work towards a shared Vision 2050 can take the Indian oil and gas E&P sector a long way.journey of the E&P sector towards Vision 2050 needs to be inclusive with gender diversity and youth participation on the agenda and reflecting the same in action. In addition, the government is committed to providing an open and conducive business environment, encouraging more participation for a competitive industry. The government and industry coming together to work towards a shared Vision 2050 can take the Indian oil and gas E&P sector a long way.

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