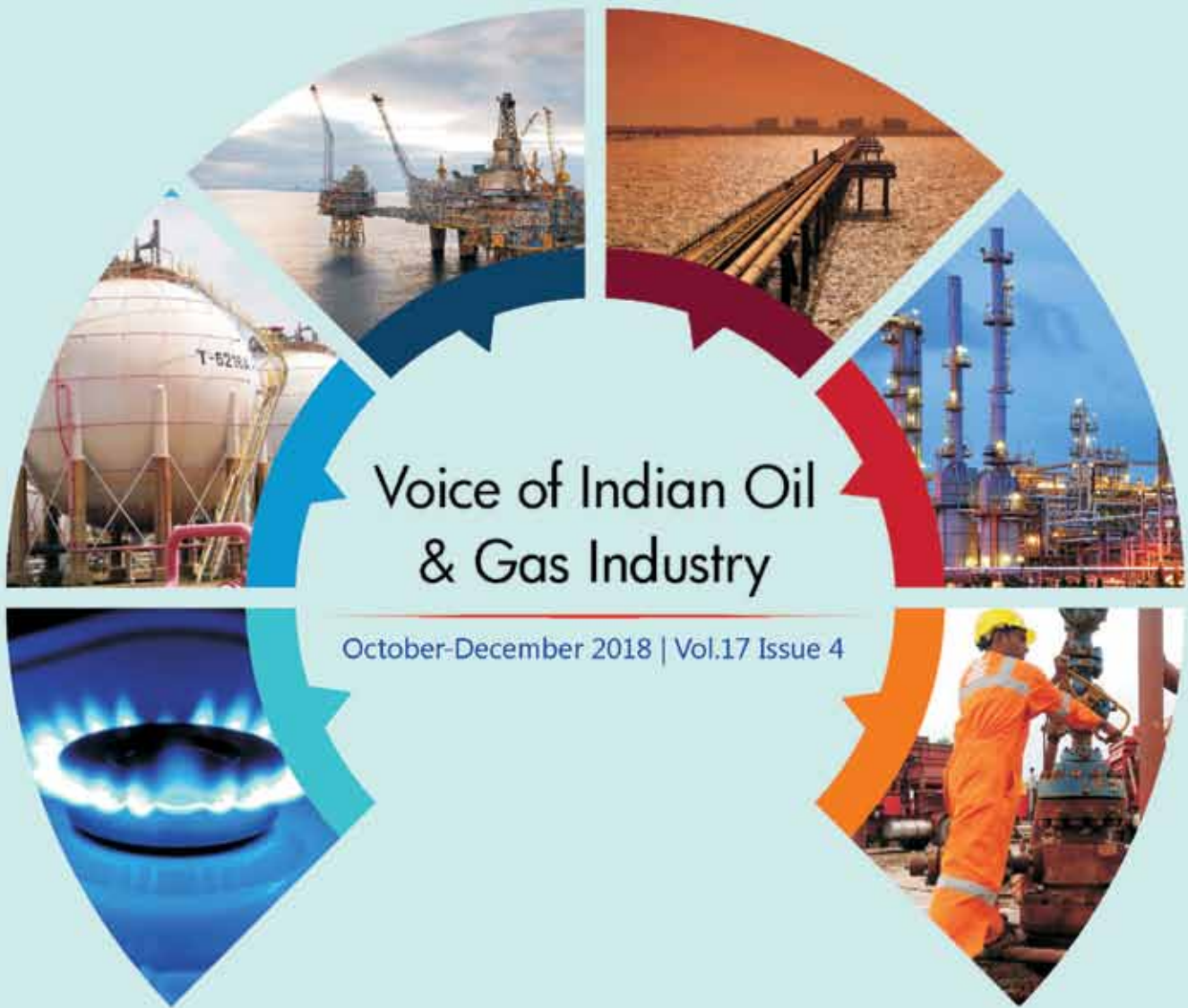


# FIPI



The Journal of Federation of Indian Petroleum Industry



## Voice of Indian Oil & Gas Industry

October-December 2018 | Vol.17 Issue 4

Deepwater Development – Challenges and Rewards

Developing Women Leaders – A Roadmap to Success

A Dream in the Making – West Coast Integrated Refinery & Petrochemical Project



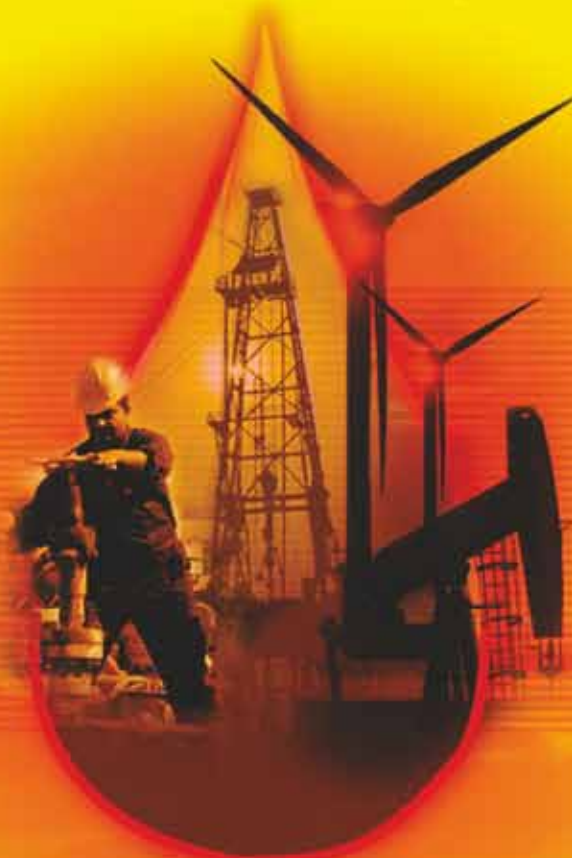


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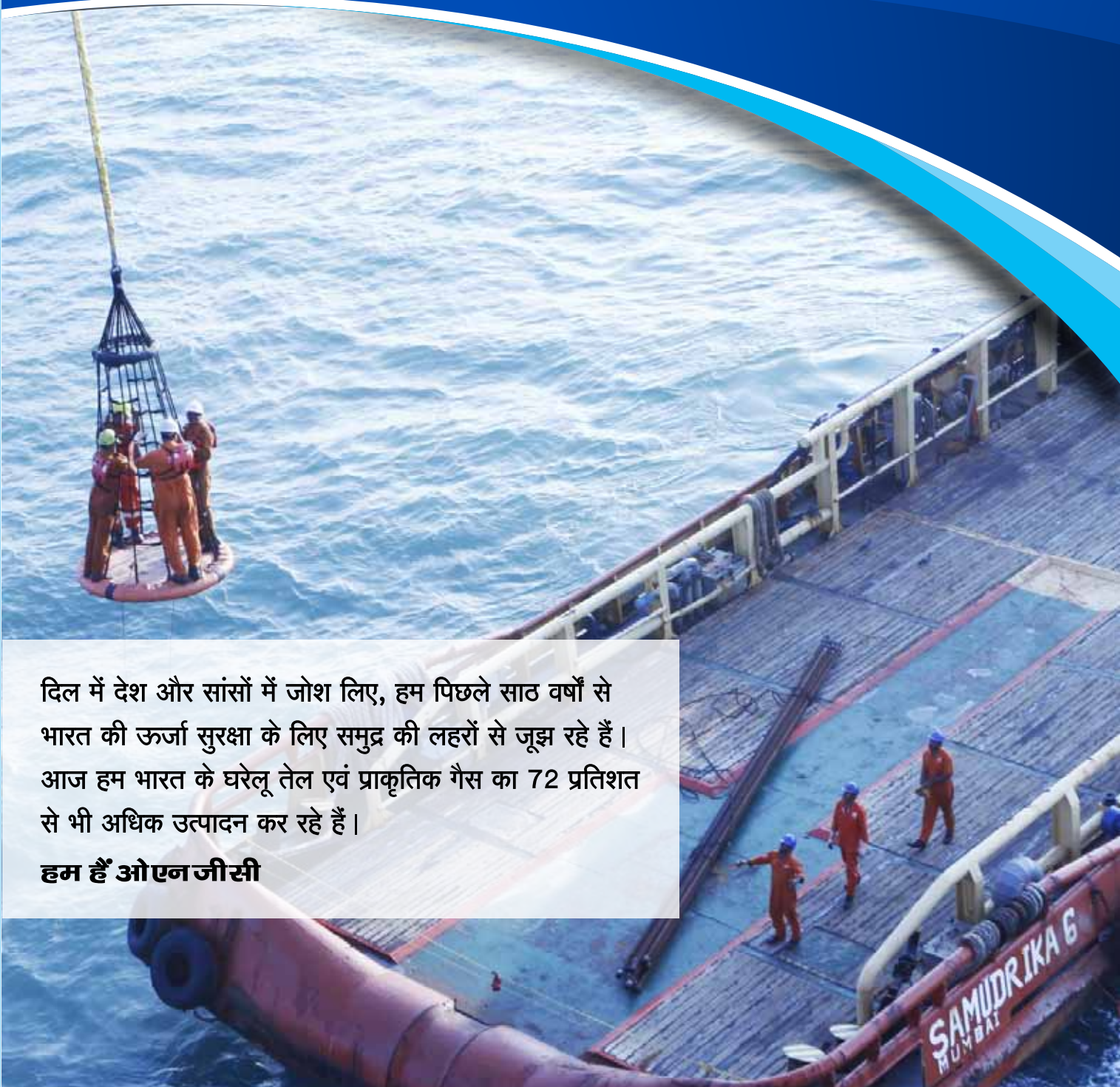


ओएनजीसी



ONGC

# समुद्र की लहरों से, देश के दिल तक... ऊर्जा के संचालक



दिल में देश और सांसों में जोश लिए, हम पिछले साठ वर्षों से भारत की ऊर्जा सुरक्षा के लिए समुद्र की लहरों से जूझ रहे हैं। आज हम भारत के घरेलू तेल एवं प्राकृतिक गैस का 72 प्रतिशत से भी अधिक उत्पादन कर रहे हैं।

**हम हैं ओएनजीसी**

नई दिशाएं, नई खोज, नई ऊँचाई एवं नई सोच के साथ आगे बढ़ते हुए - ओएनजीसी

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**Edited, Designed & Published by :**  
**Federation of Indian Petroleum Industry (FIPI)**

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From the Desk of the

## Director General

*Greetings from the Federation of Indian Petroleum Industry!*

For the oil market, 2018 has been a roller coaster ride. The oil price volatility is not new but the sudden ups and down seen this year were exceptional. The high for Brent crude during 2018 per barrel was \$ 86.07 and low was \$ 51.49, with average of \$ 71.19. The year 2018 started with Brent trading at \$ 66.65, but what unfolded in the ensuing months nobody could have predicted.

Most important factor for the oil market in 2018 was the U.S. withdrawal from the Iran nuclear deal. At the start of 2018, it was clear that this might happen and it actually led to high prices. At the start of October, oil prices were on an upward trend on signs that U.S. sanctions are shrinking Iran's crude exports faster than anticipated, potentially leaving the world with a shortage of oil. But the series of waivers issued in November to allow Iran to continue to export oil to some countries, checked oil prices and brought a sigh of relief to India.

The IEA expected that U.S. would add 1.3 million barrels per day (mb/d) in 2018, while the U.S. EIA predicted growth of 1 mb/d. In reality, the U.S. added about 1.5 mb/d in 2018. EIA expects that US crude oil production will average 10.9 mb/d in 2018, and will average 12.1 mb/d in 2019, further reducing US dependence on OPEC.

At the start of 2018, OPEC+ was upbeat but by mid-year, the group had worries that they may have tightened things too much. With steep losses from Iran expected by November, OPEC+ decided in June to increase the oil production. In spite of increase of production by OPEC, the run up in prices was seen in September and October, and then came the crash that unfolded beginning in November as a result of Iran sanction waivers by Trump administration. OPEC+ closes out the year in a worse situation than at the beginning of 2018 – oil prices in free-fall and surging U.S. supply. The group is once again trying to assess an oversupplied market & strategies to check the decline.

During the year 2018, India's voice found a new heft as world's fastest growing large economy and third largest oil consumer. PM Modi's voice against high oil price counts much for OPEC and forms a valuable component of deliberations by grouping of 14 countries. The acknowledgement of India's position in global oil market came from none other than the Oil Minister of Saudi Arabia.

Government of India has taken a number of new initiatives in the last one year to promote Exploration and Production activities in the country. In a major policy drive to give a boost to petroleum and hydrocarbon sector, the Government has unveiled a series of policy reforms. Some of the notable Policy reforms include, Hydrocarbon Exploration and Licensing Policy (HELP) & Open Acreage Licensing Policy (OALP) – Under OALP Bid Round I, 55 Blocks having area of 59,282 sq. Km have been awarded on 1st October, 2018. OALP Bid Round II with 14 blocks is in the offering.

Another major policy reform is to Incentivize Enhanced Recovery Methods for Oil and Gas - The Policy framework to promote and encourage adoption of Enhanced Recovery (ER)/Improved Recovery (IR)/Unconventional Hydrocarbon (UHC) production Methods/techniques through fiscal incentives and an enabling ecosystem to improve productivity of existing fields and enhance overall production of domestic hydrocarbons. The Policy provides for systemic assessment of every field for its ER potential, appraisal of appropriate ER techniques and fiscal incentives to de-risk the cost involved in ER Projects and to make it economically viable.

In order to promote the usage of natural gas as a fuel/feedstock across the country and move towards a gas based economy, the development of additional 13500 Km long gas pipeline is under way to complete the Gas Grid.

To make available natural gas to public at large, Government has put strong emphasis on expansion

of City Gas Distribution (CGD) network coverage across the country. Till 2017, only 19% of the country's population spreading over 11% of the country's area was covered for development of CGDs in 96 Geographical areas. With the conclusion of 10th round of recent CGD bidding, it will expand the coverage of CGD networks to about 70% country's population spreading over 50% of India's area. The growth of CGD coverage has potential to attract total investment of more than Rs. 1,20,000 Crore in gas value chain with generation of about 3 lakh employment opportunities in coming years.

Under the Pradhan Mantri Ujjwala Yojana (PMUY), the initial target of 5 crore LPG connections was achieved by OMCs well before the target of 31st March, 2019. As on 05.12.2018, more than 5.83 crore connections have been released under the scheme. Implementation of PMUY has resulted in significant increase in national LPG coverage, in general and Eastern States, in particular. The World Health Organization (WHO) has appreciated the efforts and termed it as a decisive intervention to check the indoor health pollution being faced by the women of the country.

The implementation of BS-IV Auto Fuels in the entire country started w.e.f. 01.04.2017 in a phased manner. Accordingly, BS-IV Auto Fuels supply is being made in the entire country. It has also been decided that the country will leapfrog directly from BS-IV to BS-VI fuel standards w.e.f. 01.04.2020. Considering the serious pollution level in Delhi, OMCs have commenced supply of BS-VI in NCT of Delhi w.e.f. 01.04.2018 well in advance.

The Government has notified National Policy on Biofuels 2018 on 8.6.2018 which is expected to give boost to the biofuel programme of the country. More emphasis is being given to Second Generation (2G) ethanol & bio-CNG. The scope of raw material has been expanded for ethanol production by allowing use of sugarcane Juice, sugar containing materials like sugar beet, sweet sorghum, starch containing materials like corn, cassava, damaged food grains like wheat, broken rice, rotten potatoes, unfit for human consumption for ethanol production. The Policy also allows use of surplus food grains for production of ethanol for blending with petrol with the approval of National Biofuel Coordination Committee. With a thrust on Advanced Biofuels, the Policy indicates a viability gap funding scheme for 2G ethanol Bio refineries of Rs.5000 crores in 6 years in addition to additional tax incentives and higher purchase price as compared to First Generation biofuels.

Now I would like to briefly mention few of the important activities of FIPI in recent past. FIPI is associated with organization of Petrotech-2019, 13th International Oil & Gas Conference and Exhibition is being organized under the aegis of the Ministry

of Petroleum & Natural Gas by ONGC (as the lead organisation) during February 10-12, 2019 at India Expo Mart, Greater Noida, UP.

As a pre-cursor event of Petrotech-2019, FIPI organised a one-day workshop on "WINNERS : Women in India's Energy Sector" on October 31, 2018. The workshop was attended by about 300 women professionals, including 60 girl students. The day-long deliberations laid emphasis on gender equality and providing more opportunities for women in India's energy sector.

The other pre-conference events which FIPI is organizing are 'Youth Forum' and Workshop on 'Digital Transformation in Oil & Gas Sector'.

FIPI on behalf of our member companies, associated with IHS Markit in organizing the 2nd India Energy Forum by CERA Week during October 14-16, 2018. This event created a national and international dialogue on the opportunities, challenges and strategies to bring about a new energy future for India.

FIPI had set up an India Pavilion at the Abu Dhabi International Petroleum Exhibition & Conference (ADIPEC) during November 12-15, 2018 at Abu Dhabi wherein 7 organizations namely, ONGC, IOCL, OIL, HPCL, BPCL, EIL and L&T participated and exhibited their forte.

The India Pavilion at ADIPEC was formally inaugurated by the Hon'ble Minister for Petroleum & Natural Gas and Skill Development & Entrepreneurship, Shri Dharmendra Pradhan and H.E. Sultan Ahmed Al Jaber, Minister of State, UAE and Director General & CEO of ADNOC on November 12, 2018 in the presence of dignitaries from oil & gas sector across the globe.

An exclusive India session titled 'India's Growing Energy Demand & Race for Energy Independence' was coordinated by FIPI. The panel discussion moderated by me included CMD ONGC, Chairman IOCL, CMD HPCL, CEO & MD L&T Hydrocarbon as panelists who gave useful insights about their respective areas of business.

I also had the privilege to participate at ADIPEC in a panel discussion on "Downstream Diversification & Growth: How can diverse, effective human capital shape the future of the downstream sector".

Recently, I also had the opportunity to chair a workshop organized by Asian Development Bank (ADB) with PwC as knowledge partner, among South Asia Sub-regional Cooperation (SASEC) regional gas and petroleum working group member countries during December 4-5, 2018 at New Delhi. Representatives from Bangladesh, Bhutan Maldives, Nepal, Sri Lanka and India were present at the workshop.

During the workshop areas of cooperation such as natural gas and LNG trade, sharing of pipeline infrastructure, trade of petroleum products, sharing of advanced technologies related to biofuels and trade of power among SASEC member countries were identified.

During the year, FIPI initiated dialogue with ministries and departments of the central government, involved in the system for granting approvals/consents etc. to understand the issues that cause delay in the approvals required to set-up a Retail Outlet (RO) and way forward to ease-out the system for accelerating the pace. A report has been prepared and submitted to concerned authorities. MoP&NG subsequently constituted an Expert Committee to review the guidelines for granting marketing authorization for transportation fuels. FIPI made a presentation to the Committee recommending revision in the current policy.

FIPI conducted one & half day workshop on 'Realizing Hydrocarbon Vision 2030 for North East India-Way Ahead during November 29-30, 2018 at Shillong, Meghalaya to review the progress made by the industries in fulfilling NE Hydrocarbon vision 2030 road map and to understand the challenges & constraints. This was the 2nd such workshop after the publication of the vision document in 2016. A report on the progress made so far, the challenges & constraints and the takeaways for future has been submitted to MoP&NG for necessary support to fulfill the NE Hydrocarbon vision 2030.

FIPI during last few months made recommendations on policy matters to Government on behalf of the industry which included the following:

- Submitted to Revenue Secretary, Ministry of Finance during November, 2018 on Effective operationalization of exemption granted to vessels and ships imported under lease by the importer, under mega exemption notification 50/2017-customs dated 30.06.2017.
- Submitted to Revenue Secretary, Ministry of Finance during November, 2018 on Effective operationalization of exemption granted to rigs and ancillary items for oil and gas exploration and production, under mega exemption notification no. 50/2017-Customs dated 30.06.2017.
- Submitted to Secretary (Revenue), Ministry of Finance during September, 2018 on Effective operationalization of exemption granted to vessels and ships imported under lease by the importer, under notification 85/2017-customs dated 14.11.2017.
- Submitted to Secretary, MoP&NG as well as Secretary, Ministry of Finance during September 2018 on Reducing OID Cess rate on Crude oil produced in India.

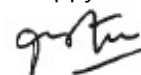
- Submitted to Secretary, MoP&NG during September, 2018 on Incentives for Enhanced Recovery of Oil & Gas.
- Submitted to Senior Consultant, Government of India, MoP&NG during August 2018 requesting for reduction of GST rate on LNG motor vehicle.

FIPI during last few months have undertaken the following studies:

- Viability assessment of LNG as a fuel for long distance transportation in India: The study assessed the potential of LNG as fuel in heavy duty vehicles by replacing diesel. Final report of the study has been shared with all stakeholders as well as MoP&NG.
- Future of Oil for Transportation and its impact on Refineries - Scenario 2030 and Beyond: The objective of the study is to deep dive into the policy goals of the government and different initiatives, detailing out different scenarios of future mobility fuel and the likely EV penetration across vehicle segments, understanding the impact of fuel transition on the economic indicators, and associated stakeholders and finally evaluating the 'best-fit' strategy for downstream Oil and Gas players.
- Contribution of Indian domestic oil production to the economy of the country over the past 60 years: This study plans to identify the contribution of the Oil & Gas industry to the Indian economy in terms of investment, economic growth, employment, impact on other sectors and other direct & indirect economic indicators and is the first to be carried out of its kind in the country and may act as a guidance to future policy making decisions of the government.
- Analysis of revenue and impact on oil industry and other sectors due to exclusion of five petroleum products from the GST.

FIPI during the year started publishing a monthly policy report focusing on Economic and Policy Issues pertaining to global as well as national oil & gas sector. This report contains a detailed analysis of the various policy issues and the oil & gas market trends. The report is published on the 1st of every month and is also uploaded on our website.

I sincerely wish that the hopes and aspirations of our readers are fulfilled in the New Year. I wish the readers and their families a healthy and happy 2019.



**Dr. R. K. Malhotra**  
Director General

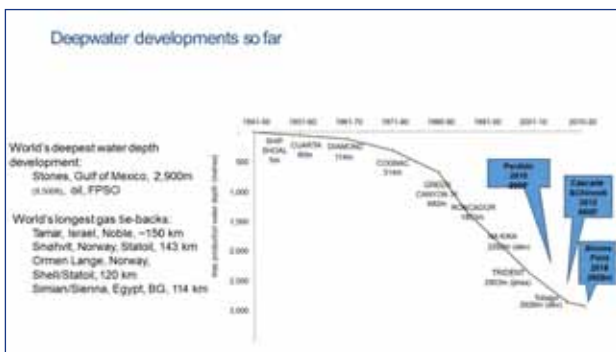
## UPSTREAM

### DEEPWATER DEVELOPMENT – CHALLENGES AND REWARDS



**T.K. Sengupta**  
 Director (E&P),  
 Federation of Indian Petroleum Industry

Oil and natural gas produced from offshore acreages are major elements of global supply. In recent past major growth has been seen in discovery of large gas fields and increase of gas production over oil. More than a quarter of today's oil and gas supply is produced offshore, mostly in the Middle East, the North Sea, Brazil, the Gulf of Mexico and the Caspian Sea. While offshore oil production has been relatively stable since 2000, natural gas output from



offshore fields has risen by more than 50% over the same period. Out of the total offshore production, Deepwater accounts for approximately just about 7% of total conventional production, in comparison with onshore and shallow water, with 60% and 33% respectively. Nonetheless, the massive Brazilian subsalt deposits in the Santos Basin along with sizeable finds in Gulf of Mexico, Angola, Mozambique and Ghana have managed to support the impression that in Deepwater operations – 'potential benefits can outweigh potential risks'.

Today, there are 31 sedimentary basins worldwide that produce or have economic discoveries in Deepwater, in terms of both modern water depths and reservoir type. Exploration wells have now been drilled in water depths up to 11,155 feet (offshore Uruguay) and the deepest offshore production at present is from Stone's field in Gulf of Mexico at a WD of 9500 feet operated by Shell. In India exploration wells have been drilled in Bay of Bengal in East Coast of Andhra Pradesh at a water depth of 10385 ft (3165m) in 2013. The well has been drilled upto 5625 m.

We all know successful Deepwater production has profound economic impact. Sometimes, however, it is difficult to grasp how profound the economic impacts are. To get an idea, it is published that the total gross income collected by the U.S. federal government from offshore oil and gas resources averaged \$8 billion per year from 2005 to 2014 in comparison to \$3 billion from onshore resources for the same period. Globally exploitation from DW is challenging but proved to be rewarding. (Investments 2016-20 > \$137 Billion)

Though initially, three key Basins areas were key to the successful transition of exploration into Deepwater: The North Sea, the northern Gulf of Mexico and Brazil. But with further progress in the technology area in surveys & exploration in Deepwater Basins in West Africa, Brazil, GOM, North Sea, India, South East Asia, good amount of Deepwater discoveries reported. But the most prolific is the area within the





activities, the world got the benefit of it and started exploration in previously declared in accessible zones. The new offshore areas in West African countries have seen the major discoveries mainly in the offshore of Angola, Congo, Gabon, Equatorial Guinea, and Nigeria.



The Deepwater discoveries and the producing fields around the world.

### The India Story: -

India has an estimated sedimentary area of 3.14 million square kilometers, comprising 26 sedimentary basins, out of which around 43% i.e. 1.35 million square kilometers area is in deep water and 1.79 million square kilometers area is on land and shallow offshore. An area of about 1.50 million square kilometers under 254 blocks has been awarded in nine rounds of NELP. Currently in OLAP (Open Acreage licensing Policy) round I another 6574 sq.km of deepwater area has been awarded for exploration. This deepwater blocks falls under KG Offshore in East Coast of India. This is going to generate much interest in Deepwater activities in India.

India did join the league of global Deepwater players with exploration work since early 80's but its first Deepwater Gas & Oil production started in September 2008 by Reliance Industries Ltd. The discoveries and subsequent development made recently by E&P companies like RIL, ONGC in the Krishna Godavari Basin of the Bay Bengal on the east coast of India in water depths from 300 m to 3000 m shows the making of a major new oil and gas region for exploration and production. ONGC is having ambitious plan to explore and develop its deep-water blocks whereas other key player M/s RIL is moving towards expanding its foot print at KG basin by new development and will bring more Deepwater gas. Reliance-BP are targeting to bring to production the R-Series and satellite fields in KG-D6 block by 2020. These fields along with the ultra deep MJ find are to produce 30-35 million standard cubic meters per day of peak natural gas. The planned investment is around 6 billion US Dollar.

As such, ONGC has 11 discoveries in its northern area (KG-DWN-98/2 NDA) which are at a distance of

25 to 40 km from East Coast lying at water depth ranging from 450 to 1300 m. ONGC is producing its deepwater gas from G1 field since 2014 and new gas from Vasistha & S1 deepwater fields have been added in 2018. ONGC is in development mode for KG-98/2 Cluster II field. The investment is around 5 billion US dollar to produce 15.5 MMSCMD of gas and 77000 Bopd of oil from Cluster II. This will be produced over a period of 10 years time. In cluster III, ONGC is planning to invest around 3-4 billion USD to produce 19 MMSCMD gas. This is the single largest investment for ONGC. The fields of cluster II will be on production from 2019-20 /2020-21 and will add Gas & Oil in a big number. This is going to bring new era in the history of ONGC.



The Shallow and Deepwater area in Bay of Bengal

### Risk and Challenges in Deepwater Development :-



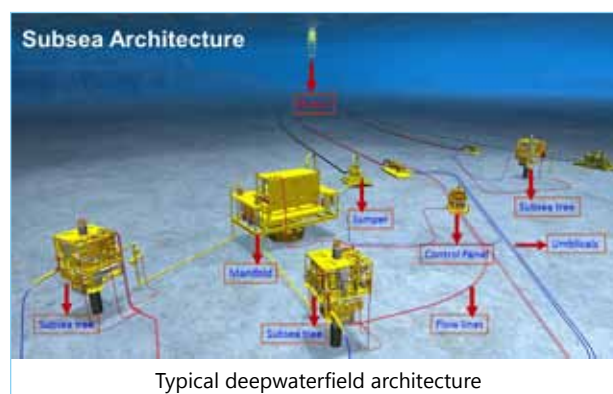
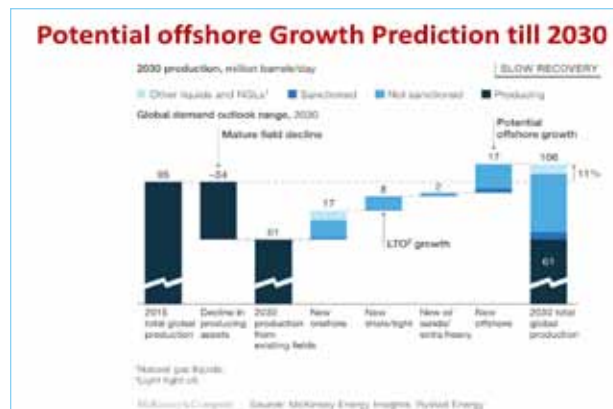
### Means of Mitigation

Metoccean conditions : wind, wave and current	Higher design requirements - 1000 year storm conditions
Geophysical & Geotechnical Challenges	Requires detailed and extended data collection & interpretation
Reservoir behavior	Reservoirs are challenging. Require understanding of Depositional systems (Pre-salt, Turbidite, Riverine channel levysystems).

Low temperature, Hyperbaric pressures	Deep and Ultra deepwaters biggest challenge is due to low ambient temperature & high hydrostatic pressures. Higher insulation, electrical heated systems & higher wall Thickness/MOC.
All the above <b>risks are inherent in nature</b> for any <b>Deep/Ultradeep water development</b> with the implication of Higher costs, risk and schedule with minimum control.	

**Means of Mitigation**

Flow Assurance	Hydrates, waxes, slugging, hydraulic issues. Mitigation means are not always 100%. New Technologies required.
Specialized installation equipment	In view of the water depths specialised lay barges required which are very few in count ( 3-4 no.) at very high rates.
Challenges during drilling.	Low drilling margins (Pore and hydrostatic Pressure), poor consolidation require expensive specialised mud chemicals etc.
Poor infrastructure	Long tieback distances, higher CAPEX requirements
Cost of remediation	Need to be right the first time.
High contingency costs	Macandofall-out. Contingency systems need state support in view of the conditions
The above risks are operational challenges inherent for Deep/Ultradeep water development with the implication of Higher costs, risk and schedule with marginal control	



**The Future Economic Challenges in DW Development -**

As predicted, Offshore production could account for upto 50 percent of new supply requirements in 2025 to make up for mature asset decline curves. Global 2030 demand reaches approximately \$106 million barrels per day, new offshore production may need to reach approximately 17 million barrels per day to close the projected supply/demand gap. At this time with Oil price volatility and all these challenges, the obvious question is whether Operators will go for Deepwater exploration and development? The recent price downturn has had a significant global impact on the economics of Deepwater. Many Deepwater projects are not economically viable in the current oil price environment due to high capital and operating costs. As there are huge Oil & Gas reserves locked in the Deepwater basins, low cost technology advancement is required to find, develop and produce the oil at a reasonable oil & Gas price. Otherwise either an increase in oil price and consistent around 70 \$/bbl/ or a decrease in operating expenses are essential for Deepwater exploration and production to remain profitable in the future.



## HRD

### DEVELOPING WOMEN LEADERS – A ROADMAP TO SUCCESS



**Ranjan Kumar Mohapatra**  
Director (HR), IndianOil

**“What helps advance a woman in her leadership journey is both good for business and good for society as a whole”.**

#### Women Leadership at the forefront, again!

Women leadership is at the forefront again, probably more strongly than ever, helping women and organizations build leaders for tomorrow. Women leaders have shown their mettle in the industry by climbing the ladders of success, shattering the glass ceiling and proving that are just as capable of heading organisations as their male counterparts.

That being said, things are far from perfect, as women still have to address a host of challenges in the workplace. While women leaders face unique challenges in the workplace they add unique value and perspective. In the context of politics, Margaret Thatcher once said – “If you want anything said, ask a man; if you want anything done, ask a woman”. Her simple yet succinct mantra to the women leaders was “Don’t follow the crowd, let the crowd follow you”.

As per Business Insider, only 25 Fortune 500 Companies have women CEOs. It is not an overstatement to say that no or lack of women representation in Boards or senior leadership seriously hampers the quality of decision making in an organization. Yet, in many cases, women aren’t encouraged to take on leadership roles as often as their male counterparts, contributing to an imbalance of who’s in power.

#### What makes women great leaders?

Gender shouldn’t be a factor in whether or not a person can be a great leader — a person’s leadership

abilities should depend on their individual strengths and personality traits. Women may not always realize how poised for success they are in leadership roles, but their potential and abilities are undeniable.

Women are natural multi-taskers and improvisers, and their strength is not derived from wielding power but through their wisdom, empathy and camaraderie. Challengers of status quo, women leaders demonstrate amazing adaptability and resilience. A recent study by a business news daily revealed the major traits that make women great leaders. The purpose of the study was not to ‘stereotype’ leadership on the basis of gender, but to bring forth some of the qualities that an organization can leverage by having more and more women in the leadership roles. A study listed the following qualities of women leaders:

#### *They are empathetic:*

- “Most women are naturally empathetic and value relationships. This enables them to have a strong understanding of what drives and motivates people.”

#### *They make great listeners:*

- “Women make great leaders because they take the time to listen instead of reacting right away. They appreciate people and their viewpoints. Whether they are right or wrong, they hear them out and then make the decision.”



*They are nurturing:*

- “One of the key aspects of leadership is the ability to help team members develop their own skills and strengths. Women are naturally nurturing, which in the best scenarios can translate to helping those around them succeed.”

*They focus on teamwork:*

- “The women consistently demonstrate passion, enthusiasm and an immense capacity to serve as team players”

*They're good at multitasking:*

- “Women make great leaders as they are natural multi-taskers. The ability to decisively and quickly respond to simultaneous and different tasks or problems at a time is a critical component to successful leadership.”

*They're strong communicators:*

- “Communication is said to be among woman’s strongest skill - and female leaders know how to use it! Whether communicating with employers, co-workers, or partners, open communication allows for clarity in executing roles and responsibilities.”

*They handle crisis situations well:*

- “Many women know how to deal with crisis situations with compassion and patience, which is a great leadership trait.”

*They have high emotional intelligence:*

- “Emotional intelligence — the ability to recognize emotions in yourself and others and relate — is something that has recently gained momentum as an essential leadership behavior. The study points out that this is something that comes more naturally to women than men.”

In their recent book, ‘Option B: Facing Adversity, Building Resistance And Finding Joy’, Facebook COO Sheryl Sandberg and Wharton Professor of Psychology Adam Grant implores aspirign women leaders to build wells of strength to cope with adversity. It brings out ‘understanding others’ and ‘helping others’ as important leadership traits.

**Women-friendly policies and initiatives: IndianOil’s experience**

IndianOil has always cherished and deeply valued the amazing contribution of women IOCIans in the growth of the company.

Riding on its employee-friendly policies and a

nurturing work environment, IndianOil is rated as one of the best employers in India and the Best PSU Employer in India by the Great Place to Work Institute. An equal opportunity employer, IndianOil has also topped the ranks as the Best Enterprise for Women among Maharatna PSUs by the Forum of Women in Public Sector (WIPS) for last two consecutive years – 2016 and 2017, primarily because of its women-friendly policies and initiatives.

IndianOil is committed to diversity and inclusiveness and has, therefore, adopted various practices to achieve women’s development and gender equality in the organization. Women employees have equal opportunities, equal rights and equal responsibilities. Congenial work culture of IndianOil continues to inspire women employees to shoulder higher responsibilities in various verticals of the Corporation.

With our guiding philosophy of empathy and inclusiveness, more and more women are joining IndianOil over the last few years. We are proud of the contribution of our women employees and truly believe that empowering women to fully leverage their competencies is essential for our growth.

In the last ten years, the number of women officers has almost doubled from 941 in 2008 to 1802 in 2018, with the total employee strength largely remaining the same. Today, women constitute 8.36% of our workforce. Number of women at middle and senior management levels has also risen during the period. Women in IndianOil hold senior managerial positions; work in demanding roles and handle challenging job profiles at various points across the supply chain - at refineries, pipelines and marketing installations. Women scientists at IndianOil’s R&D Centre are engaged in developing cutting-edge in-house technologies, products and processes.

IndianOil has women in various leading technical positions in the leadership matrix of the organizations. For instance, there are several women in positions such as heads of a refinery unit, petroleum products terminal, LPG as Area Offices, process managers in refineries, aviation fuelling stations, etc. Women officers are also heading departments/locations.

Women in IndianOil have not only made significant contributions in their professional fields, but have also indulged their spare time and interest in fields such as sports, performing arts, writing, social activities, etc. Differently-abled women of IndianOil have made a mark by their contribution at the workplace and in areas of their interest.

In a large measure, all these have been made possible

because of the women-friendly policies and practices in IndianOil. Contributions by women are a result of their capabilities which have been nurtured by sustained and continuous efforts by the Corporation towards engaging and developing women through a number inclusive policies and practices.

IndianOil empowers its women employees at five levels:

- Equal employment opportunities – Women representation is ensured in interview committees for recruitment and selection to promote fairness and to eliminate discrimination. No discrimination with regard to gender in recruitment, selection and assigning jobs.
- Enabling policies for women – Women play the roles of primary caregivers in families as per societal norms. Policies on Maternity Leave, Husband joining leave, Child Adoption Leave, Child Care Leave etc take care of women in crucial stages of their lives when they are required to focus on family.
- Safe, congenial and harmonious working environment for women – Awareness on prevention of sexual harassment through gender sensitization programmes is created and policy of zero tolerance is followed in cases of sexual harassment.
- Development of women through challenging assignments, coaching & mentoring and learning & development initiatives – Special leadership development, including coaching initiative for mid-level women executives has been undertaken; nominations to external and internal functional and developmental programme and special programmes for women are being done.
- Encouraging and supporting forum of Women in Public Sector (WIPS) – Through WIPS, women are provided a platform to express and connect with each other, facilitating women to network and learn from one another.

### Women Leadership Development

In addition to the development opportunities to women at large, IndianOil has also introduced a 'one-of-its-kind' initiative which aims at long term and all-round development of select group of women leaders at the middle management level.

This unique endeavour aims to facilitate enhancement of leadership capacity of the participating women

IOCians by -

- Developing greater self confidence
- Directing their passion to grow and contribute to the organization
- Understanding how other women leaders have coped with their professional careers across varied industries – the role models!
- Building a support/ network group amongst women leaders
- Becoming more effective at the workplace, and
- Developing an action plan for performance excellence and goal achievement

The programme was based on 'long-term coaching and mentoring' model. The last phase of the programme comprised of Overseas Learning Module where the participants, divided into two groups, visited our offices in Sri Lanka and Mauritius.

Chairman, IndianOil, Mr. Sanjeev Singh believes, "Women workforce is an important pillar of IndianOil. We are extremely sensitive to the needs of the women employees. As women move up the ladder, expectations of the organization as well as the family grow in equal proportion. Therefore, they need to maintain a fine balance between personal and professional life."

### The road ahead

While we all are focused on developing women at workplace and providing them the right opportunities to grow and lead; yet there are many challenges we need to overcome.

The Thomas Reuters Foundation surveyed almost 10,000 women from 19 of the G20 countries about the challenges they face in the workplace. One of the 5 recurring themes to emerge from this study was that women are provided with fewer opportunities for growth than men. Study after study supports the fact that women are still subject to 'subconscious biases' in the workplace. This presents unique challenges generally not even recognised by men. So the 'million-dollar question' is how can we start addressing these issues in the workplace? Many companies are actively trying to do better by creating inclusive workspaces. I strongly believe that conscious efforts are required on the part of everyone in the organization – be it men or women – to overcome the subconscious biases.



## Conclusion

I will conclude with an inspiring story drawn from the lives of the world's top 2 women skiers that clearly brings out how women can build each other by supporting each other:

At the 2014 Winter Olympic Games, the Norwegian cross-country skier Therese Johaug was vying for her first individual gold medal. Fresh off a world championship in the 10-kilometer race, she was now competing in the 30-kilometer. More than a grueling hour later, Ms. Johaug landed the silver, finishing less than three seconds behind the gold medalist — her training partner, Marit Bjorgen.

The two Norwegians are the top two female cross-country skiers in the world and fierce competitors. Instead of being bitter rivals, they are best friends. Ms. Bjorgen, 36, has been the reigning queen for more than a decade. When Ms. Johaug burst onto the scene, a wunderkind eight years younger threatening to unseat her, Ms. Bjorgen took her under her wing.

"She has given me an incredible amount of confidence," Ms. Johaug said, "and because she has done that I have become the cross-country skier I am."

Therese Johaug and Marit Bjorgen are competitors in each individual race; only one can win. But in the long run, training together has made them both stronger. As teammates in Sochi, they won three golds, a silver

and a bronze for Norway. When a woman helps another woman, they both benefit.

Research tells us that when women are active and equal in the workforce, everyone benefits. Business outcomes are improved, economies are stronger, and living conditions improve for entire communities.

Recognising factors that hold women back from excelling is only a small part. If organisations are serious about furthering diversity in their workplaces and leveraging the skills, talents and experience of so many talented women out there, then real, actionable steps need to be put in place. We have taken actionable steps towards this goal and we believe that small yet significant steps by organizations will result in a giant leap in furthering the cause of women leadership.

## References

<sup>1</sup> Rama Mehta, Socio-Legal status of women in India (1st Ed.1987), pp. 38 & 39.

Great Leaders Grow: Becoming a Leader for Life by Kenneth H. Blanchard (Goodreads Author), Mark Miller

'Option B: Facing Adversity, Building Resistance and Finding Joy', Facebook COO Sheryl Sandberg and Wharton Professor of Psychology Adam Grant

<sup>1</sup><https://rework.withgoogle.com/>



## REFINERY & PETROCHEMICALS

### A DREAM IN THE MAKING – WEST COAST INTEGRATED REFINERY & PETROCHEMICAL PROJECT



**B. Ashok**  
Chief Executive Officer  
Ratnagiri Refinery and Petrochemicals Limited

A huge integrated Refinery & Petrochemical Complex has been planned to be set up in the state of Maharashtra on the coast. This 'Maha' Project, promoted by the three Public Sector Oil Marketing Companies viz. IndianOil, Bharat Petroleum and Hindustan Petroleum is unique in several respects. Potentially one of the largest Project's in the world conceived at this point of time, it is most certainly the largest proposed investment until now, in India. The scale and magnitude of this Project has attracted worldwide attention. Saudi Aramco, the National Oil Company of Saudi Arabia and one of the largest Oil & Gas Company's in the world has expressed its intent to partner in the Maha Project along with another reputed National Oil Company ADNOC from Abu Dhabi, UAE.

With an investment potential of close to US \$ 45 billion (over Rs. 300000 crore) it has generated enough buzz and views. The Project is no doubt very ambitious and challenging, but at the same time offers enormous potential for energy security and growth, with a multiplier effect on the overall economy in the region, state and the country.

#### **India as a Refining Hub :-**

The Indian Refining industry has grown significantly from a capacity of 0.5 MMTPA at the time of Independence to a current capacity of nearly 247 MMTPA with the number of Refineries growing from 1 to 23. At the turn of the millennium, India

had a refining capacity of around 113 MMTPA which has more than doubled over the last 18 years with capacity additions by both Public-Sector Oil Companies as well as Private Sector and Joint Ventures. The demand for refined products in the country is currently around 205 MMTPA, however, the production capacity over the last nearly two decades has led the demand numbers making India a Refining hub. Prior to that time, India used to be a big importer of products such as petrol, diesel and kerosene which is almost negligible today except for some periods of demand spikes or refinery shutdowns.

The technical configuration of the Indian Refineries has evolved from simple to fairly complex ones over the last couple of decades thereby providing the flexibility to expand sourcing of crude from different parts of the world. This is also a unique capability of the Indian refining system that has provided tremendous comfort to crude supply security during uncertain geo- political times.

While crude continues to be the largest foreign exchange guzzler, since India depends on crude import for over 80% of its requirement, export of finished products has certainly helped to minimize some of the impact on the Trade Balance.

#### **Continuance of the demand story:**

India is one of the fastest growing major economies in the world and poised to continue growing at



around 7 to 8% for the next 2 to 3 decades. The Indian economy is projected to grow to US\$ 10 trillion by 2040, which is nearly 5 times of the current size. As Indians, we need to have a firm conviction and belief in this growth story, if our country has to provide its huge population with good living conditions and opportunities for the youth.

Having said that, one of the key requirements for this economic trajectory would be availability, access and affordability of energy. Hence, it is more likely that all forms of energy including some futuristic forms, would continue to grow and find its space in the energy market of the country. Renewables, alternatives, gas as well as conventional fossils including oil thus must grow. Their proportion in terms of a percentage of the energy basket may change, but in absolute terms, it is believed that every form of energy will have to grow in a galloping India.

#### **Integrating Refining & Petrochemicals :-**

There is no doubt that we are in an extremely challenging world that is volatile, uncertain, complex and disruptive. Hence decision making is also faced with a lot of complexity and challenge especially when there is a need for huge capital commitments. However, one also needs to recognize that it is not possible to go back to an environment of scarcity and shortages in the present times. The Maha Project which has a huge capital outlay, hence addresses these issues in several ways.

In terms of a per capita consumption, India is way below world average, both in energy as well as in petrochemicals. The building blocks for a robust petrochemicals production will also need to significantly come out of the existing refineries in the absence of access to cheaper feedstocks, such as domestic gas. For the Refineries at the same time, extending its production capability to value added petrochemicals improves its financial returns besides meeting the ever-increasing market demand for the feedstocks.

After considering some of the possible future scenario changes, MOP&NG has brought out a detailed report on enhancing refinery capacity up to 2040. This report considers the brownfield expansion plans of the existing refineries, the proposed greenfield projects likely to come up in both Government owned and Private sectors and has arrived at a deficit in refining capacity of around 75 MMTPA by 2030.

India will need to continue to be a refining hub also due to some of the major reasons as under:-

- Crude is a much deeper market relative to finished products. It is easier and more economical to import crude in large carriers from around the world and refine them to produce a variety of products of need.
- Product import on the contrary, is sourced more from nearby geographies due to logistical reasons, in smaller quantities and is more difficult to import and transport within the country due to port, storage and other transport infrastructure constraints.
- Moreover, huge imports of finished products by a large country like India can have a significant impact on the pricing of these products in the international markets as opposed to crude procurements.
- The existing excess capacity is fast depleting in view of the robust demand growth. Even as of now, if exports and the refineries own use of fuel is backed out, the net additional capacity available is quite limited.
- With the quality specifications switching to BS-VI (EURO-VI) auto fuels in the next two years across the country, the production flexibility available to the refineries becomes highly restricted demanding very high levels of reliability in operations. Hence, the high capacity utilization of over 100%, which are currently notched up by different refineries could be difficult to maintain, leading to shortfall in production.
- India also needs to continue with an option of exporting finished products from a balance of trade perspective. Moreover, with fuel quality gaining primacy due to emission norms, demand for higher quality fuels would also grow in the immediate neighbourhood of the country. The large refineries in India could effectively meet such demand competitively.
- Many of the Indian refineries are over 50 years or more vintage and have capacities which are quite low besides not being integrated and less energy efficient. While these have been modernized over time, there is a limit to their technology upgradation, reliability and competitiveness.

In the case of petrochemicals, the per capita consumption in India is around 10 Kgs. as against the world average of nearly 33 Kgs. Whilst there is sensitivity around single-use plastics which is likely to be banned in many cities, use of advanced plastics

and petrochemical derived products is bound to increase significantly in future. In that sense, if there is large scale manufacture of solar panels, wind turbines or electric vehicles, a significant part of the panels, turbine blades or vehicle components whether battery casing, body or other components, would still be conceivably from plastic materials.

Hence, while we face a complex future, it is also necessary to build integrated refining and petrochemical capacity to provide future energy and material security with lower volatility. Risk mitigation of the huge capital investment can however be considered through the following approaches: -

- Building world scale capacity with modern technology for competitive advantage.
- Building flexibility of production to address future disruptions.
- Working in partnership to reduce individual promoter risks.

The Maha Project is conceived after considering the above propositions. In terms of size, scale and technology, this is conceived as the largest project to be built to date with the latest infusion of technology. The technology chosen would be flexible enough to adapt to future change in demand of either fuels or of petrochemical feedstocks. Similarly, the partnership between the three major OMCs along with the large foreign entities also ensures that individual risks to the project promoters are minimized while benefits accrue.

#### **Opportunities afforded by the Project:-**

A Project of this scale and magnitude has a tremendous impact and influence on the entire eco system around the project. Some of the direct and indirect benefits are detailed below: -

##### **1. Economic: -**

The Maha project on its own when commissioned fully, has a revenue potential of US\$ 40 to 50 billion. In addition, extended economic area should potentially drive at least another 20 to 30% extra growth. This would include the first and the second level downstream industrial units set up around this anchor integrated Refinery-Petrochemical Project, the infrastructure developments such as Ports, Railway extension, Airport, Roads, bridges etc., the social infrastructure which would get developed including a smart city etc. It is assessed that the economic impact on the state GDP would be over 12% while the country's GDP would grow between 1.5 – 2%.

##### **2. Employment: -**

The Project would provide a tremendous boost to employment generation. It is estimated that during the construction period, the core Project alone would require over 1,50,000 people. In addition, the rest of the infrastructure development activities would also need employees in thousands. Direct employment in the Project / associated Units once commissioned, is expected to be around 15000 to 20000. However, potential indirect employment would be in thousands, if not in lakhs.

##### **3. Social: -**

A Project of this scale and magnitude would invariably result in creation of a huge amount of infrastructure which potentially benefits the society around. This includes medical facilities like hospitals, schools and other educational institutions, city development, markets, entertainment and recreation facilities besides fillip to tourism potential and a large number of business opportunities. There are enough examples of such developments out of projects developed even at a much smaller scale than this Project, in the country .

##### **4. Multiplier effect: -**

The Maha Project has huge potential for a multiplier effect on the entire Indian industrial landscape. Right from the construction period, there would be a huge demand for commodities such as steel and cement to other manufactured and fabricated goods such as pipes, fittings, pumps, valves, compressors, motors, sophisticated instruments etc. Enormous fabrication capacity for a variety of equipment in the plants also would be required. The sheer quantities of such materials would be so large that one could explain the hugeness in the context of steel equivalent to hundreds of Eiffel Towers, cement in many numbers of Bhurj Khalifa, pipelines in lengths of many Ganga rivers and cable lengths around the globe. Obviously, this would mean that many industries, both domestic as well as global, would need to ramp up capacities to meet the requirement of this Maha Project. This would drive a chain of economic activities, employment generation and wealth creation. In addition, many other businesses such as transportation, warehousing, channel development etc. would happen. The services sector including banking and finance, insurance, information technology, hospitality, tourism etc. would get developed besides direct service providers for maintenance, operations, health and safety etc. The list is certainly not exhaustive but is intended

to provide a broad idea about the potential of this project to generate value.

**Challenges to development: -**

It is needless to emphasize that a dream project such as this would not be without challenges. Primary amongst them is to find the suitable land for this mammoth Project. Maharashtra coast has been identified due to several positive reasons. Proximity to crude supplies, ability to bring in large quantities at lower logistic cost, demand and growth considerations in the region and availability of land with minimal need for displacement of people etc. While in a country like India, it is difficult, if not impossible, to find a large quantum of land without the need for people to be displaced, the intent is to minimize the same while not compromising on the need for economic development and growth. Adequate compensation and proper rehabilitation of the project affected personnel would certainly mitigate the pain of such displacement.

The need for a large pool of skilled manpower to execute the project has to be addressed through appropriate skill building activities early, to serve the need of the project. Many different agencies including some of the potential industries such as construction firms, which would have a role in the setting up of this project, will need to play a proactive role for skill development. Similarly, capacity planning for a wide spectrum, from materials to fabrication and

construction would be a significant challenge. Safety and security will be another dimension which would be challenging.

It is important to remember that sustainability should be key feature of development of any project in the current world. Sustainable development is meeting the needs of the present without compromising the ability of future generation to meet their needs. The MahaProject would aim to keep this principle in the forefront and be a very responsible developer towards both the environment as well as the ecology. Many features such as maintaining extreme tightness in terms of emission controls, discharges, treatments and monitoring systems besides sustained greenery development have been contemplated. It is proposed to maximize use of renewable power and produce products out of this complex which are relatively cleaner. There would also be additional focus to sustain locally cultivated crops and agricultural produce.

To conclude, the huge Maharashtra Integrated Refinery & Petrochemical Project is intended to be a game changer in not only meeting the galloping energy & petrochemical demand of a rapidly growing India, but also serve as a tremendous economic boost through a world scale Project. With strong domestic and overseas promoters backing this project, this is an opportunity that should not be missed by the country.





## ENERGY

### IS SUSTAINABLE ENERGY TRANSITION IN INDIA ON TRACK?



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India's energy transition trajectory is complex, encompassing myriads of factors. Energy systems and structure, both from the demand and supply side, are undergoing transformations, under the compulsions of three d's, namely democracy (thriving and evolving), demography (young) and development (vibrant). While energy consumption has exhibited a secular trend, the energy basket is set to undergo a different composition.

Structured in the following five headings, this paper is an assessment of the transition that is underway in terms of its intensity and actualization.

1. Energy transition measured
2. Physical energy transition

3. Energy transition: target vs. accomplishment
4. Green energy programs
5. Future green energy initiatives

#### 1. Energy Transition Measured

##### 1.1 India's Energy Consumption

India is world's third largest consumer of energy (724 MTOE in 2016), after China (3053 MTOE) and USA (2272 MTOE). Keeping pace with its fast GDP growth and urbanization, the country's energy consumption grew at 5.75 CAGR during last decade.

**Table:** Per-capita Energy Consumption and Energy Intensity

Year	Energy Consumption in peta joules	Midyear population (in Million)	GDP (Rs. crore)	Per Capita Energy Consumption (in Mega Joules)	Energy Intensity (Mega Joules per Rupee)
2005-06	14286	1118	3253073	12778	0.4392
2006-07	16571	1134	3564364	14613	0.4649
2007-08	17878	1148	3896636	15573	0.4588
2008-09	18936	1161	4158676	16310	0.4553
2009-10	21408	1175	4516071	18220	0.4740
2010-11	22458	1182	4918533	19000	0.4566
2011-12	23872	1219	8736329	19579	0.2732
2012-13	25128	1237	9213017	20307	0.2727
2013-14	25755	1256	9801370	20513	0.2628

2014-15	27589	1274	10527674	21660	0.2621
2015-16	28337	1292	11386145	21935	0.2489
2016-17	29279	1310	12196006	22351	0.2401

**Source:** Energy Statistics, MOSPI, GOI, 2018 and previous issues.

Significant to observe that per capita energy consumption in the country is growing and the energy intensity per unit of output on average is on a declining path. This is primarily explained by increasing share of national income from service sector and deployment of energy saving equipment and programs.

## 1.2 Transition in energy basket

Transition in energy consumption is to be seen from the points of view of: a) significant increase in energy demand and b) shift towards low carbon energy mix.

**Table:** Total Primary Energy Consumption: Actual up to 2016 and Projection thereafter- India vs. World

Fig - MTOE

	1965	1970	1980	1990	2000	2014	2015	2016	2025	2030	2040
	Actual – Historical							Projection			
World	3731	4912	6642	8142	10035	13684	13633	13760	13921	13836	14084
India	53	65	102	195	441	824	851	897	1118	1236	1479
% of India to World	1.4	1.3	1.5	2.4	4.4	6.0	6.2	6.5	8.1	9.2	10.8

**Source:** Figure till 1990 – BP Statistical Review of World Energy, 2017, by BP

Figure from 2000 onwards – World Energy Outlook, 2017, by IEA

India is poised to occupy the centre stage of world energy consumption, as its share goes on increasing from 6.5% of world consumption in 2016 to 10.8% in 2040, which is CAGR growth of 2.67%.

## 1.3 Move towards sustainability

Sustainability in energy consumption has been captured by two indices: 1. Energy Trilemma Index, formulated and estimated every year by World Energy Council, and 2. Energy Architecture Performance Index, formulated and estimated by World Economic Forum every year.

### Energy Trilemma Index

Energy Trilemma Index of World Energy Council (WEC), computed since 2010, considers 3 dimensions of a country's energy system: a) Energy Security, b) Energy Equity and c) Environmental Sustainability.

India has moved up in overall rank from 122 in 2014 to 92 in 2017. The improvement has come from all the three indicators and is more pronounced with respect to environmental sustainability.

**Table:** Energy Trilemma Indicators for India

Figures indicate Rank, except the balance score, which is a composite Score

	2012	2013	2014	2015	2016	2017
Energy Security	86	76	76	60	51	66
Energy Equity	110	110	105	93	93	96
Environmental Sustainability	123	121	123	96	97	92
Contextual Performance	-	76	90	105	100	86
Overall Rank	117	115	122	92	91	92
Balance Score	-	CDD	CDD	BDD	BCC	CCC

**Source:** World Energy Trilemma Index 2017 & 2014, World Energy Council

### Energy Architecture Performance Index

World Economic Forum, since 2013, devised a composite index, 'Energy Architecture Performance Index' (EAPI), as a measure of 3 key indicators of a country's energy system, which are again split into 18 sub indicators. EAPI index ranks 127 countries in descending order and gives score to the 3 key indicators on a scale of 0 – 1.

3 Broad Index	What the Sub-indices indicate
Economic Growth and Development	This sub-index measures the extent to which a country's energy architecture adds or detracts from economic growth
Environmental Sustainability	This sub-index measures the environmental impact of energy supply and consumption
Energy Access and Security	This sub-index measures the extent to which an energy supply is secure, accessible and diversified

**Table:** Energy Architecture Performance Index for India (score on the scale of 0 – 1)

	Rank out of 127 Countries	Composite Score	Economic Growth & Development	Environmental Sustainability	Energy Access & Security
2017	87	0.55	0.54	0.49	0.62
2016	90	0.53	0.51	0.49	0.61
2015	95	0.51	0.50	0.42	0.61
2014	69	0.48	0.49	0.41	0.54

**Source:** Global Energy Architecture Performance Index, World Economic Forum

Above table brings out the fact that India has improved score on all fronts, during last 4 years, particularly with respect to energy access and security and environmental sustainability. There is marginal improvement in composite score over the years, though the rank scrolled down in 2015 and went up in 2016 and further up in 2017.

### Energy Transition Index

World Economic Forum in 2018 has formulated concept of Energy Transition Index (ETI) and computed value (in terms of percentage) for 114 countries. In addition to measuring country's energy system performance, ETI evaluates the extent to which countries have created the conditions for being future ready for becoming sustainable energy economy.

**Table:** Energy Transition Index for India

Figures in Percentage

	India Score	Highest Score – Country
Energy Transition Index	49	76 - Sweden
System Performance Index	52	84 – Norway
Transition Readiness Index	47	73 - Finland

**Source:** WEF, 2018

## **2. Physical Energy Transition**

### **2.1 India's Resolve for Energy Transition**

India ratified its Nationally Determined Contribution (NDC) commitment made in Paris Agreement in COP 21 of United Nations Framework Convention on Climate Change (UNFCCC) on 2nd October 2016.

The significant measurable commitments are:

- To reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 level.
- To achieve about 40 percent cumulative electricity installed capacity from non-fossil fuel based energy



resources by 2030 with the help of transfer of technology and low cost international finance including from Green Climate Fund (GCF).

- To create additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030.

Government of India announced in 2014 its intention to have cumulative renewable power generation capacity of 175 GW by 2022 (excluding large hydropower). Out of this, solar will be 100 GW, wind 60 GW, biomass 10 GW and small hydro projects will be 5 GW.

## 2.2 Energy Basket for India

Table: Energy Type Mix (Actual till 2016 and projection till 2040)

Fig - MTOE

	1990	2000	2013	2014	2015	2016	2025	2030	2040	
	Actual						Projection			
Coal	92	147	341	378	379	401	463	456	408	
Oil	63	112	176	185	206	222	293	331	348	
Gas	11	23	45	43	43	47	102	135	203	
Nuclear	2	4	9	9	10	10	28	59	116	
Hydro	6	6	12	11	12	11	19	26	38	
Bio Energy	133	149	188	194	196	200	168	142	167	
Other Renewables	0	0	4	4	5	6	45	87	199	
Total	307	441	775	824	851	897	1118	1236	1479	

Source: World Energy Outlook, International Energy Agency

## 3. Energy Transition: Target vs. Accomplishment

### 3.1 Status of India's Transition Trajectory

In this section, we will critically evaluate the progress that India has achieved on the path of transition, in terms of volume and de-carbonization.

### 3.2 How Much Renewable Energy Capacity Built in India?

Table: Trend of Renewable Energy Capacity

Fig in MW

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Hydro	32432	33493	34393	35307	36734	37571	38097	39570	41471	42801	44596
Wind	7845	9655	10926	13065	16084	18421	20150	22465	25088	28700	32878
Solar	4	10	12	37	565	926	1336	3518	5396	9647	19275
Bio	1586	2016	2453	3023	3758	4019	4280	5148	5605	9024	9533
Total	41867	45174	47784	51432	57141	60937	63863	70701	77560	90172	106282

Source: IRENA, 2018

India till 2017 has renewable energy capacity of 106 GW including 40 GW of large hydro projects, forming 4.88

percent of world capacity. There has been substantial addition of renewable capacity in India, growing at 9.76 CAGR during last decade. The capacity addition has been accelerated during last 3 years, when it grew at 14.55 CAGR. There has been 5 fold increase in solar capacity from 3.5 GW in 2014 to 19.3 GW in 2017. Wind energy capacity has increased by 14% in 2017.

### 3.3 Green (Renewable) Power Generation Capacity as per India's Commitment in Paris Agreement

**Table:** Target vs Accomplishment of Renewable Electricity

Figure - GW

Source of Power	Estimated Potential As on 31. 03. 2017. @1	Target Capacity as per INDC committed in Paris COP 21 in Oct. 2015, to be created by 2022	Actual Capacity as on 31. 03. 2018. @2	Capacity added in 3.5 years (Apr 2014-Dec 2017)	Balance to reach the target in 4 years
Solar	649.3	100	21.6	12.87	78.4
Wind @ 100 mt. height	302.2	60	34	11.70	26
Biomass	18.6	10	0.7	0.79	0.6
Bagasse Cogeneration	7.3		8.7		
Small Hydro	21.1	5	4.5	0.59	0.5
Waste to Energy	2.5	-	0.1	-	-
Total Renewable	1001	175	69.6	27.07	105.5

Sources:

@1. – Energy Statistics, 2018, CSO, MOSPI, GOI

@2. – mnre.gov.in, accessed on 15.05.2018 (Physical Progress-Achievement)

Number of schemes are in place and regulatory environment has been created for taking the country's generation and use of renewable energy on fast forward mode. Still there are micro issue centring on technology, investment and functioning of State Electricity Distribution Companies (DISCOMs) which are being addressed.

In the table below capacity addition during last 4 years has been compared with the 2022 target.

**Table:** Grid Connected Renewable Electricity – Target vs Addition in Capacity

Fig in GW

Source	As on end March						Addition during 4 years	Target 2022
	2014	2015	2016	2017	2018			
Wind	21.1	25.1	27.7	32.3	34.0	12.9	60	
Solar	2.5	4.9	8.1	12.3	21.6	19.1	100	
Biomass @1	4.01	4.45	4.88	8.83	9.36	5.35	10	
Waste to Power	0.11	0.13	0.12	0.11	0.14	0.03		
Small Hydro	3.8	4.2	4.3	4.4	4.5	0.7	5	
Total	31.5	38.8	45.1	57.9	69.7	38.2	175	

@1 – Biomass & Gasification and Bagasse Cogeneration

Source: Author's own record for historical data

From the above 2 tables, looking at the actualization during last 4 years, the target for power generation from solar

and wind appear to be daunting. However, reviewing the progress of several initiatives underway, the targets are not outside the zone of realization.

#### 4. Green Energy Programs

##### 4.1 National Mission for Enhanced Energy Efficiency

India put in place a 'National Mission for Enhanced Energy Efficiency' (NMEEE), as part of 8 point National Action Plan for Climate Change' in 2008.

##### 4.2 Carbon Sink

India committed in COP 21 at Paris creating additional carbon sink the equivalent of 2.5 to 3 billion tonnes carbon dioxide by 2030.

The carbon stock in India (as in January 2018) is roughly 7 billion tonnes, equivalent to 25.66 billion tonnes of carbon dioxide. The average annual increment of carbon stock is 35 million tonnes, which is equivalent to 128.33 million tonnes carbon dioxide.

By 2030, the increment is expected to be equivalent of 1.92 billion of carbon dioxide, which would mean shortfall of 0.6 to 1.1 billion tonnes.

##### 4.3 Emission Intensity of GDP

India aims to reduce emission intensity of GDP by 33 to 35% by 2030 from 2005 level. India is attempting to achieve this by two ways: a) by tapping non fossil energy source and, b) by creating additional carbon sink.

#### On the issue of reduction of GHG, India has two types of policy instruments:

- a) Domestic market mechanism, such as, renewable energy certificates market (REC) and energy efficiency certificates market (PAT)
- b) Carbon pricing policies, such as carbon tax in the form of coal cess.

In 2005, India's emission intensity was 0.47 metric tonnes of carbon dioxide per \$1000 of GDP. (Charles Frank, 2016) By 2010, the emission intensity has reportedly reduced by 12%.

##### 4.4 UDAY Scheme

Ministry of Power, Government of India in November 2015 launched a scheme for the State Electricity Boards (Electricity Distribution Companies), named as Ujwal DISCOM Assurance Yojana (UDAY). Objective of the scheme were to provide support for: a) financial turnaround,

b) operational improvement, c) reduction of cost of generation of power, d) development of renewable energy and e) energy efficiency and conservation. Under the scheme, State Governments were to takeover up to 75% of their respective DISCOM's debt by issuing sovereign bonds to pay back the lenders. So far, 32 States and Union Territories have become partner of the UDAY scheme. Rs 2.32 lakh crores worth bonds have been issued to 16 States and estimated Rs 2.69 lakh crores will be issued.

##### 4.5 International Solar Alliance

International Solar Alliance (ISA) is open to 121 countries located between the Tropic of Cancer and Tropic of Capricorn, of which 61 countries have joined the ISA framework agreement and 32 countries have ratified it.

#### 5. Future Green Energy Initiatives

##### 5.1 Floating Solar Plant

India has started building floating solar plant as alternative to conventional ground mounted photo voltaic systems which are land intensive. It has benefits like conserving water through reduction of evaporation, increased generation due to cooling effect on the panels and requires lesser installation time than conventional land mounted ones.

##### 5.2 Hybrid Solar and Wind Plant

The Ministry of New and Renewable Energy (MNRE) has issued the national wind solar hybrid policy on May 14, 2018. The key objective of this policy is to provide a framework for promotion of large grid connected wind-solar PV hybrid system for optimal and efficient utilization of transmission infrastructure and land, reducing the variability in renewable power generation and achieving better grid stability.

##### 5.3 Corporate Renewable Energy Leadership

Corporate sourcing of renewable energy has become a global phenomenon and the market is growing, currently at 645 TWh in 2017 in 75 countries. There are 35 companies in India who have got into this mode. (IRENA, 2018 a)

Mumbai metro committed to buy 50 MW in April 2018 from the solar plant to be set up in Dhule district of Maharashtra. Delhi metro committed to buy power from the 750 MW Rewa solar plant in Madhya Pradesh. Microsoft in Bengaluru has signed to purchase 3 MW solar powered electricity, which is 80% of its electricity



need for its office building, from Atria Power. Three companies have so far committed to be hundred percent renewable energy powered; Infosys, Tata Motors and Dalmia Cement.

#### 5.4 National Bio Fuel Policy

India had a national bio fuel policy 2009. A new national bio fuel policy 2018 has been approved by the Government in May 2018.

The policy that calls for usage and production of ethanol from damaged food grains and farm products has paved way for optimal utilization of agricultural waste to produce bio-power (1st, 2nd and 3rd Generation bio-fuel, bio-CNG). It has also made provisions to convert waste/plastic and municipal solid waste to fuel.

#### 5.5 Green Energy Corridor

India commenced work on the ground its first green energy corridor project with an ultra-high-voltage direct current link over 1800 km passing through five States. The link is a key element of integrating renewable energy with main grid. It will integrate thermal and wind energy for transmission of power from high consumption centre located thousands of kilometre away, supporting electricity demands in the south (Pugalur in Southern State of Tamil Nadu) and transmitting clean energy to the central India

(Raigarh), when there is excess wind power. The project is worth over Rs 4,350 crores, partly funded by Asian Development Bank and is part of Indo-German Energy Program.

#### 5.6 Electric Mobility

India has all the compelling reasons to leapfrog into the electric mobility bandwagon that is out to disrupt automobile industry world over. India has expressed policy intent and has taken drive to fast forward the transition to electric vehicle.

Under Faster Adoption and Manufacturing of Hybrid & Electric Vehicles (FAME) scheme, Government of India subsidizes 60% of total cost of an electric bus (each bus costs Rs 1.7 to 2.5 crores) and has already sanctioned 390 buses in 11 cities (as on April 6, 2018).

#### Conclusion

What emerges is that India has indeed embarked on the path of sustainable energy transition, very much in synch with global trend. However, the complexities of India's socio-economic status and resource endowment have not allowed India to make a radical shift. Last four years have witnessed a massive thrust in right direction and results are visible in the form of green shoots.

[This paper was presented in Energy Systems Conference held in Queen Elizabeth II, in Westminster, London on 19. 06. 2017, jointly organized by Elsevier and Energy Institute, London.]



## OIL

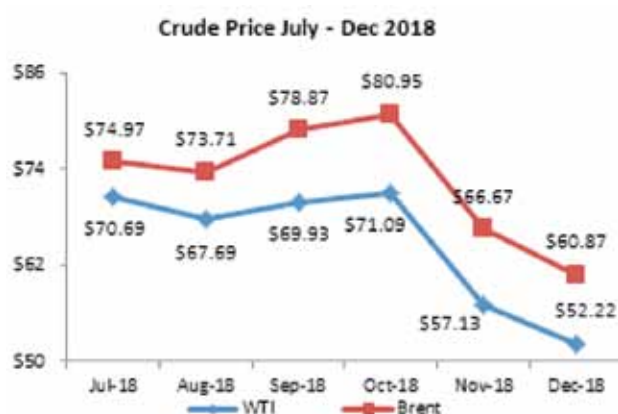
### OIL AND GEO-POLITICS



**Anand Vaidyanathan**

Sr. Asst. Director (Exploration & Production),  
Federation of Indian Petroleum Industry

Khalid al-Falih, Saudi Arabia's Energy minister sent signals of production cut after the OPEC meeting on November 11th. Speaking after the meeting, Kingdom's Energy minister said, the production would need to fall by a million barrels per day to wipe out the surplus oil in the market and keep the price steady. End of the business day, markets reacted and the crude price went up by 8%. However, the news of proposed production cut didn't meet the market expectations.



Source: oilprice.com

Earlier in July 2018, Saudi Arabia's King Salman stated that, "the Kingdom is prepared to utilize its spare production capacity when necessary to deal with any future changes in the levels of supply and demand". Following the meeting OPEC and other major producers agreed to increase the production

by a million barrel per day. Over this period crude fluctuated owing to the geo political situation. Brent climbed up to USD 85.45 per barrel during first week of October, the highest since 2015. By December first week, the oil prices dipped into bear market by the fears of slow economic growth, reduced demand and roaring production from US, Russia and Saudi Arabia. By the last week of December, a barrel of Brent and WTI crude were trading at \$53.21 and \$45.41 respectively.

So what made Kingdom, the swing producer of crude to reverse its decision from increasing the production to production cut? Multiple reasons can be attributed to this, ranging from increase in production from non-OPEC members to lower demand, with waiver of Iran sanctions being the prominent reason.

#### **Waiver for 8 countries from US sponsored Sanctions on Iran**

What turned out to be surprise for the OPEC producers is the waiver from Iran sanction for 8 major buyers of Iranian crude. As the OPEC members were planning to increase the production to balance the loss of Iran's production, waiver from US came as the shocker for OPEC nations. US gave a timeframe of 6 months for the 8 countries to gradually reduce the Iran imports to zero. While countries like Japan and South Korea have stopped taking oil from Tehran, India and China showed resistance to have reduced their volume of purchase



Source: Bloomberg, Reuters

### Increase in Production from non-OPEC countries:

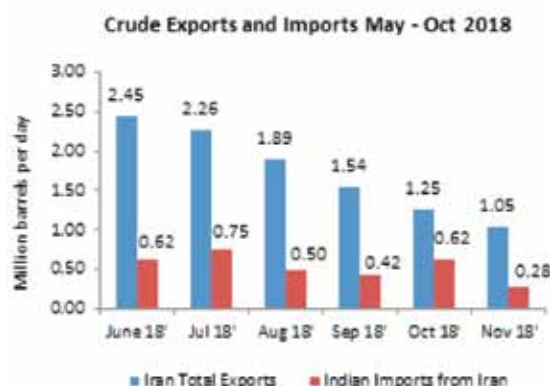
October 2018 saw the production level of US, Russia and Kazakhstan reaching their all-time high. In October 2018, Russian production level reached 11 bpd, their highest since Soviet days. Similarly, US crude oil production touched 11 bpd, propelled by the production from their Shale assets.

### Market being oversupplied

Currently the excess crude oil in the market is estimated to be 1 – 1.2 mbpd. In the OPEC meeting held in Abu Dhabi, the demand forecast for 2019 was slashed by 700,000 bpd. Accounting all these, OPEC plans to slash down the production by 1.5 mbpd to balance the supply demand in 2019, possibly leading to a tighter market to raise the crude price.

### Should India worry?

With 80 % dependency on imported crude, such market oscillations are always a matter of concern in terms of supply and price conditions. Apart from being the suitable blend for Indian refineries, Iran crude came at a discounted price of 2-3 dollar per barrel with extended credit terms and free shipping. Replacing this with any other crude is going to add financial burden for the refineries by 5% - 8% considering discount lost.

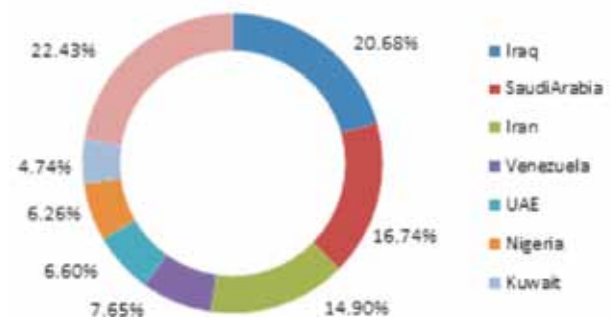


Source: oilprice.com

### Supply Impact

Iran was the third largest supplier until November. During the time period between April – July 2018, Iran imports reached 750,000 bpd. From August, Indian refineries changed their crude sourcing strategy prior to the sanctions as they weren't sure if they would get US waivers for Iran crude oil. In October 2018, Indian refiners imported 30% more crude from the African producers, with Nigeria being the major supplier. Crude imports from Africa stood at 874,000 bpd. Increased crude imports from Africa and US are filling the void created by the decrease in Iran crude. As the Iran sanctions came in place, United States' Secretary of State Mike Pompeo stated that US will be happy to replace the Iranian crudes with American products.

Pre-Sanction Indian Crude Import Pattern (Apr- Jul 2018)



Source: Ministry of Commerce, India

India, one among the 8 eights who got the waiver was allowed to importing up to 300,000 bpd from Iran until March 2019. Waiver gave ample time for Indian refineries to shift the market and choose alternative suppliers. Despite the decrease in Iranian imports from 750,000 bpd in July to 276,000 bpd in November 2018, Indian refineries have managed the supply equilibrium. Assured supply from Saudi Arabia, increased imports from Africa can fill the Iranian void even if the imports are pushed down to zero.

### Impact on Indian Economy

Being the third largest importer of crude, crude prices' impact on Indian economy is high. Higher crude oil prices impacts the CAD and Fiscal deficit due to the trade imbalance. Widening CAD impacts the Indian Rupee and weakens it against the other major currencies. Every \$10 increase in oil prices affects the current trade balance by 0.4 %, and it could raise the retail inflation by 0.2 %. While a fall by \$10 per barrel could reduce the deficit by \$9.2 billion.



### Price Impact

Though exports from Iran have gone down over the last few months, its impact on the crude price has stayed minimal. Trump Administration made it clear that, they won't push for immediate curtail of Iranian crude, rather a step wise reduction to avoid any disruption to the market and to keep the price at a check.

As the announcement of production cut came from OPEC, Donald Trump called for lower oil price based on the supply. Similar view was echoed by Vladimir Putin. After the Singapore Summit, Putin stated that US\$ 70 will suit Russia. With the two major producers on keeping the oil price lower, the onus was left with to OPEC.

### Role of OPEC

Prior to the OPEC meet on deciding the production cut, Saudi Arabia's energy minister Khalid Al Falih expressed that, the oil producing nations will consider the views of world leaders namely Indian Prime Minister Narendra Modi, and US President Donald Trump before taking a decision. Though, production cut would impact the crude price, the need for lower oil price is pushed by the major buyers

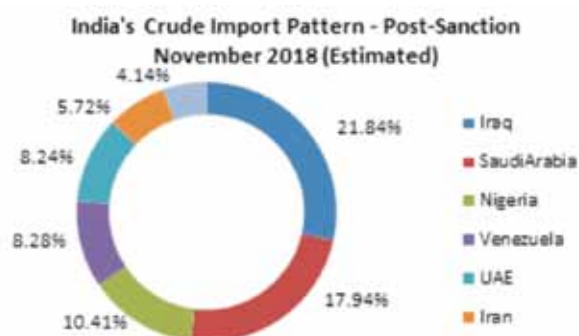
### OPEC production cut announcement:

OPEC members met on December 6th in Vienna. Initially, it was proposed to make decision on production cut. OPEC members and non-OPEC members announced a 1.2 mbpd production with former taking an 800,000 bpd cut and the latter taking the balance of 400,000 bpd. Lion share of the production cut from non-OPEC members is set to come from Russia gradually. By January 2019, Russia will cut down its production by 50,000 bpd to 60,000 bpd. Adding the reduction in export from Iran and production disruptions in Venezuela, the actual cut could be more than 1.5 mbpd. OPEC lowered the 2019 demand for its oil by 100,000 bpd less than October's forecast and 1.53 mbpd less than their current production of 32.97 mbpd. However, the planned output cut is put at 1.2 mbpd. There are chances for market to stay over-supplier despite the cut.

### Final Words

Global supply market has remained unhurt by the loss of Iranian crude. Increase in production from Saudi Arabia in November has filled in the plunge caused by Iran's decline in output. Other production disruptions in Iraq, Gabon, Libya, Nigeria and Venezuela were offset by the raised output in United Arab Emirates and Kuwait. With reduced demand forecast for 2019, the market will be left with surplus crude of 300,000 – 500,000 bpd considering the proposed production cut of 1.2 mbpd.

From Indian perspective, Indian refiners are less likely to face any supply disruptions or shock due to the prevailing geo political system. Timely change in crude import pattern, support for additional crude from Saudi Arabia, Africa has kept the supply intact.



Note: Estimated figures

From the price point of view, global crude price saw new high and new low over the last 2 months. Brent, which was trading at \$86 a barrel in October, is currently placed around \$61. WTI traded at \$76.18 in October is now traded around \$52.

Cracks in global economy, signs of strain in demand and expected growth in US shale production, crude price is forecasted to wobble around \$60- \$70 and \$55 -\$65 per barrel for Brent and WTI crude respectively. Major global financial institutions slashed the price forecast for 2019 on the basis of uncertainty in production cut. Though production cut is expected to balance the demand-supply, upper side of the crude price will be limited.

## OPERATIONS

### Corrosion & Scaling in E&P Industries



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#### ABSTRACT

The E&P industry is a capital intensive industry with assets ranging from Wells, Risers, Drilling Rigs, Casing Strings, Downhole Tubular, Flowlines, Surface Tanks & Facilities, Oil & Gas Transmission Pipelines and Offshore Platforms. The E&P industry is required to develop new facilities and extend the life of ageing assets to achieve levels of production of Oil and Gas required to support the economic growth. Corrosion control plays an important part of the integrity management of Oil & Gas asset. Application of proper corrosion control measures aims to protect People, Environment and Assets through Management, and reduce unscheduled down time and maintenance cost. Understanding the corrosion threats and how to mitigate them is therefore, important in order to avoid loss of containment. The E&P Industry is continuously improving materials, corrosion mitigation methods, corrosion monitoring equipment and corrosion prediction modelling tools in order to avoid corrosion related failures.

Scale formation is another problem associated with oil and gas production. Scaling is the deposition of a mineral salt on processing equipment or the inside of a pipeline which is a result of supersaturation of mineral ions in the produced fluid. This supersaturation of ions is mostly due to the production of high salt content water like formation water from the well which increases the ionic concentrations, leading to deposition of scales in water disposal lines, valves and pumps etc. Scaling is aggravated and prominent in installations handling water produced from different geological age reservoirs like Oligocene and Eocene

This article discusses Corrosion & Scaling in E&P industry, Corrosion Principles, Field cases and examples of corrosion, importance of material selection, corrosion & scaling inhibition and the need for a robust corrosion control system and mitigation methods. The article is based on the invited talk on "Corrosion & Scaling in E&P Industries" delivered in the "FIPI R&D Conclave 2018" held on August 22-24, 2018 at Goa.

#### 1 Introduction

Corrosion is the deterioration of a metal or its properties, and it attacks every component at every stage in the life of every oil and gas field. In the oilfield, it manifests itself in several forms and affects Casing Strings, Production Platforms, Drilling Rigs, Production Setups, Downhole Tubular, Flowlines & Separators, Crude Oil and

Natural Gas Transmission Pipelines etc. The problems of corrosion have created increased challenges to the already challenging field of exploration and production of oil and gas, given the conditions associated with Oil & Gas production and transportation, corrosion impacts CAPEX and OPEX and increases HSE related costs. The implications of misunderstanding corrosion

are dire and often manifested through:

- 1) Increasing risk of failure due to corrosion, leading to lower personnel safety and impaired environmental protection.
- 2) Higher chemical treatment, repair, and inspection costs.
- 3) An increase in the number and duration of unplanned shutdowns (either partial or total).

All corrosion processes show some common features. Thermodynamic principles can be applied to determine which processes can occur and how strong the tendency is for the changes to take place. Kinetic laws then describe the rates of the reactions. There are, however, substantial differences in the fundamentals of corrosion in such environments as aqueous solutions, non-aqueous liquids, and gases.

Wells producing water are likely to develop deposits of inorganic scales. Scales can and do coat perforations, casing, production tubulars, valves, pumps, and downhole completion equipment, such as safety equipment and gas lift mandrels. If allowed to proceed, this scaling will limit production, eventually requiring abandonment of the well.

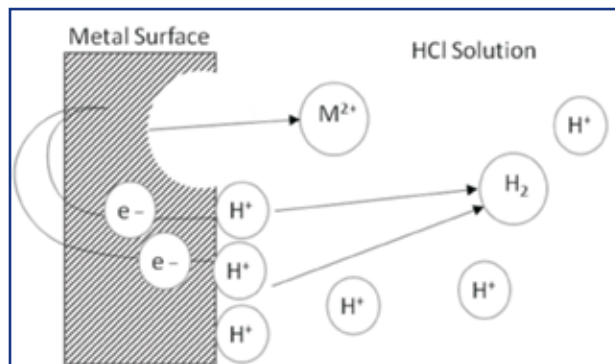
Calcium carbonate is one of the most common scales found in hydrocarbon production environments. Carbonate scales frequently appear in the wellbore, especially near the wellhead where, due to pressure drop, dissolved CO<sub>2</sub> escapes from produced water and causes water pH as well as the saturation index of carbonate minerals to increase. If we know where and when scale will form, scale treatments could be applied before severe problems appear. An understanding of the scaling regime in a well from modeling studies can assist in determining when the benefits of treating a well can offset the disadvantages. This requires accurate prediction of scaling thermodynamics as well as kinetics.

## 2 Corrosion Principles

Although atmospheric air is the most common environment, aqueous solutions, including natural waters, atmospheric moisture, and rain, as well as the various formulations used during oil field operations (drilling mud, formation water, etc) are the environments most frequently associated with corrosion problems. Because of the ionic conductivity of the environment, corrosion is due to electrochemical reactions and is strongly affected by such factors as the electrode potential

and acidity of the solution.

Corrosion is the deterioration of a metal or its properties and is primarily an electrochemical process wherein transfers of electrons take place via an electron path or a conducting electrolytic or medium. The corrosion reaction requires two half cells one anodic and the other cathodic.



**Figure 1:** Schematic diagram of metal M dissolution, liberating into solution a metal ion M<sup>2+</sup> and into metal electrons e<sup>-</sup>, which are consumed by reduction of H<sup>+</sup> to H<sub>2</sub>

Therefore, for corrosion to occur we need three things :

- A conducting medium – usually water
- Anodic half reaction
- Cathodic half reaction

## 3 Scale mechanisms

As brine, oil, and/or gas proceed from the formation to the surface, pressure and temperature change and certain dissolved salts can precipitate. This is called "self-scaling." If a brine is injected into the formation to maintain pressure and sweep the oil to the producing wells, there will eventually be a commingling with the formation water. Additional salts may precipitate in the formation or in the wellbore (scale from "incompatible waters"). Many of these scaling processes can and do occur simultaneously. Scales tend to be mixtures. For example, strontium sulfate is frequently found precipitated together with barium sulfate. The most common oilfield scales are:

- Calcite
- Barite
- Celestite
- Anhydrite
- Gypsum
- Iron sulfide
- Halite

#### 4 Corrosion encountered in E&P industries

Over the years, corrosion scientists and engineers have recognized that corrosion manifests itself in forms that have certain similarities and therefore can be categorized into specific groups. However, many of these forms are not unique but involve mechanisms that have overlapping characteristics that may influence or control initiation or propagation of a specific type of corrosion. The corrosion encountered in E&P operations involves several mechanisms. These have been grouped into electrochemical corrosion, chemical corrosion and mechanical and mechanical/corrosive effects.

Types of Oil Field Corrosion typically encountered in E&P industries are:

- H<sub>2</sub>S / CO<sub>2</sub> / MIC
- General / Pitting / Mesa / Environmental Assisted Cracking
- Fatigue / Erosion Corrosion / Splash Zone Corrosion, etc

Factors influencing oil field corrosion can be categorized as under:

##### a) Usual aggressive species

- Water, plus
- O<sub>2</sub> – not usually an issue in producer wells, but is with injectors / offshore / subsea
- CO<sub>2</sub> – sweet corrosion of steel
- H<sub>2</sub>S – sour corrosion, SSC, etc.
- Cl<sup>-</sup> – causes pitting in steel, SCC
- Other factors include : Pressure, Temperature, Flowrate, Oil wetting, pH, Bicarbonate, Bacteria, Galvanic couples, Differential concentration, Dew point, Inhibitor injection, Coating/Lining, History

The downhole water sources in an oil well includes liquid water with dissolved salts from formation water, aquifer water, breakthrough of injection water; Worst case – water wet at all depths (esp. for high water cut) and bicarbonate dissolves in the water and buffers, so the system pH tends to be less acidic pH > 4.5. Figure 2 shows a typical downhole well completion diagram to illustrate the corrosive environment.

The sources of water in a gas wells are primarily encountered at the start of production. The presence of water vapour in the gas increases water wetting toward the top of the well as temperature decreases and water condenses. Since no bicarbonate buffer acts in condensed

water, therefore in presence of CO<sub>2</sub> / H<sub>2</sub>S, the system pH is usually < 3.5 and highly amenable towards corrosion. As the well ages – water presence may be same as that of oil wells.

The same water that is associated with crude oil and natural gas during production is separated at the surface facilities and along with the contaminants mentioned above, creates a conducive corrosive environment. Figure 3 illustrates the typical layout of a onshore surface production facility. The produced water quality parameters primarily determine the corrosive nature of the formation fluids. The scenario becomes even more challenging in the presence of micro-organism that also accelerates corrosion of the oil & gas assets. Tables 1 and 2 shows the properties of produced water quality parameters and the desired properties of injection water quality respectively.

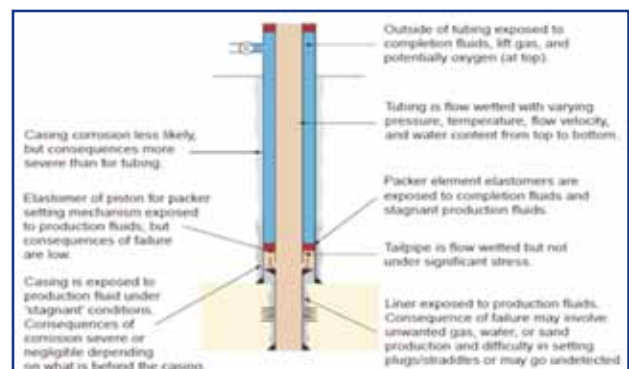


Figure 2: Corrosive environment - typical downhole completion

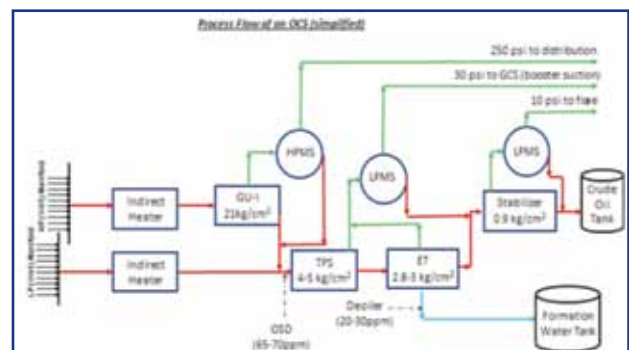


Figure 3: Process flow of a surface production facility

Table 1: Produced water quality range

Sl. No.	Parameters	Inlet Effluent Quality	Desired Outlet Quality
1.	TOC, ppm	100 – 5000 (more than 50% of the oil is in free form)	< 5
2.	pH	< 7.5	8 – 9
3.	TSS, ppm	Up to 150	<1



4.	Dissolved Oxygen, ppm	Up to 6	< 0.02
5.	Turbidity, NTU	100 to 180	<1
6.	SRB, CFU/mL	103 to 106	< 102
7.	TSS size distribution, $\mu\text{m}$	1.23 to 24	< 2
8.	Any other bacterial activity	General Bacteria	NIL

**Table 2:** Injection water quality range

Sl. No.	Parameters	Range
1.	pH	6.5 – 8.0
2.	Turbidity, NTU	1.0 – 200
3.	DO, ppm	0.1 – 6.0
4.	TSS, ppm	0.1 – 70
5.	Fe, ppm	1.0 – 20.0
6.	Physical Appearance	Clear – Turbid

Few field examples of corrosion problems in Oil & Gas:



**Figure 5:** Low Magnification Examination 10 x of production tubing internal showing progressive pits

## 5 Microbial Induced Corrosion

Microbial Induced Corrosion (also called bacterial corrosion, bio-corrosion, microbiologically-influenced corrosion, or microbial-induced corrosion) is corrosion caused or promoted by microorganisms and is usually in the form of pitting. This form of corrosion requires pH 4 to approx. 9 and a temperature between 10 to 50°C which promotes the growth of microbes and bacteria in aqueous media. The MIC can cause souring of reservoirs which in turn leads to Sulphide Stress Cracking etc.



**Figure 6:** Microbial induced corrosion in water injection manifolds

Mitigation of microbial induced corrosion can be achieved by the use of the following either alone or usually in combination:

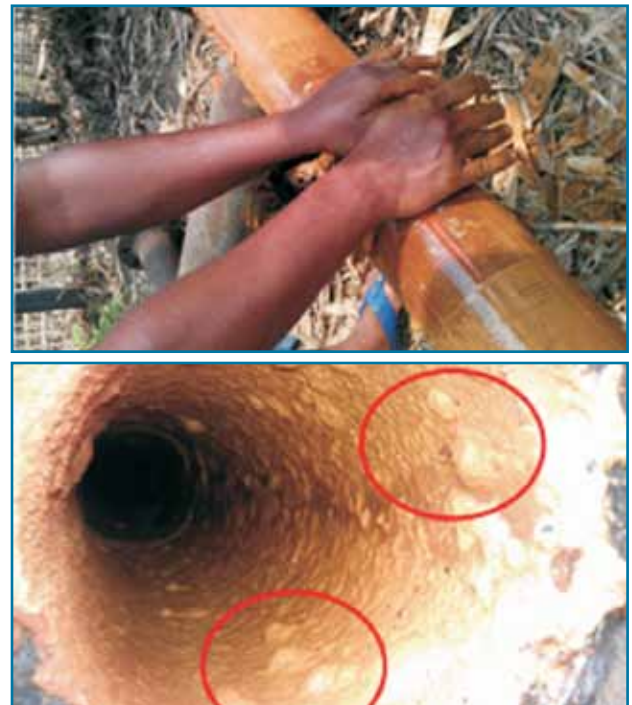
- Coatings
- Cathodic Protection with a more negative protection potential than usual (eg.  $-1.1\text{ V vs Cu-CuSO}_4$ )
- Use of biocides in pipelines
- Avoid dead legs and no-flow
- Treat injection water with biocide
- Keep lines clean to prevent under deposit corrosion

## 6 Electrochemical Corrosion

Galvanic corrosion (two metals) – two dissimilar metals in a conductive medium develop a potential difference between them. One becomes anodic and the other cathodic. The anode loses

Common anaerobic bacteria include sulphur / sulphate reducing bacteria (SRBs) and organic acid formers. SRB are anaerobic bacteria which metabolize sulphates ( $\text{SO}_4^{2-}$ ) and produce sulphuric acids or  $\text{H}_2\text{S}$ , thus introducing hydrogen sulphide into the system. SRB colonies can also form deposits that are conducive to under-deposit corrosion (crevice corrosion)

**Figure 6** shows the manifestations of microbial induced corrosion in the water injection manifold and filters.



metal ions to balance the electron flow. Because metals are made up of crystals, many such cells are set up, causing intergranular corrosion. The problems are most acute when the ratio of the cathode-to-anode area is large.

Crevice corrosion – Much metal loss in oilfield casings is caused by crevice corrosion. This localized form of corrosion is found almost exclusively in oxygen-containing systems and is most intense when chloride is present. In the crevice, metal is in contact with an electrolyte, but does not have ready access to oxygen. Crevice corrosion is autocatalytic in nature. Pitting corrosion is another form of crevice corrosion where a small scratch, defect or impurity can start the corrosion process. A build up of positive charges occurs inside a small pit on the metal surface, chlorine ions from the saline solution migrate towards the pit which in presence of hydrogen ions acts as a catalyst causing more metal dissolution.



## 7 Chemical Corrosion

Hydrogen sulphide, Polysulfides and Sulfur – Hydrogen sulphide ( $H_2S$ ) when dissolved in water, is a weak acid and therefore, it is a source of hydrogen ions and is corrosive. The effects are greater in deep wells, because the pH is further reduced by pressure. The corrosion products are iron sulfides and hydrogen. Iron sulfide forms a scale that at low temperature can act as a barrier to slow corrosion. The absence of chloride salts strongly promotes this condition and the absence of oxygen is absolutely essential. At higher temperatures, the scale is cathodic in relation to the casing and galvanic corrosion starts. In the presence of chloride ions and at temperatures in excess of  $150^\circ C$ , chloride forms a layer of iron chloride ( $FeCl_2$ ) which is acidic and prevents formation of a  $FeS$  layer directly on the corroding steel, enabling the anodic reaction to continue. Hydrogen produced in the reaction may lead to hydrogen embrittlement.

Carbon Dioxide – Like  $H_2S$ , carbon dioxide ( $CO_2$ ) is a weak acidic gas and becomes corrosive when dissolved in water. The corrosion product is iron carbonate (siderite) scale. This can be protective under certain conditions. However, siderite itself can be soluble and corrosion occurs wherever the protective film is not present. Crevice and pitting corrosion occur when carbonic acid is formed. Carbon dioxide can also cause embrittlement, resulting in stress corrosion cracking.

Strong Acids(direct chemical attack) – Strong acids are often pumped into the wells to stimulate production by increasing formation permeability in the near wellbore region. The acids systems are designed depending on the type of formation and includes 5 to 28 % hydrochloric acid, up to 3% hydrofluoric acid in combination with 12% hydrochloric acid etc. Corrosion control is normally achieved by a combination of inhibitor loading and limiting exposure time, which may range from 2 to 48 hours. In addition to spent acid, other stagnant columns of fluids such as drilling and completion fluid, may also be corrosive.

Heavily concentrated brines – Dense halide brines of the cations of calcium, zinc, and magnesium are sometimes used to balance formation pressures during various production operations. All may be corrosive because of dissolved oxygen or entrained air. In addition, these brines may be corrosive because of acidity of generated by the hydrolysis of metallic ions. Corrosion due to acidity is more severe with dense zinc brines.

## 8 Mechanical and Mechanical/Corrosive Effects

Cavitation – this type of metal loss often grain by grain is due to high pressure shock waves

generated from the collapse of minute bubbles in high velocity fluids impinging on nearby metal surfaces. Cavitation metal loss is usually found on pump impellers developing too low a suction pressure.

Erosion – This is direct metal removal by the cutting action of high-velocity abrasive particles. Erosion failures (washouts) are seen in drillpipe when leaks (loose connection or a corrosion fatigue crack) allow drilling mud to flow through the wall under high pressure. Erosion of chokes (bean), flow lines at bends and joints by produced sand is probably the other most common occurrence of metal erosion in the petroleum industry.



Figure 7: Erosion corrosion failure of choke at a gas well

**Erosion Corrosion** – When erosion removes the protective film of corrosion products, corrosion can occur at a faster rate. Erosion corrosion play a role in  $CO_2$  corrosion. Under mild flow conditions, sand may also cause erosion corrosion. This type of corrosion is also seen in anchor chains where corrosion between links proceeds quickly. Erosion corrosion is also prominent in natural gas pipelines.



Figure 8: Black powder (Siderite) problem in Natural Gas pipelines is owing to  $CO_2$ /Erosion corrosion

**Corrosion Fatigue** – This results from subjecting a metal to alternating stresses in a corrosive environment. At the points of greatest stress, the corrosion product film becomes damaged allowing localized corrosion to take place. Eventually this leads to crack initiation and crack growth by a combination of mechanical and corrosive action. Because of this combined action, corrosion fatigue is greater at low stress cycles that allow time for the corrosion process. Welded connection on drillships, drilling and production rigs, sucker rod pumps, production platforms are subject to this type of corrosion.

**Sulfide Stress Corrosion** – Production of hydrogen results from sulfide stress cracking or SCC. SCC occurs when a susceptible metal is under tensile stress and exposed to water containing hydrogen sulfide or other sulfur compounds – generally under anaerobic conditions. Penetration of hydrogen into the body of the metal reduces ductility and can also cause blistering of metal surface. Accumulations of hydrogen at imperfections generate tremendous pressure leading to corrosion failure.

**Stress Corrosion Cracking** (combined effect of SSC and corrosion fatigue) –The stress corrosion cracking starts at a pit or notch, with cracks progressing into the metal primarily along the grain boundaries. A broad range of stress corrosion cracking is chloride stress cracking, a phenomena in which austenitic steels under tensile stress in presence of saline water above 95°C fails by cracking.

### 9 Mitigation methods

The best mitigation philosophy is to pay close attention to operations and develop a robust corrosion management plan which may include:

- Removal of the corrosive species
  - o Downhole dehydration, if feasible.
  - o Injection of chemicals to prevent or remove H<sub>2</sub>S / CO<sub>2</sub> / Bacteria
- Inhibition
  - o Continuous
  - o Batch
- Cathodic protection (for casing)
  - o Impressed (continuous or pulsed for casing protection)
  - o Sacrificial

### 10 Factors Affecting Corrosion Behavior

A primary factor in determining corrosion behavior of metals is their chemical composition. Alloying, which is adding other element(s) to a metal, is one of the major means used to improve the corrosion resistance of the base material. Alloys with varying degrees of corrosion resistance have been developed in response to an ever increasing number of severe service environments. An example of improved corrosion resistance by modifying the chemical composition is the alloying of steels. Carbon and low-alloy steels are less costly but also less corrosion-resistant. At the higher end of the alloying scale are the more costly and significantly more corrosion resistant stainless steels. The corrosion resistance of stainless steels is due to the protective nature of the surface oxide film that forms a barrier between the environment and the alloy. The physical and chemical properties of the oxide film and the service environment determine the corrosion resistance of the alloy. In addition

to alloying, there are metallurgical factors, often referred to as microstructure, such as crystal form, grain size and shape, grain heterogeneity, second phases, impurity inclusions, and residual stress that can influence corrosion.

In addition, mechanical treatments can have effects on the corrosion properties, both positive and negative. Thus, alloying, metallurgical treatments, and mechanical treatments can greatly affect the corrosion resistance of the resulting alloy.

### 11 Factors influencing choice of materials

Mechanical properties required for the materials are primarily governed by the dimensions and strength of material governed by well characteristics. Corrosion allowances are normally not used – as standard sized tubing and components are being used following industry standards. The selected materials should have the lowest life cycle costs (although the emphasis is often on capex). In view of the cost of failure (eg. Offshore vs. onshore), sudden failure (eg. SCC, SSC) owing to corrosion must be designed out by the use of proper corrosion resistant alloys. Table 3 below gives a relative cost of tubing depending on the type and composition of the tubing material.

**Table 3:** Relative cost of production tubing

Tubing grade	Approximate cost relative to Carbon Steel
L80 Carbon Steel	1
L80 1% Cr	1.05
Coated (e.g. phenolic epoxy carbon steel)	2
Fibreglass lined carbon steel tubing	3.5
L80 13 Cr	3
Modified 13Cr Steel (2Mo – 5 Ni)	5
22Cr Duplex	8
25Cr Duplex	10
2550 or 2035	20+
Titanium	10-20

Materials selection and design are of equal importance in achieving the desired performance and life expectancy of components and the oil field equipment.

### 12 Corrosion Control Options

The wide-ranging environmental conditions prevailing in the oil and gas industry necessitates the appropriate and cost-effective materials choice and corrosion control measures. Corrosion can impose a significant cost penalty on the choice of material at the design stage, and its possible occurrence also

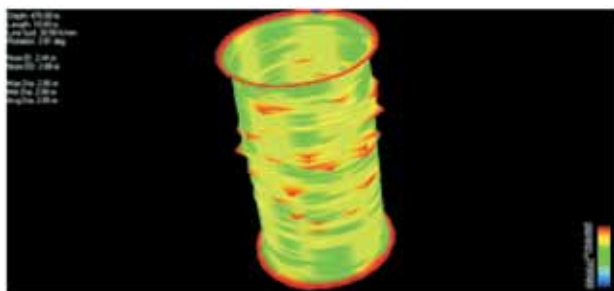


has serious safety and environmental implications. Furthermore, as production conditions tend to become more corrosive, they require a more stringent corrosion management strategy.

Corrosion control may be affected in a number of ways, either singularly or in combination. In the case of oil and gas production, the corrosion control methods include:

- Changing/modifying operational parameters (e.g., flow, temperature, remove water) or system
- Designing efficiently to remove sharp bends, dead legs, crevices, etc.
- Changing/modifying chemistry of the environment (e.g., removing O<sub>2</sub> from any liquid re-injected in the production flow, lower CO<sub>2</sub> partial pressure, scavenge H<sub>2</sub>S, add corrosion inhibitor, increase pH)
- Changing/modifying interfacial conditions of metal (surface modifications or possible implementation of cathodic protection)
- Applying organic coating (e.g., fusion-bonded epoxy, phenolic-modified epoxy) or using a liner (e.g., polypropylene) to isolate metal from corrosive environment
- Using more corrosion-resistant materials (e.g., 13% Cr steel, duplex stainless steels) either in the solid form or as cladding on carbon steel. The relative cost of tubing material is shown in Table 3.
- Using non metallics (e.g., fiber-reinforced plastics)

The value and importance of corrosion monitoring and inspection should not be forgotten and goes hand-in-hand with the above for the most part and certainly where carbon and low-alloy steels are used. Use of state-of-art downhole tools such as "Multifinger Imaging Tool" can help in ascertaining corrosion damage in production strings and casings. These tools however come at a cost and require close interaction with service providers.



**Figure 9:** 3D view of failed production tubing joint extrapolated from MIT log

Note: Red spots indicates total metal loss, Yellow indicates partial metal loss & Green indicates no metal loss

Corrosion inhibitors are also used extensively throughout the oil and gas industry offering, where appropriate, a cost-effective means of corrosion control, particularly for flowlines, pipelines, and trunklines. For the most part they are used to inhibit the reactivity of carbon and low-alloy steels contacting the aqueous phase co-produced with oil and gas.

### 13 Scale Control Options

Scale control has tended to be reactive rather than proactive. There are a variety of methods of removing the effects of scale on production. The first step is to determine which scales are forming and where they are forming. Scale remediation techniques must be quick and non-damaging to the wellbore, tubing, and the reservoir. If the scale is in the wellbore, it can be removed mechanically or dissolved chemically. Selecting the best scale-removal technique for a particular well depends on knowing the type and quantity of scale, its physical composition, and its texture. Mechanical methods are among the most successful methods of scale removal in tubulars.

Inhibitors are typically used after remediation to prevent further scaling. This same technology can be used to do pre-emptive scale control. Scale precipitation can be avoided by chelating the scaling cation. A variety of such chemicals viz. organic/inorganic scale inhibitors are available from many companies.

### 14 Conclusion

Oil field corrosion of carbon and low-alloy steel remains a complex phenomenon and, despite several extensive studies over the past four decades, its mechanism, realistic prediction, and control are in need of being addressed effectively. Its understanding, prediction, and control remain key challenges to sound facilities design, operation, and subsequent integrity assurance of oil & gas assets. The relative merits of each corrosion control approach must be viewed in the context of the application, the required service life, and the severity of the conditions. No hard and fast rules exist in a general sense, and many decisions are made based on past experience and individual preference. Clearly, each action is associated with a cost that highlights the need for good initial design together with a sound understanding of the possible corrosion & scaling processes if cost-effective corrosion & scaling management is to be achieved without compromising health, safety and environment.

## ORGANIZATIONAL DEVELOPMENT

### Changing Landscape – The Organizational Perspective



**Sanjay Gupta**  
Ex C&MD, Engineers India Ltd.

**Change is the only constant.** Acclimatizing to change however, to ensure continuity of sustained growth and creativity remains a challenge. All organizations, essentially, evolve around the cardinal principle of nimbleness, flexibility, **understanding the changing fault lines and consequently**, devising a commensurate process to rise to the challenge. The ones who have taken upon themselves to allow alacrity in the process of adjusting to the immediate and the near future, have emerged as winners. Those who haven't, have struggled. **It is necessary to adopt therefore, a somewhat clairvoyant approach, to evolve tangible and lasting solutions.**

Organizational perspectives and strategies for an outlook are critically dependent upon the nature of activities that a company undertakes or indulges in. For instance, the approach of a production and manufacturing company could be vastly different from a knowledge company. The quality of manpower, the vision of the Management, the market needs, the response to stimuli and the future plans, all may be different and perhaps may have to be aligned accordingly. A constant vigil therefore, over the organizational perspective consequently, is a vital necessity.

As organisations expand, challenges begin to emerge as well. Some of these challenges are subtle. With the Organisation's growth, options and alternatives begin

to evolve to pose challenges to the vision and focus of the company, as well. An important aspect, therefore, is to ensure that the 'Definition of the Company' and its goals remains succinct and undiffused all along. Again this subject is slightly subjective and could vary with the vision of the leadership.

For a knowledge company perhaps, the challenge is even more subtle as the area of operation of a large and substantive knowledge company is vast, be it Technology, Engineering or Project Management etc. Also, the scale of operation and the financial size and ambition linked with the same, are critical parameters, which define the role, approach, ambition and future perspectives of the company.

For us, as an individual, to witness the perspectives of a great knowledge company like EIL, over a period of more than 3.5 decades, was a very intimate and exhilarating experience. A longish time span ranging between 1981 through 2017, wherein we got an opportunity to serve the company, we witnessed several vicissitudes in deciding the fate of the company. From a flagrant high, to some unprecedented lows, the company had its own set of cathartic pangs. The debate, as to what really is the vision of the company kept confronting the company time and again, amidst changing times and requirements.

The earlier phase of the company was beset with

consolidation amidst diversity. To accumulate skills and enhance itself, the company launched itself as a “concept to commissioning” organization in the field of project delivery. Alongside, it expanded its role from implementation of Refineries, Gas Processing, Pipelines to Petrochemicals, Non-Ferrous metallurgy, underground caverns to Infrastructure Projects. As the Projects grow bigger, so did the company and its ambitions. Its technology prowess began to improve, its engineering strength and range enhanced, its commercial acumen evolved and its project Management skills found feet. The company’s manpower grew alongside.

Since the turn of the century, speed, scale, complexity and modes of implementation gained a centre stage. The company began to spread its ambitious wings from conventional consultancy to ambitious Engineering Procurement and Construction / Open Book Estimate (EPC/OBE Modes of Implementation), affecting thereby, the very financial perspective and vision of the company. A 400 to 600 crores company, suddenly began to look like a 2500 to 4000 crores company, with ambitions to scale 5000 to 10000 crores peaks, in the not too distant future.

Soaring ambitions, precedence and efficient operations, laid the footprints of an emerging dream. A dream, encapsulating an outsourcing model with optimal manpower on rolls, a clearer plan for operations, linked with commensurate delegation of power. These were also the times to settle the debate as to what really the company stood for.

Higher financial targets and pertinent and ambitious footprint for future necessarily needs to build on its strengths. For a company like EIL strong on technology and engineering, higher revenues and targets could be possible only with a significant commercial orientation. Project Management, Time & Cost Management and timely Quality Delivery had to be identified as the Apex Orientation of the company, therefore!

The critical productive strength of the company needed re-orientation and re-structuring. Manpower had to be oriented on focussed goals, driven by focussed delivery, minimised efforts for maximised returns, defined roles and responsibilities and with distinct accountability.

The process required both, first consolidation and then redistribution and realignment. Accordingly, skeleton and ill defined outfits with little or no commercial benefit to the company had to be re-

arranged. The critical strength of the company had to be consolidated at one place and then redistributed amongst complete and self sufficient task forces, with clear definition of work, schedule, manpower and accountability. The organization, in a way, was divided into slick verticals and their performance monitored, through well structured and clearly defined MOUs with financial and efficiency accountability. A powerful MIS system with an intent of close and precise manpower distribution and control was devised alongside. The results were obviously fortuitous, as well as highly favourable towards project delivery and therefore, the company stands to benefit at large.

The essence of an organization is invariably led by a motivated and progressive staff. It is therefore essential, that alongwith the financial benefits of the arrangement, the core aspect has to be distribution of opportunity and challenge across the company. The younger force of the company gains the maximum out of the arrangement, through focussed exposure and additionally acquiring the inherent benefits and gains of development of commercial and managerial skills. In a way, therefore, the Task Forces will enable a huge breeding ground for Leadership development. This augurs well for future!

It is true, that perfection means non-existence. And therefore, no system can claim perfection. It is the striving to perfection that is important. An organizational change, which involves restructuring of landmark proportions, will have voids. It takes time to achieve a certain measure of equilibrium. The youngsters need to be patient, the people in general need to overcome the feeling that bringing them out of status-quo is discomfoting. After all, the Company has to find precedence over individual predilections and proclivities.

In a vertical set up, where the focus is on delivery, some senior people suddenly find themselves bereft of motivation. Their role changes from superficial management, to action oriented activity. Their contribution to Business Development, Standardization, HR Management and looking into newer horizontal avenues of Expansion for the Company gains momentum, rather than routine and repetitive work. It is also true, that quite a number of people find themselves wanting both in terms of initiative and experience. Yes, the gainfulness of so many, doing the same repetitive and unproductive works, begins to find limelight. Surely, this is an organizational challenge, but it is one, which must

be contended with, rather than living in an imaginary world of self deception of tangible contributions, where none exists!

This brings to the fore, the central point of how critically a policy is required in any company, to gainfully provide exposure and experience to people and plan their movement, both horizontally and vertically to ensure, that their own growth momentum is sustained and motivation level for productive output is always kept above par. The PSUs, in particular, need to re-visit their manpower policies to dispassionately make a balance between requirement-availability-development and delivery. It is felt more often than not, that organizations desire, not to address the difficult and the purposeful, but instead ponder more on the intangible. This breeds inefficiency, lethargy and mundane, leading to lots of interfaces, infinite coordination efforts, with

pre-dominant impact on the Company's financials.

Organizational perspectives therefore, have to be drawn against a background. The process of asking difficult questions has to begin, the process to implement difficult and inconvenient decisions, has to commence!

For a variety of reasons, the PSUs have found themselves to be thrust with inefficiency and overburdened with enhanced manpower, for catering to several socio-political causes. If the Nation, however, has to evolve and progress as a World Power, the organizations will have to be run optimally and efficiently. Manpower has to be utilized optimally, wherein, notwithstanding the reasons, profitability, efficient delivery, sustained quality and persistent people development remain the core objectives of the Organization!





## FINANCE

### FORMS OF BUSINESS PRESENCE IN INDIA FOR THE DSF BLOCKS



**CA Neetu Vinayek**



**CA Nidhi Agarwal**



**CA Jatin Ravaria**

With an intention to boost the country's energy security, Government of India approved the Marginal Field Policy in September 2015, which was subsequently renamed Discovered Small Field ('DSF') Policy. Under the said Policy the un-monetized small oil/gas discoveries available in the country were sought to be bid out for extraction of oil and natural gas.

The oil fields being bid out have been discovered by India's National Oil Companies – Oil and Natural Gas Corporation Limited and Oil India Limited and are now being offered under this policy which is investor friendly and under an easy to administer revenue sharing contract model.

Currently the second round of bids under the DSF Policy is underway and is expected to close on 18 January 2019.

While the bidder, and eventually the contractor, is required to be a company – whether Indian or foreign – such company can bid singly or in association with other companies, through an unincorporated or incorporated venture. Where a foreign company is awarded a contract it may require an entity in India for its execution.

The appropriate type of entity will need to be determined having regard to the Foreign Direct Investment ('FDI') Policy and the Foreign Exchange Management Act, 1999 ('FEMA'). The type of entity is also relevant for evaluation of the tax implications in the hands of the bidding company.

Typically, a foreign company can consider the following forms of presence in India.

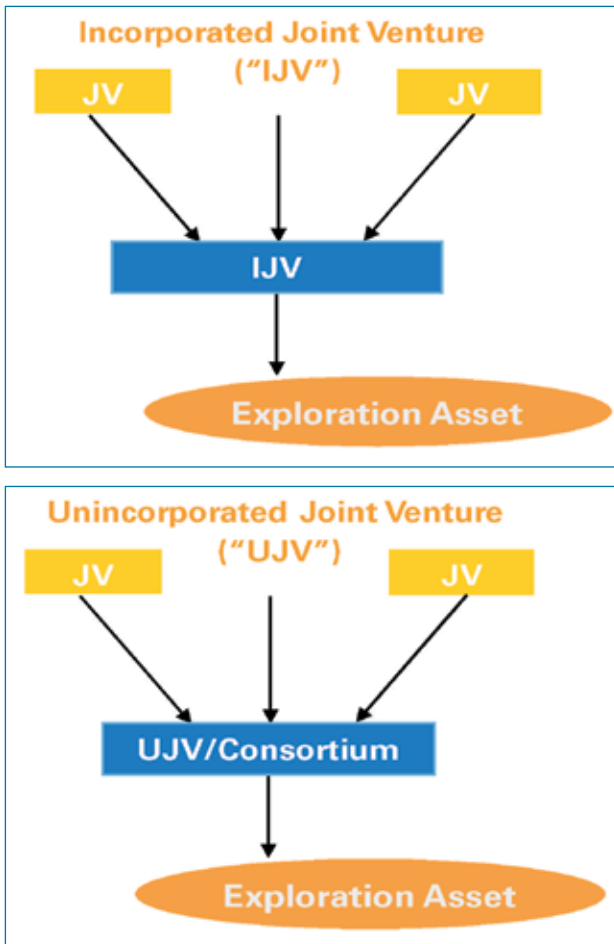


Presence in the form of an incorporated entity, whether a Wholly Owned Subsidiary ('WOS') or Incorporated Joint Venture ('IJV') or Limited Liability Partnership ('LLP'), requires registration of a legal entity which is separate from that of its foreign parent. Whereas a foreign company can carry out activities directly in India through an Unincorporated Joint Venture, Project Office, Branch Office or Liaison Office.

As per the Model Revenue Sharing Contract under the DSF Policy, the contractor can only be a 'company'. Therefore, it may not be practicable to consider an entity in the form of an LLP.

Further, branch offices and liaison offices of foreign companies are permitted to carry out only specific business activities in India and business of extraction and production of mineral oil is not one of them. Accordingly, presence in the form of a branch or liaison office for such a business may also not be feasible.

Where foreign companies have bid jointly with other foreign or Indian companies, investments into an exploration asset can be typically structured using the following modes:



Where the foreign company has bid and been awarded the contract singly, it may consider setting-up a wholly-owned subsidiary ('WOS') in India or executing the contract through its project office set-up in India.

The type of entities that a foreign company may consider setting-up in India once the contract for extraction and production of oil or gas is awarded have been discussed in details.

#### Wholly Owned Subsidiary / Incorporated Joint Venture

Foreign investments in the form of capital in a WOS or IJV formed for the purpose of exploration and production ('E&P') of oil or gas is permitted under the 100 per cent automatic route.

Since WOS or IJV are companies incorporated in India, they will be considered as domestic company for the purpose of taxation in India. Profits of a WOS/IJV are taxable at the rate of 30 per cent (plus applicable surcharge and cess).

Further, profits distributed to shareholders (including foreign shareholders) of the WOS/IJV attract dividend

distribution tax at the rate of 20.56 per cent in the hands of such WOS/IJV and are tax free in the hands of the recipient shareholder.

#### Unincorporated Joint Venture/Consortium

When companies form a consortium to bid for the exploration asset but are not desirous of setting up an incorporated venture in India, the business may be carried out through a UJV, such that each joint venture partner is responsible for its share of profits and expenses as well as scope of work.

However, having regard to the nature of E&P business, the scope of work of the joint venture partners will be the same, with the difference of only share in profits and expenses.

Generally, for the purpose of taxation such UJV's are regarded as Association of Persons ('AOP'). An AOP is recognized as a separate taxable person for the purpose of taxation, irrespective of taxability of members of the AOP, leading at times to tax inefficiencies.

However, vide a specific notification, members of a UJV participating in the E&P business have been discharged from being taxable as an AOP. Each of the joint venture partners are therefore taxable as per their individual status rather than collectively as an AOP.

Thus, where a foreign company forms a consortium along with an Indian company or any other foreign company, each of these companies shall be taxable as such, rather than as AOP. Say for e.g. FCO, a foreign company and ICO an Indian company form a consortium in the 70:30 profit sharing ratio. They are awarded the contract for E&P of a DSF block but are not keen to set up an IJV for carrying out the business.

In such a case, having regard to the specific notification FCO and ICO can claim not to have constituted an AOP in India for tax purposes and therefore the profit share of FCO shall be taxable at 40 per cent (plus applicable surcharge and cess) in FCO's hands and ICO's share at the rate of 30 per cent (plus applicable surcharge and cess) instead of the whole of the profits being taxed in the hands of the AOP.

For execution of the project, and if physical presence of the foreign company is required, it may consider setting up a project office in India.

#### Project Office

Project offices are entities set-up for specific projects. Where the contract under the DSF Policy is awarded by the government to a foreign company, whether singly or jointly with a partner, such company may consider setting-up a project office in India for execution of the contract. Where more than one block are awarded through different contracts, more

than one project offices can be set up, each office being for a specific contract.

In such a case, no prior approval is required to set-up a project office in India. However, the project needs to be either funded directly by inward remittances from the foreign head office or by a bilateral or multilateral International Financing Agency. Further, the activities of the project office are regulated by the

FEMA in terms of intermittent remittance of surplus proceeds, transfer of assets/funds between different project offices, etc. and other day to day matters.

A project office, once set-up, is a virtual projection of a foreign company in India for carrying out the specific contract for which it is formed. Therefore, the profits of the project office is taxable at the rate of 40 per cent, as applicable to foreign companies in India.

**Project Office vs. IJV/WOS – at a glance**

Particulars	IJV/WOS	Project Office
Range of activities	Relatively permanent form of business presence. Subject to FDI Policy and relevant laws, all business activities may be carried on	Foreign companies are permitted to open project offices in India for one-time contracts and short-term assignments
Regulatory approvals	No prior approval required for foreign investment in IJV/WOS in the E&P business	No RBI approval required, subject to certain conditions
Suitability	For having a permanent and a localized form of business presence and local execution capabilities	For one time contracts and short term assignments like procurement contracts, turnkey projects etc.
Taxability status	Taxed as a domestic company.	Taxed as a foreign company
Taxability	Tax resident of India. As such, global income taxable in India	Project office not a tax resident of India but constitutes PE of the foreign company in India. As such, income attributable to the PE taxable in India
Availability of Treaty benefits	Not applicable	Available
Rate of tax	30 per cent (plus applicable surcharge and cess) of taxable income	40 per cent (plus applicable surcharge and cess) of taxable income
Minimum tax rate	Minimum Alternate tax 18.5% (plus applicable surcharge and cess) even in case there are no taxable profits Base for calculation is profit as per books	Minimum Alternate tax 18.5% (plus applicable surcharge and cess) even in case there are no taxable profits Base for calculation is profit as per books
Minimum capital requirements	Minimum capital requirement of Rs. 100,000 for a private limited company	No minimum capital requirement
Tax on dividends	Dividend payout attracts dividend distribution tax of 20.56% Dividends are tax exempt in the hands of the shareholders.	No tax on profit distribution once corporate income tax paid
Start-up costs	Higher start-up costs	Low start-up costs
Regulation on day-to-day operations	No exchange control regulations on domestic day-to-day operations	RBI regulates day-to-day operations
Corporate compliance requirements	More corporate compliance requirements	Fewer corporate compliance requirements
Administrative costs	Higher administrative costs	Lower administrative costs
Applicability of Corporate Social Responsibility ('CSR') provisions	Applicable. 2% of average net profit of three preceding years required to be compulsorily spent for prescribed CSR activities	Applicable. 2% of average net profit of three preceding years required to be compulsorily spent for prescribed CSR activities

A foreign company which has been awarded an exploration asset in the DSF round can carry out the E&P activity either through a project office or through an entity incorporated in India. Though the corporate tax rate applicable to project offices is higher than that applicable to an Indian company, the effective tax rate amounts to 46.03 per cent in case of an Indian IJV/WOS as against 43.60 per cent in case of a project office due to applicability of tax on distributed profits.

Further, on account of operational flexibility available to foreign companies with Indian project offices, practically a project office may be a preferred form of presence for executing the E&P contract.

## OIL & GAS IN MEDIA

### PRIME MINISTER LAYS FOUNDATION STONES OF CITY GAS DISTRIBUTION PROJECTS UNDER THE 9TH CGD BIDDING ROUND; 10TH BIDDING ROUND LAUNCHED

Prime Minister Shri Narendra Modi laid the Foundation Stones of City Gas Distribution (CGD) Projects in 65 Geographical Areas (GAs) in 129



*The Prime Minister, Shri Narendra Modi addressing at the foundation stones laying ceremony of City Gas Distribution Projects in 65 Geographical Areas covering 129 districts under 9th CGD Bidding Round and launch of the 10th CGD Bidding Round for 50 Geographical Areas covering 124 Districts, in New Delhi on November 22, 2018*

Districts under the 9th CGD Bidding Round, remotely from Vigyan Bhawan, New Delhi on 22nd November

2018. During the event, Hon'ble PM also launched 10th CGD Bidding Round in 50 GAs spread over 124 districts in 14 states.

Speaking on the occasion, the Minister of Petroleum and Natural Gas & Skill Development and Entrepreneurship Shri Dharmendra Pradhan said that the Government is working to move towards the gas-based economy. Presently the share of gas in the country's energy mix is just over 6% and the aim is to reach the 15% figure, while the world average is 24%. He said the Prime Minister has assured the world that India will take initiative to bring down its carbon emission level, and a number of initiatives have been taken in this direction like LED bulbs, BS VI fuel, Bio-energy, International Solar Alliance, Pradhan Mantri Ujjawala Yojana, and providing clean piped gas supply to more cities is also a step in this direction. The Minister also mentioned about enhancing the LNG terminal capacity, renegotiating Indo-Qatar Gas deal, and positive Indo-US engagement in this direction. He said that efforts are not only being made to increase the use and supply of Gas, but also to produce gas through agro-wastes and other products and including the same into the CGD network.



*The Prime Minister, Shri Narendra Modi launching the 10th CGD Bidding Round for 50 Geographical Areas covering 124 Districts, in New Delhi on November 22, 2018. The Union Minister for Petroleum & Natural Gas and Skill Development & Entrepreneurship, Shri Dharmendra Pradhan and the Union Minister for Science & Technology, Earth Sciences and Environment, Forest & Climate Change, Dr. Harsh Vardhan are also seen*



Government of India has put thrust to promote the usage of environment friendly clean fuel i.e. natural gas as a fuel/feedstock across the country to move towards a gas based economy. Accordingly, development of CGD networks has been focused to increase the availability of cleaner cooking fuel (i.e. PNG) and transportation fuel (i.e. CNG) to the citizens of the country. The expansion of CGD network will also benefit to industrial and commercial units by ensuring the uninterrupted supply of natural gas.

Till September 2018, 96 cities/Districts in different parts of the country were covered for development of CGD networks. About 46.5 lakh households and 32 lakh CNG vehicles are availing the benefit of clean fuel through existing CGD networks. To boost the expansion of PNG/CNG network, PNGRB launched 9th CGD bidding round in April, 2018 for 86 Geographical Areas (GAs) covering 174 districts

in 22 States/ Union Territories. Subsequent to processing of received bids, grants of authorization have been issued to the successful bidders to develop CGD network for 84 GAs at present. As per commitment made by various entities in this bidding round, around 2 crore PNG (Domestic) connections and 4600 CNG stations are expected to be installed in next 8 years across the country. This has expanded the potential coverage of CGDs to about 50% of country's population spreading over 35% of India's area. Various pre-project activities for these GAs have already commenced and efforts are being made to commence the physical works at the site. In addition, PNGRB has also initiated the process of 10th CGD bidding round for additional 50 new GAs covering 124 districts in 14 States to increase the potential coverage to about 53% of the country's area covering 70% of country's population.

## ISPRL SIGNS MEMORANDUM OF UNDERSTANDING WITH ADNOC TO EXPLORE STORAGE OF CRUDE OIL AT PADUR UNDERGROUND FACILITY IN KARNATAKA

Indian Strategic Petroleum Reserves Ltd (ISPRL) signed a Memorandum of Understanding (MoU) on 12th November 2018 in Abu Dhabi with the Abu Dhabi National Oil Company (ADNOC) to explore the possibility of storing ADNOC crude oil at ISPRL's underground oil storage facility at Padur in Karnataka, which has a 2.5 million tonne capacity. Under the MoU, ADNOC is expected to store crude in compartments at Padur.



The MoU with ISPRL, an Indian government-owned company mandated to store crude oil for emergency needs, follows the arrival, on November 4, of the final shipment of the initial delivery of ADNOC crude to be stored in another ISPRL underground facility at Mangalore, also in Karnataka, which will store 5.86 million barrels of ADNOC crude oil.

The MoU was signed by Abdulla Salem Al Dhaheeri, Director of Marketing, Sales and Trading at ADNOC and Mr. HPS Ahuja CEO & MD ISPRL on the sidelines of the Abu Dhabi International Petroleum Exhibition and Conference (ADIPEC). The signing was witnessed by H.E. Dr Sultan Ahmed Al Jaber, UAE Minister of State and ADNOC Group CEO, and Shri Dharmendra Pradhan, Minister of Petroleum and Natural Gas & Skill Development and Entrepreneurship, Government of India.

On the occasion, H.E. Dr Al Jaber said "India is an important oil market and this agreement underscores the strategic energy partnership between the UAE and India that leverages the UAE and ADNOC's expertise and oil resources. It is our firm hope that we will be able to convert this framework agreement into a new mutually beneficial partnership that will create opportunities for ADNOC to increase deliveries of high quality crude oil to India's expanding energy market and helping India meet its growing energy demand and safeguard its energy security."

ADNOC is the only foreign oil and gas company, so far, to invest by way of crude oil in India's strategic petroleum reserves program.

Shri Dharmendra Pradhan said "This Memorandum of Understanding will allow ISPRL to explore, with ADNOC, opportunities related to the possible storage of ADNOC crude at Padur, which would help

to significantly strengthen the country's strategic petroleum reserves. This agreement reflects the strong bonds of cooperation between India and the UAE and provides a foundation for strengthening and expanding our strategic energy relationship."

ISPRIL has already built 5.33 million tonnes of underground storage capacity at three locations - Visakhapatnam (1.33 million tonnes), Mangalore (1.5 million tonnes) and Padur (2.5 million tonnes), that can meet around 9.5 days of the country's oil

needs as per consumption data of last financial year. The government of India, in June 2018, announced the creation of two new reserves, a 4 million tonnes storage facility at Chandikhol in the eastern state of Odisha and an additional 2.5 million-tonne facility at Padur.

The existing and newly announced strategic reserve facilities put together will provide around 21 days of emergency coverage for India's crude oil requirements.

## ODISHA GOVERNOR LAYS FOUNDATION STONE FOR SECOND GENERATION (2G) ETHANOL BIO-REFINERY IN BARGARH

The foundation stone for Second Generation (2G) Ethanol Bio-refinery of Bharat Petroleum Corporation Limited being set up at Baulasingha village, Bhatli Tehsil, Bargarh district, Odisha was laid by Governor of Odisha Professor Ganeshi Lal on 10th October 2018. Shri Dharmendra Pradhan, Minister of Petroleum and Natural Gas & Skill Development and Entrepreneurship, along with several dignitaries were present on the occasion.



*The Governor of Odisha, Prof. Ganeshi Lal unveiling the plaque to lay the foundation stone for BPCL's Second Generation Ethanol Bio-Refinery, at Bargarh, Odisha on October 10, 2018. The Union Minister for Petroleum & Natural Gas and Skill Development & Entrepreneurship, Shri Dharmendra Pradhan and other dignitaries are also seen*

The Bio-refinery, the first of its kind to be set up, will have a capacity to produce three crore litres of fuel grade Ethanol annually using Rice straw as the feedstock. Ethanol produced from this plant will be blended with Petrol. The cost of the project is around Rs 100 Crore.

Biofuels have assumed importance recently due to the growing energy security needs and environmental concerns. Several countries have

put forth different mechanism and incentives to encourage production and use of biofuels to suit their domestic requirements. India has surplus biomass availability of about 120-160 MMT annually which if converted, has the potential to yield 3000 crore litres of ethanol. The National Biofuel Policy of India 2018 targets 20% Ethanol blending to Petrol by year 2030. However, due to non-availability of Ethanol, the current Ethanol blending in Petrol is about 3 to 4%. Setting up of 2G Ethanol plants will help achieve the target of Ethanol blending in Petrol. The Bargarh Bio-Refinery will utilize about two lakh tonnes of Rice straw annually as feedstock which will be sourced from nearby locations like Bhati, Ambabhona, Sohela, Burla, Lakhanpur, etc.

The Bio-Refineries will contribute to cleaner environment due to usage of waste Rice straw for Ethanol production thereby reducing waste straw burning in fields. Blending of Ethanol in Petrol will reduce Green House Gas emissions as compared to fossil fuels. The plant is based on Zero-liquid discharge plant technology where all water will be recycled back into the plant. In addition to cleaner environment, the project will also help improve the socio-economic conditions of the farmers due to additional income from sale of Rice straw to the bio-refinery. Also, this will generate employment for appx 1200 persons (both direct and indirect) during construction, operation of plant and supply chain management of biomass. This will boost the infrastructural development in the area and overall improvement in livelihood of people. Further, blending of ethanol enhances self-sufficiency of the Nation by reducing oil imports, thereby saving foreign exchange.

## PETROLEUM MINISTER LAUNCHES SATAT INITIATIVE TO PROMOTE COMPRESSED BIO-GAS AS AN ALTERNATIVE, GREEN TRANSPORT FUEL

Shri Dharmendra Pradhan, Union Minister of Petroleum and Natural Gas & Skill Development and Entrepreneurship launched an innovative initiative, with PSU Oil Marketing Companies (OMCs) inviting Expression of Interest (EoI) from potential entrepreneurs to set up Compressed Bio-Gas (CBG) production plants and make available CBG in the market for use in automotive fuels on 1st October 2018. The EoI are available on the websites of the



*The Union Minister for Petroleum & Natural Gas and Skill Development & Entrepreneurship, Shri Dharmendra Pradhan addressing at the launch of the "SATAT" (Sustainable Alternative Towards Affordable Transportation), an initiative of OMCs inviting Expressions of Interest to procure Compressed Bio-Gas (CBG), in New Delhi on October 01, 2018*

OMCs and can be filled from 1st October, 2018 to 31st March, 2019.

Speaking on the occasion, the Petroleum Minister said that the Swachhta fortnight is being observed throughout the country, and this is a significant move in this direction. He said that the Gas is clean and cheaper mode of fuel and the Government has

taken several steps to promote its production and usage. Sh Pradhan said that the Government is keen to set up 5000 CBG plants in next 5 years, and for this purpose, production offtake guarantee is being given for such plants. There will be no restriction on the technology choice and Government is incurring Rs 75,000 Crore capital expenditure for setting up infrastructure for City Gas distribution network. Besides the potential to boost availability of more affordable transport fuels, better use of agricultural residue, cattle dung and municipal solid waste, the CBG plants will provide an additional revenue source to farmers, and 75,000 direct job opportunities and lakhs of indirect jobs. He said that not only OMCs, but also other Gas distribution companies and other concerned departments should also take part in it. The Minister said that currently 42 lakh households are getting PNG supply, and there is a commitment to cover 2 crore households in 300 districts by the suppliers after the implementation of 9th round of CGD bids.

Titled SATAT, the initiative is aimed at providing a Sustainable Alternative Towards Affordable Transportation as a developmental effort that would benefit both vehicle-users as well as farmers and entrepreneurs. This initiative holds great promise for efficient municipal solid waste management and in tackling the problem of polluted urban air due to farm stubble-burning and carbon emissions. Use of CBG will also help bring down dependency on crude oil imports and in realising the Prime Minister's vision of enhancing farmers' income, rural employment and entrepreneurship.



*The Union Minister for Petroleum & Natural Gas and Skill Development & Entrepreneurship, Shri Dharmendra Pradhan launching the "SATAT" (Sustainable Alternative Towards Affordable Transportation), an initiative of OMCs inviting Expressions of Interest to procure Compressed Bio-Gas (CBG), in New Delhi on October 01, 2018. The Secretary Ministry of Petroleum & Natural Gas, Dr. M.M. Kutty and other dignitaries are also seen*

source : PIB



## FIPI EVENTS

### 13th Program on 'Modern Practices in Petroleum Exploration'



*Dr Hari Lal, ED-Head KDMIPE delivering the theme address during the inaugural session*

Federation of Indian Petroleum Industry (FIPI) organized the 13th Program on 'Modern Practices in Petroleum Exploration' in association with Keshava Deva Malviya Institute of Petroleum Exploration (KDMIPE), ONGC from 8th-10th October 2018 at KDMIPE-ONGC, Dehradun.

The objective of organizing this Industry-Academia workshop was to have a two-way interaction between practicing managers and the learned faculty of academic institutions covering various aspects of oil exploration to enrich knowledge on both the sides.

The programme was designed by experts from ONGC for the teaching faculty of Engineering Colleges, Universities, Industry members as well as students from institutes to make them aware of the latest developments in the oil and gas arena. Twelve faculties from various educational institutes, 10 students from UPES & DIT University and 14 practicing Manager from industry attended the programme. The program consisted of two days classroom sessions including Geochemistry, Geophysics, visiting VRC Lab & GEOPIC, and one day visit to geological sites.

The programme was inaugurated by Mr. T.K. Sengupta Director (Exploration & Production) FIPI alongwith Dr. Hari Lal ED & Head Keshava Deva Malviya Institute of Petroleum Exploration (KDMIPE) who gave useful insights to the participants about



*Mr. T.K. Sengupta, Director (E&P) FIPI addressing the participants*

the recent technological advancements in the field of exploration & production and how industry professionals and teaching faculty can mutually benefit by coming together on a single platform like the one being organised by FIPI in association with KDMIPE.

The programme covered a wide range of topics like Futuristic technology in Seismics, Sedimentary Structures and their significance in interpretation of paleo depositional environment, Drilling Challenges in Petroleum Exploration, Modern Trends in Seismic data processing, Advances in Non-Seismic Methods, High Resolution Geochemical tools in Hydrocarbon exploration, Petroleum System Analysis, New vistas in Petroleum Exploration in Frontier Basin, Recent Advances in Well logging, Advances in Remote sensing for hydrocarbon Exploration and Structural Modeling in Hydrocarbon exploration.



*Group Photograph*



## Workshop on “WINNERS: Women in India’s Energy Sector”

Federation of Indian Petroleum Industry (FIPI) along with the Knowledge Partner the Boston Consulting Group (BCG) organised a one-day workshop on “WINNERS: Women in India’s Energy Sector” on October 31, 2018. The workshop was attended by about 300 participants.



*Dr. R. K. Malhotra, Director General, FIPI delivering the welcome address*

Dr. R.K. Malholtra, Director General, FIPI presented welcome note to the attendees in the conference by re-instating PM Narendra Modi’s view that multitasking is a key in managerial world. He said that Indian women have been multitasking since ages and their efforts have contributed a lot in bringing our country at this level especially rural women. Dr. Malhotra added that there’s a large participation of women in sectors such as service and hospitality. However, energy sector remains to be least gender diverse. He recognised social and cultural reservations affecting participation of Indian women in this area. He also mentioned various steps that could help increase the women workforce. Dr. Malhotra on his ending note emphasised that we need to educate women, employ them in dignified jobs and empower them with conducive environment through policy intervention to help them go further and faster.



*Dr. Alka Mittal, Director-HR, ONGC (designate) addressing the participants*

Dr. Alka Mittal, Director-HR, ONGC designate in her address said, pain points such as security, legal protection, biases at workplace if addressed can help increasing gender diversity. Appropriate regulatory framework as has been observed globally help in increasing women workforce. She observed that % of women workforce decline as the seniority goes up and it need intervention to retain women at higher levels. She ended her session with the thought that it is time that we progress by letting go gender related perceptions and normalise it with gender neutral policies and evaluating parameters.



*Dr. Niru Kumar, Gender Diversity Consultant & Trainer speaking on 'Why Gender Diversity & the business case perspective'*

Dr. Niru Kumar, Gender Diversity Consultant & Trainer at Pepsico, Vodafone, E&Y started the session by emphasising on the need to change lens of perception. She spoke about psychological perspective on gender diversity. Dr. Kumar illustrated various psychological aspects and stigmas that impact professional life of women.



*Ms. Nishi Vasudeva, Former CMD, HPCL delivering the theme address on 'Women in Energy Sector'*

Ms. Nishi Vasudeva, Former CMD, HPCL reiterated that women are untapped reservoir for industry and

more so for energy sector. She said it is commendable that women workforce in energy sector has increased and it is heartening to see them on field jobs. She said women need to be encouraged at the young age at entry level. Thus, mentorship should be introduced formally in organisations. She mentioned organisational support is much more crucial and should be imbibed in way of thinking. She said as women professionals we are at par, and it is about taking and grabbing an opportunity in different roles to reach up corporate ladder.



*Panel discussion on 'Role of women in energy sector – Current status / challenges and opportunities'*

Ms. Ulrike von Lonski, Director of Communication, WPC provided a brief background on the status of women workforce with statistics and research findings. Ms. Manjusha Bhatnagar, former Director (HR), Balmer Lawrie & Co. emphasised on need to conduct gender audit and policy interventions to support career. Ms. Shelly Trench, Partner & MD, BCG talked about necessity of facilities and infrastructure for women at workplace. Introducing corporate level gender neutral policies such as sponsorship programme, and parental policies for child care can help support women workforce. Ms. Madhu Srivastava, Head-HR & Admin, Cairn shared Cairn's objective of reaching 33% women workforce by 2020. Sensitisation with gender intelligence workshop, anchoring/sponsorship programmes and maintaining gender diversity in committees and groups within organisations are some of the steps to create a gender diverse workforce. Ms. Arti Mahajan, Dy. Chief Internal Audit Officer, Nayara Energy shared that with success stories and visibility of women at leading role can encourage women to continue with professional growth. She also emphasised that women should make use of women centric policy available at corporate level.



*Dr. Jyoti Kiran, Chairperson, Rajasthan State Finance Commission sharing her empowering thoughts on working women as a professional in a high ranking role during a panel discussion in 'Women who inspire'*

Ms. Seema Bansal, Director, Social Impractice in India, BCG initiated the discussion quoting 'if we think we can, we can'. She said it is imperative that we adapt with learnings from other sectors. Ms. Mala Mayar, MD, Corporate & Institutional Banking, Standard Chartered Bank emphasised on importance of strong diversity and inclusion policies that are helpful in creating diverse workforce. Dr. Jyoti Kiran, Chairperson, Rajasthan State Finance Commission spoke about unrecognised efforts of rural women. She also recommended that need to change financial architecture and policy narrative to create and support diversity and balance it. Dr. Disha Banerjee, Director, Policy Advocacy & Govt. Relation, Smart Power India highlighted need of gender neutral policy and visible success stories of women to help address gender diversity issues. On parting note, panellist Ms. Mayar said that while men are evaluated on potential, women are evaluated on performance, thus it is imperative that perceptions change. Dr.



*Industry stalwarts, discussed career opportunities for women in energy sector & how they can be encouraged to enter & participate as professionals in India's energy ecosystem during panel discussion moderated by Ms Shelly Trench*

Kiran said that women should value their struggle and learn from the journey. Dr. Banerjee encouraged audience to visualise success, identify goals and seek



a mentor to succeed in professional front.

Ms. Trench started the session by elaborating on India's strong presence globally and education system in STEM. Ms. Jain said instead of waiting for women to reach seniority to bring them on the board, the criteria should focus on talent. She added that adaptability, vigility and proactiveness can help women go a long way in their career. Dr. Preeti Jain, Lead for Govt. Relations and Business Development (South Asia), SABIC also recommended that professionals must have a career map visualised and try achieving each of their goal with skills, aspiration and mentoring. Mr. Jay Shah, Head (HR), Nayara Energy said, that women should take a leap in their role with accountability and delivery. Dr. Anshu Nanoti, Sr. Principal Scientist, CSIR-IIP said that gender diverse selection panel in screening processes can help reduce any biasedness in the processes. Dr. Ajay Mathur, Director General, TERI being a member in PM's Council on Climate change elaborated his experience that women entrepreneurs aren't able to get loans as easily from financing agencies. This issue was handled with background guarantee for women. Such kind of strategic thinking is required to empower women. In addition, there's a need for reskilling, need for risk assessment to have established systems be more inclusive.



*Mr. Ranjan Kumar Mohapatra, Director (HR), IOCL addressing the participants*

Mr. Ranjan Kumar Mohapatra, Director (HR), IndianOil in his session highlighted that gender equality is one of the most important aspects of World development agenda. Currently, there's a need to enhance fair governance as females in leadership roles especially in PSU is very low. The framework should be such that it brings a sense of belongingness to diverse groups. Elaborating on various skills women owes, he said there's a dearth of opportunities to women.



*Concluding session moderated by Mr. Anirban Mukherjee, Partner & MD, Energy practice BCG, ended with a panel discussion on policy measures and interventions required for increased role of women in energy sector*

Mr. Anirban Mukherjee, Partner & MD, Energy Practice, BCG set up the context that there's an entire continuum of issues such as parity, sexual harassment at work place, termination on pregnancy, seeking information on pregnancy existing at the workplace. There's a need to set up conducive environment for women to help mothers join back workforce, have a mandate on board representation of women and focus on imparting specific skill development. Mr. Pushkar Kumar, Head HR-Development SBUs, Technology & Projects, Cairn shared that we are at a place, that even though there are women centric policies in place, at times they are not fruitful due to lack of sensitisation amongst the workforce. Hence, to make such policies effective, capacity building for managers and management is required. Ms. Jaskinder Shingwekar, Head B2B & Pricing, Nayara Energy emphasised that a lot needs to be done to make policy framework effective so that it is able to achieve its intent. Ms. Vartika Shukla, ED (Technical) EIL said that we need to break stereotype. It is leadership who has to make conscious efforts to make women centric policies achieve its potential especially in energy sector. Ms. Pegu added that policies are evolving. Barriers are not organisation specific but go beyond organisation to society and country level. It was also discussed by the panel that there's a need to educate, employ the female workforce. With grooming and sponsorship, help them achieve leadership potential.

A quiz was held on Women in Energy and was participated by quite enthusiastically and in huge numbers. The winners of the quiz ranged from professionals to students and were awarded by Mr. M.A. Pathan, Former Chairman, IOCL, Mr. Anil Razdan, Former Secretary – Power and Additional Secretary, Ministry of Petroleum and Natural Gas and Dr. R.K Malhotra, Director General, Federation of Indian Petroleum Industry.



*Mr. M. A. Pathan, Former Chairman, IOCL delivering the valedictory address*

Mr. M.A. Pathan, Former Chairman, IOCL recounted his early days of career and commended that India has evolved in terms of its women workforce. He further said, they are now taking up challenging roles

on field. He adds, a lot is being taken up at policy level such as mandate to have women representation at board. There's Human Resource taskforce of 7 public sector oil and gas companies working on five areas that is source (supply side of talent), develop (leadership development), perform (performance management), affiliate (engagement and aligning different set of employees) and HR excellence (transforming HR functions as process custodian) to retain talent. Adopting best practices from other companies that can benefit employees is also amongst other areas on which the task force is working. Mr. Pathan ended his session by emphasising on gender equality and providing more opportunities for women in India's energy sector.

## FIPI sets up India Pavilion at ADIPEC 2018: Synergy in Energy



*Shri Dharmendra Pradhan, Hon'ble Minister of Petroleum & Natural Gas and Skill Development & Entrepreneurship along with H.E Sultan Ahmed Al Jaber, Minister of State, United Arab Emirates(UAE); the Director-General and CEO of the Abu Dhabi National Oil Company (ADNOC Group) inaugurating the India Pavilion set up by FIPI at ADIPEC*

As entrusted by the Ministry of Petroleum and Natural Gas, Government of India, Federation of Indian Petroleum Industry (FIPI) setup India Pavilion at the Abu Dhabi International Petroleum Exhibition & Conference (ADIPEC) from 12th – 15th November 2018 at Abu Dhabi. ADIPEC is one of the world's largest, most important and influential oil and gas events that brings together industry stakeholders and experts to share knowledge and exchange ideas on future of energy sector. The theme of the pavilion set up by FIPI was "Synergy in Energy" which showcased the Indian oil and gas sector to the international world. An eminent delegation of Indian oil and gas companies encompassing the entire hydrocarbon value chain took part in ADIPEC 2018. In the India Pavilion set up by FIPI, 7 organizations viz. ONGC, IOCL, OIL, HPCL, BPCL, EIL and L&T participated. This was the first time FIPI had taken the lead in setting up such a pavilion at an international level.



*H.E Sultan Ahmed Al Jaber engaged in conversation with Mr. T. K. Sengupta, Director(E&P), FIPI at India Pavilion*

The India Pavilion was formally inaugurated by Shri Dharmendra Pradhan, Hon'ble Minister of Petroleum & Natural Gas and Skill Development & Entrepreneurship and H.E. Sultan Ahmed Al Jaber, Minister of State, UAE & Director General & CEO of ADNOC in an impressive ceremony held on 12th November in the presence of global as well Indian dignitaries from the oil industry. Mr. Navdeep Singh Suri, Ambassador of India to the UAE and other senior government officials from India were also present at the inauguration.



*Senior Industry Leaders with Shri Dharmendra Pradhan, Hon'ble Minister of Petroleum & Natural Gas and Skill Development & Entrepreneurship*



Shri Dharmendra Pradhan, Hon'ble Minister of Petroleum & Natural Gas and Skill Development & Entrepreneurship participated in the Ministerial Session on 'Reshaping Markets: Continuing the Global Energy Discussion' on 12th November along with energy ministers from UAE, Arab Republic of Egypt, Sultanate of Oman and Bolivarian Republic of Venezuela.



*Dr. R.K. Malhotra, Director General, FIPI moderating the panel discussion on India's Growing Energy Demand & Race for Energy Independence included Mr. Shashi Shanker, CMD ONGC and Chairman, FIPI; Mr. Sanjiv Singh, Chairman IOCL and Vice-Chairman FIPI; Mr. M.K. Surana, CMD HPCL; Mr. Subramanian Sarma, CEO & MD, L&T Hydrocarbon Engineering; Mr. P.K. Sharma, Director (Operations), OIL; Mr. Vinod Kumar Mishra, Director (Finance), Petronet LNG as panelists who gave useful insights about their respective areas of business.*

An exclusive India Session, titled 'India's Growing Energy Demand & Race for Energy Independence' was coordinated by FIPI. The panel discussion, which was moderated by Dr. R.K. Malhotra, Director General, FIPI included Mr. Shashi Shanker, CMD ONGC and Chairman, FIPI; Mr. Sanjiv Singh, Chairman IOCL and Co-Chairman FIPI; Mr. M.K. Surana, CMD HPCL; Mr. Subramanian Sarma, CEO & MD, L&T Hydrocarbon Engineering; Mr. P.K. Sharma, Director (Operations), OIL; Mr. Vinod Kumar Mishra, Director (Finance), Petronet LNG as panelists who gave useful insights about their respective areas of business.



*Team FIPI with Shri Dharmendra Pradhan, Hon'ble Minister of Petroleum & Natural Gas and Skill Development & Entrepreneurship*

Besides, Mr. Shashi Shanker, CMD ONGC and Chairman FIPI was one of the speakers in the session on "Fast-tracking offshore and marine long-term growth: adapting to new market conditions alongwith eminent speakers from Kuwait Oil Tanker Company, Steelhead LNG, ADNOC Logistics and Eni.



*FIPI India Pavilion*

Dr. R.K. Malhotra also participated in a panel discussion on "Downstream Diversification & Growth: How can diverse, effective human capital shape the future of the downstream sector" alongwith senior industry professionals from A.T. Kearney, Fluor Energy & Chemicals, Hellenic Petroleum and CEPSA Petroleum Operations.



*FIPI India Pavilion*

During ADIPEC 2018, the Indian Strategic Petroleum Reserves (ISPRL) inked a memorandum of understanding (MoU) with the Abu Dhabi National Oil Company (ADNOC) to explore the possibility of storing ADNOC crude oil at ISPRL's underground oil storage facility at Padur in Karnataka.

## 2nd Program on Realising Hydrocarbon Vision 2030 for North East India

The 2nd one and half day workshop on 'Realising Hydrocarbon Vision 2030 for North East India' was held at The Hotel Polo Towers, Shillong on 29th & 30th November 2018. The program was attended by the participants from various Oil PSUs viz. ONGC, IGGL, IOCL, OIL, NRL, BCPL, HOEC, Cairn and an official from MoEF&CC, Regional Office Shillong, Govt. of India.

### Inaugural Session: -



Lighting of Lamp during the 2nd Program on Realising Hydrocarbon Vision 2030 for North East India



Dr R K Malhotra, Director General FIPI delivering Welcome Address during the Inaugural Session

In the opening address Dr R.K. Malhotra, Director General, FIPI reiterated the key objective of North East Vision Document i.e. Leveraging Hydrocarbon sector for development of the region. He talked about the first programme organised by FIPI in 2017 at Kaziranga after the Vision document was released in 2016. He also mentioned that the second such programme organised by FIPI is to review the progress and capture the challenges & constraints in the region. The major points discussed were the

challenges faced by E&P companies to increase their exploration and production activities, supply of clean fuel, providing pipeline connectivity for LPG, Development of gas grid, generating employment etc.

There were three eminent Speakers in the opening session representing the major oil & gas companies operating in Assam.

1. Shri Utpal Bora, Chairman & Managing Director -Oil India Ltd.
2. Shri S. K. Moitra, Director (Onshore) ONGC
3. Shri S. M. Vaidya, Executive Director IOCL



Inaugural Session: (L to R) Mr T. K. Sengupta, Director (E&P) FIPI, Mr S. K. Moitra, Director (Onshore), ONGC, Mr Utpal Bora, CMD OIL and Mr. S. M. Vaidya, Executive Director (Ops) IOCL

Shri S. M. Vaidya, Executive Director, IOCL in his opening speech reminded about the huge requirement of refinery by 2030 and the need of massive upgradation and use of natural gas in Refinery/power to have an optimised running of the refinery system.

While mentioning the NE vision related to downstream sector he mentioned about the preparedness of refineries like Digboi, NRL, Guwahati & Bongaigaon for upgradation of the old refineries. He also mentioned about the infrastructure upgradation for marketing of products like POL, Petrochemicals etc. He desired augmentation of the oil production by the upstream companies so that IOC can reduce the dependency on imported oil from outside for feeding the refineries located in Assam.

Shri S. K. Moitra, Director (Onshore), ONGC in his opening speech showed his aspiration of doubling the production from 4 MMT to 8 MMT, the target set in the vision document, by drawing analogy between reserve base of Assam & Rajasthan which is 450 MMT



vs 251 MMT respectively. He mentioned that even Rajasthan with a lower reserve base is producing more than double production of Assam. So, there is no doubt that by induction of technology and removing small bottlenecks, North East can achieve the Vision targets.

He also requested his colleagues to convert challenges and constraints into opportunities by changing mind sets. He congratulated HOEC for introducing modular based structure for its onshore gas plant.

He opined that technology implementation can bring all the changes and requested FIPI to take up policy matters like Gas Marketing, pricing, Single window clearances etc.

In his inaugural speech Shri Utpal Bora, Chairman & Managing Director, Oil India Ltd. mentioned that based on the recent reassessment of sedimentary basins reserve all over India, the potential is 42 billion tonnes of O+OEG & only 12 billion tonnes of O+OEG has been discovered. Out of 42 billion tonnes Assam Arakan basin holds 18% of it and out of 12 billion tonnes of discovered reserves A&A basin holds 16%. So there is a huge potential of yet to find reserve (YTF) in NE region.

He brought out the fact that the major challenges are in seismic imaging, lithology, drilling in fold belt areas.

He compared Assam Arakan basin with Cambay Basin and termed it as a Super basin in India. Lot of opportunity exists in developing the basin.

He mentioned that for all clearances onus is also with the operators. There is substantial improvement in local disturbances and all to work together to achieve the objective of vision document 2030.

The following Technical Sessions were held during the above program:-

**Technical Session I** : Exploration-Production & Environment

Speakers : Shri Pankaj Kakoti, CGM (G&R) OIL

Shri P. Elango, Managing Director, HOEC

Shri R.L. Sanga, Conservator of Forests, MoE&CC, Shillong

**Technical Session II** : Refining, Petrochemical and Marketing

Speakers : Shri Santanu Bhar, DGM (TS), IOCL

Shri Rupam Goswami, Chief Manager (TS, E&E) NRL

Shri Prantik Sharma, Chief Manager(Mktg) BCPL

**Technical Session III** : Marketing, Pipeline and Gas

Speakers : Shri Randhir Kumar, DGM (P), IOCL

Dr Deben Buragohain, CEO, IGGL

Shri Jayant Hazarika, GM-Pipelines, OIL



Valedictory Session: (L to R) Dr R K Malhotra, Director General, FIPI, Moderator; Mr P K Sharma, Director (Ops) OIL; Mr A K Bhattacharya, Sr CGM, NRL and Mr S M Vaidya, ED, IOCL were the panellists.

#### Valedictory Session:-

In the Valedictory Session of the program Shri P. K. Sharma, Director (Operations), OIL, Shri S M Vaidya, Executive Director, IOCL and Shri Apurba Kr Bhattacharya, Sr. CGM, NRL participated as panellists. The session was moderated by Dr. R. K. Malhotra, DG, FIPI. The panel speakers gave summary and Key Takeaways from the sessions on Upstream, Midstream and Downstream held during the program. They also presented the overall opportunities available in NE Region, the challenges faced by the industries and the possible remedial measures and viable solutions to make the vision 2030 feasible.

In the end, session was opened to delegates for their views/suggestions/comments etc. & different ideas for improvement.

Shri T.K. Sengupta, Director (E&P) FIPI mentioned that in future programmes representatives from service industry also need to be roped in to share their views as they are the main service providers to make the vision 2030 feasible. He also opined that as ONGC & OIL is working in the same basin, they can jointly work on common areas of technical challenges to achieve a common solution and also share their technical strength & weakness generated in handling the problems.

Dr R K Malhotra, Director General FIPI thanked everyone for their participation and also announced that the next program in the series will be held in September 2019 at Gangtok.

The vote of thanks was given by Shri N.K. Bansal Director (Refinery & Marketing) FIPI.

The program was a grand success.



Group Photograph of the participants of the NE Vision 2030 program



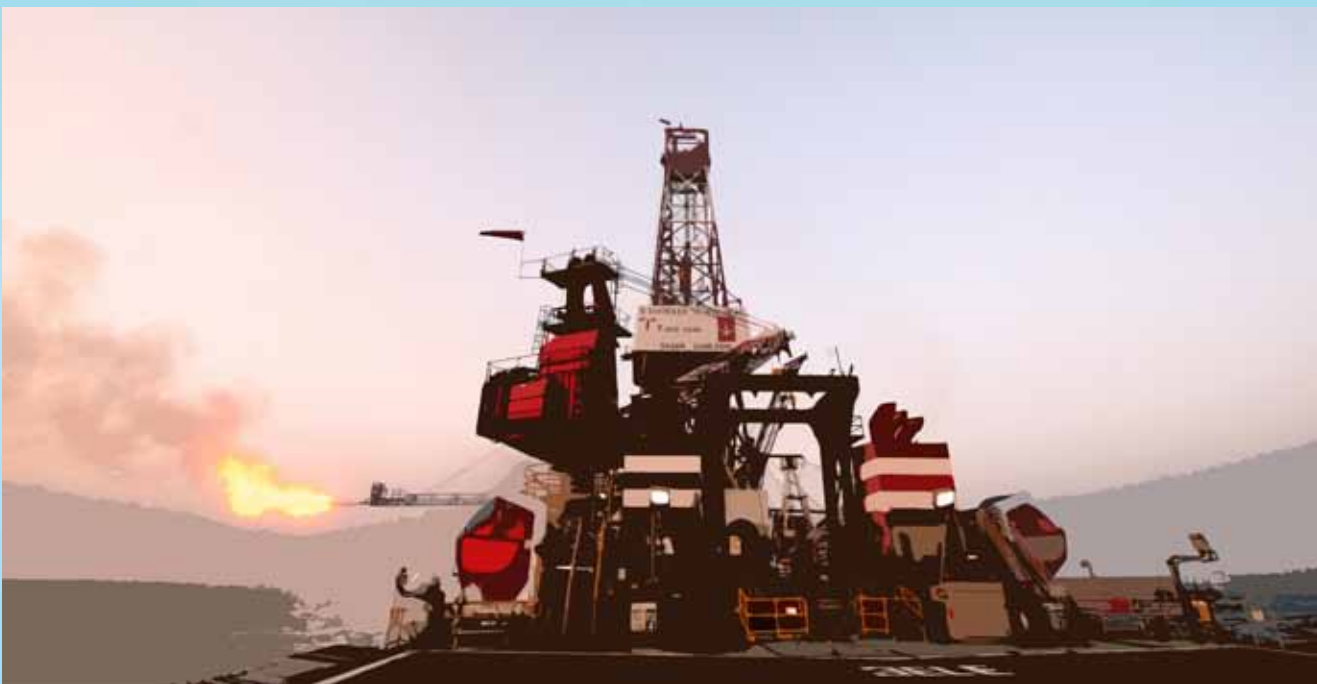
Technical Session I: (L to R) Mr Pankaj Kakoti, CGM (G&R), OIL; Mr P Elango, MD, HOEC were the speakers; Mr P K Sharma, Director (Ops) OIL was Chairing the session, Mr R L Sanga, Conservator of Forests, MOEF & CC, Mr R K Srivastava, GGM (G), ONGC were the speakers



Technical Session 2: (L to R) Mr Santanu Bhar, DGM (TS) IOCL making the presentation; Mr N K Bansal, Director (OR&M) FIPI and Mr S M Vaidya, Executive Director (Ops) IOCL were the Co-chair & Chairman of the session, Mr Prantik Sharma, CM (Mktg) BCPL and Mr Rupam Goswami Chief Manager (TS, E&E) NRL were the speakers



Technical Session 3: (L to R) Mr Jayanta Hazarika GM, Pipelines, OIL making the presentation; Mr Randhir Kumar DGM (P) IOCL and Dr Deben Buragohain, CEO IGGL were the Speakers and Mr A K Bhattacharya Sr. CGM, NRL was Chairing the session







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## NEW APPOINTMENTS

### DR. ALKA MITTAL TAKES OVER AS DIRECTOR (HR), ONGC



**Dr. Alka Mittal**  
Director (HR), ONGC

Dr Alka Mittal has joined as Director (HR) of Oil and Natural Gas Corporation Limited on 27.11.2018. Dr Alka Mittal is a post graduate in Economics, MBA (HRM) and Doctorate in Commerce and Business Studies, she joined ONGC

as a Graduate Trainee in 1985 and brings with her an extremely rich experience spanning over three decades. Dr Mittal is the first woman to hold the charge of a full-time Director in ONGC's history. She is also on the board of ONGC Mangalore Petrochemicals Limited (OMPL) as ONGC nominee Director since August 2015.

Prior to joining as Director (HR), Dr Mittal held the post of Chief Skill Development (CSD) of the Company. In her capacity as CSD she streamlined the activities and brought in uniformity in the working of the Skill Development Centres of ONGC. During this period, she has also implemented the National Apprenticeship Promotion Scheme (NAPS) in

ONGC engaging more than 5000 apprentices across all work centres.

As a senior HR specialist, Dr. Alka Mittal has made rich contributions in various professional forums and bodies. She is an Executive Committee member of NIPM (National Institute of Personnel Management), and was President of Forum for Women in Public Sector (WIPs) Northern Region till recently and heads the Women Development Forum of ONGC.

Dr Mittal has always strived to foster the philosophy of equal opportunity employer and has contributed towards creating an inclusive workplace ecosystem in ONGC.

### NAVIN CHANDRA PANDEY TAKES OVER AS DIRECTOR (T&FS), ONGC

Mr. Navin Chandra Pandey has assumed the charge of Director – Technical and Field Services (T&FS) of Oil and Natural Gas Corporation Ltd (ONGC) on 29 October 2018. Mr. Pandey is a Mechanical Engineering graduate from Motilal Nehru Regional Engineering College, Allahabad (NIT, Allahabad).

Mr. Pandey joined ONGC in 1982. He has a vast experience of over 36 years in the oil and gas industry. He held various key positions in both offshore and onshore portfolio, handling challenging assignments in oil and gas asset management, operations and services. With his excellent project

execution skills, Mr. Pandey has a strong track record in project delivery.

He has a rich experience in offshore deep-waters and shallow waters as well as onshore drilling. As Operations Manager of deep-water areas, he brought about significant performance improvements in deep-water drilling operations. He is credited with successful management of floater drilling rigs Sagar Bhushan and Sagar Vijay. He was conferred CMD's 'Manager of the Year' award in 2007.

As Asset Manager of CBM Asset Bokaro, he catalyzed a turnaround



**N C Pandey**  
Director (T&FS), ONGC

in the Asset operations by fast-tracking development activities in major CBM blocks including land acquisition and synergizing resource mobilization.

## ARUN KUMAR SINGH TAKES OVER AS DIRECTOR (MARKETING), BPCL

Mr. Arun Kumar Singh has taken over as Director (Marketing) of Bharat Petroleum Corporation Ltd. w.e.f 1st October, 2018. He is a Mechanical Engineer with first rank from National Institute of Technology, Patna (Formerly BCE, Patna).

Mr. Arun Kumar Singh has headed various senior positions in BPCL in Marketing - Retail Engg, Operations, Sales, Distribution, LPG, Pipelines,

Supply Chain Optimization and has vast experience over the last 33 years. He also held the position of President (Africa & Australasia) in Bharat PetroResources Ltd., a wholly owned Subsidiary of BPCL, engaged in Exploration and Production of Oil & Gas. Presently, he is Chairman, Indraprastha Gas Limited (IGL) and he is also a Director on the Board of Bharat Gas Resources Ltd, a subsidiary of BPCL.



**A.K. Singh**  
Director (Marketing), BPCL

## N. VIJAYAGOPAL TAKES OVER AS DIRECTOR (FINANCE), BPCL



**N. Vijayagopal**  
Director (Finance), BPCL

Mr. N. Vijayagopal has taken over as Director (Finance) of Bharat Petroleum Corporation Ltd. w.e.f. 17 December 2018. He is a member of the Institutes of Chartered Accountants of India and a Bachelor of Law.

Mr. Vijayagopal has held various senior positions in BPCL including

its upstream and pipeline subsidiary companies and handled various areas of finance, covering Refinery/ Corporate Accounts, Treasury Management, Risk Management, Taxation and Budgeting, Fund Management etc. He has more than 31 years of vast experience in financial management.

## SUNIL BHATIA ASSUMES CHARGE AS DIRECTOR (FINANCE), EIL

Mr. Sunil Bhatia has assumed charge as Director (Finance) of Engineers India Ltd. (EIL) w.e.f. October 18, 2018.

In a career spanning over 32 years, Mr. Bhatia has worked in a wide array of domains including Projects, Finance, Manufacturing & Marketing. He joined NFL in 1986 and worked in various capacities in the Finance Department at the Nangal Unit of NFL upto April, 2000. Thereafter, he served in various capacities at the NFL's Corporate Office

and was made Finance Head in August, 2013. Subsequently, in August, 2015, he was posted as Chief Financial Officer at Ramagundam Fertilizers and Chemicals Limited (RFCL), a Joint venture company of NFL, EIL and FCIL.

Mr. Bhatia is B.Com (Hons.) and M.Com alumni from Panjab University, Chandigarh and FCMA from the Institute of Cost Accountants of India.



**Sunil Bhatia**  
Director (Finance), EIL

## INDRANIL MITTRA TAKES OVER AS DIRECTOR (FINANCE) OF NRL



**Indranil Mittra**  
Director (Finance), NRL

Mr. Indranil Mittra has taken over as Director (Finance) of NRL w.e.f. 12.10.2018. Prior to his joining, he was holding the position of Chief General Manager (Finance) of NRL.

Mr. Mittra - a qualified CA & ICWA and a PG Diploma Holder from S P Jain Institute of Management & Research, Mumbai is a hard core finance man with rich and varied experience spanning around 30 years in the oil industry in diverse areas of Finance such as Corporate Finance, Indirect Tax, Business Finance, including exposure in upstream, etc. Besides, he has garnered rich experience in handling Commercial and ERP (Enterprise Resource Planning) roles. Mr. Mittra

started his professional journey in Price Waterhouse, where he spent a little more than a year before joining Bharat Petroleum Corporation Limited (BPCL) Corporate Finance in December 1989. Thereafter, he has been associated with BPCL and its subsidiaries and has held various key positions therein viz. Head-Retail Finance, Eastern Region; Head-Lubes Finance HQ; VP Finance and Chief Finance Officer(CFO) in Bharat Petro Resources Limited(BPRL); Head of Finance at International Trade, Head of Finance at Retail HQ. He was also involved in implementation of SAP in Bharat Oman Refineries Limited (BORL).

## A.K. TIWARI TAKES OVER AS DIRECTOR (FINANCE), GAIL

Mr. Anjani Kumar Tiwari assumed the Board position in GAIL (India) Ltd. as Director (Finance) on 1st December, 2018. Before assuming charge as Director (Finance), Mr. Tiwari was the Officer on Special Duty & Executive Director (Finance) in GAIL and was head of Finance & Accounts Department.

A Cost Accountant, Mr. Tiwari has more than 35 years of rich experience in the areas of Project Finance, Corporate Finance, Taxation, Treasury, Corporate Accounts, Capital Budgeting, Finalization of EPC Contracts etc. Mr. Tiwari was in charge of Project Finance at GAIL for handling the prestigious project Jagdishpur - Haldia & Bokaro-Dhamra Pipeline, popularly known as Pradhan Mantri Urja Ganga.

He also holds the position of Director in GAIL Gas Ltd., Green Gas Ltd., Ratnagiri Gas and Power Private Ltd., GAIL Gas (USA) Inc., and GAIL Global (USA) LNG LLC. Besides serving a long tenure at the GAIL, Shri Tiwari was posted as CFO, Brahmaputra Cracker and Polymer Limited (BCPL) during its formative years. During his tenure at BCPL, he was actively involved in Project Handling, Project Finance and Contract Finalization for construction of the Project. He is also actively involved in Investor Relations and interactions with Analysts fraternity. He is an active member of the Institute of Cost Accountants of India and The Institute of Directors.



**Anjani Kumar Tiwari**  
Director (Finance), GAIL

An avid reader and poet by nature, he also served in National Thermal Power Corporation (NTPC), Satluj Jal Vidyut Nigam Limited (SJVN) and Cawnpore Chemicals.



## STATISTICS

### INDIA: OIL & GAS

#### DOMESTIC OIL PRODUCTION (MILLION MT)

		2013-14	2014-15	2015-16	2016-17	2017-18 (P)	April-September 2018 (P)	
								% of Total
<b>On Shore</b>	ONGC	6.7	6.1	5.8	5.9	6.0	3.0	34.4
	OIL	3.5	3.4	3.2	3.3	3.4	1.7	19.0
	Pvt./ JV (PSC)	9.4	9.1	8.8	8.4	8.2	4.1	46.5
	<b>Sub Total</b>	<b>19.6</b>	<b>18.5</b>	<b>17.8</b>	<b>17.6</b>	<b>17.5</b>	<b>8.8</b>	100
<b>Off Shore</b>	ONGC	15.5	16.2	16.5	16.3	16.2	7.6	89.1
	OIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Pvt./ JV (PSC)	2.7	2.7	2.5	2.1	1.9	0.9	10.9
	<b>Sub Total</b>	<b>18.2</b>	<b>18.9</b>	<b>19.1</b>	<b>18.4</b>	<b>18.1</b>	<b>8.6</b>	100
<b>Total Domestic Production</b>		37.8	37.5	36.9	36.0	35.7	17.4	100.0
	ONGC	22.3	22.3	22.4	22.2	22.2	10.7	61.4
	OIL	3.5	3.4	3.2	3.3	3.4	1.7	9.7
	Pvt./ JV (PSC)	12.1	11.8	11.3	10.5	10.1	5.0	29.0
<b>Total Domestic Production</b>		<b>37.8</b>	<b>37.5</b>	<b>36.9</b>	<b>36.0</b>	<b>35.7</b>	<b>17.4</b>	100

Source : PIB/PPAC

## REFINING

#### Refining Capacity (Million MT on 1st October 2018)

<b>Indian Oil Corporation Ltd.</b>	
Digboi	0.65
Guwahati	1.00
Koyali	13.70
Barauni	6.00
Haldia	7.50
Mathura	8.00
Panipat	15.00
Bongaigoan	2.35
Paradip	15.00
<b>Total</b>	<b>69.20</b>

<b>Chennai Petroleum Corp. Ltd.</b>	
Chennai	10.50
Narimanam	1.00
<b>Total</b>	<b>11.50</b>

<b>JV Refineries</b>	
DBPC, BORL-Bina	6.00
HMEL,GGSR	11.30
<b>JV Total</b>	<b>17.30</b>

<b>Bharat Petroleum Corp. Ltd.</b>	
Mumbai	12.00
Kochi	15.50
<b>Total</b>	<b>27.50</b>

<b>Hindustan Petroleum Corp. Ltd.</b>	
Mumbai	7.50
Visakhapatnam	8.30
<b>Total</b>	<b>15.80</b>

<b>Other PSU Refineries</b>	
NRL, Numaligarh	3.00
MRPL	15.00
ONGC, Tatipaka	0.10
<b>Total PSU Refineries Capacity</b>	<b>142.10</b>

<b>Private Refineries</b>	
RIL, (DTA) Jamnagar	33.00
RIL, (SEZ), Jamnagar	35.20
Nayara Energy Ltd. , Jamnagar #	20.00
<b>Pvt. Total</b>	<b>88.20</b>

**Total Refining Capacity of India 247.6 (4.95 million barrels per day)**

# Nayara Energy Limited (formerly Essar Oil Limited)

Source : Report of Working Group of MOP&amp;NG on Enhancing Refining Capacity by 2040

## CRUDE PROCESSING (MILLION MT)

PSU Refineries	2013-14	2014-15	2015-16	2016-17	2017-18	April-Sept 2018 (P)
IOCL	53.1	53.6	58.0	65.2	69.0	35.5
HPCL	15.5	16.2	17.2	17.8	18.2	9.3
BPCL	23.0	23.2	24.1	25.3	28.2	15.4
CPCL	10.7	10.7	9.6	10.3	10.8	5.5
MRPL	14.6	14.6	15.5	16.0	16.1	7.7
ONGC (Tatipaka)	0.1	0.05	0.07	0.09	0.08	0.03
NRL	2.6	2.8	2.5	2.7	2.8	1.4
<b>SUB TOTAL</b>	<b>119.6</b>	<b>121.1</b>	<b>127.0</b>	<b>137.3</b>	<b>145.2</b>	<b>74.8</b>

JV Refineries	2013-14	2014-15	2015-16	2016-17	2017-18	April-Sept 2018 (P)
HMEL	9.3	7.3	10.7	10.5	8.8	6.2
BORL	5.4	6.2	6.4	6.4	6.7	2.5
<b>SUB TOTAL</b>	<b>14.7</b>	<b>13.6</b>	<b>17.1</b>	<b>16.9</b>	<b>15.5</b>	<b>8.7</b>

Pvt. Refineries	2013-14	2014-15	2015-16	2016-17	2017-18	April-Sept 2018 (P)
NEL	20.2	20.5	19.1	20.9	20.7	10.5
RIL	68.0	68.1	69.5	70.2	70.5	34.6
<b>SUB TOTAL</b>	<b>88.2</b>	<b>88.6</b>	<b>88.6</b>	<b>91.1</b>	<b>91.2</b>	<b>45.1</b>

	2013-14	2014-15	2015-16	2016-17	2017-18	April-Sept 2018 (P)
<b>All India Crude Processing</b>	<b>222.4</b>	<b>223.3</b>	<b>232.9</b>	<b>245.4</b>	<b>251.9</b>	<b>128.6</b>

Source : PIB Release/PPAC

## CRUDE CAPACITY VS. PROCESSING

	Capacity On 01/10/2018 Million MT	% Share	Crude Processing Million MT April-Sept 2018 (P)	% Share
PSU Ref	142.1	57.4	74.8	58.1
JV. Ref	17.3	7.0	8.7	6.8
Pvt. Ref	88.2	35.6	45.1	35.1
<b>Total</b>	<b>247.6</b>	<b>100</b>	<b>128.6</b>	<b>100</b>

Source: PIB/PPAC

## POL PRODUCTION (Million MT)

	2013-14	2014-15	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
From Refineries	216.4	217.1	227.9	239.2	249.8	128.3
From Fractionators	3.9	3.7	3.4	3.5	4.6	2.4
<b>Total</b>	<b>220.3</b>	<b>220.7</b>	<b>231.2</b>	<b>242.7</b>	<b>254.4</b>	<b>130.8</b>

## DISTILLATE PRODUCTION (Million MT)

	2013-14	2014-15	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
Light Distillates, MMT	62.7	63.2	67.1	71.0	74.7	37.7
Middle Distillates , MMT	112.8	113.4	118.3	122.5	127.5	65.0
Total Distillates, MMT	175.5	176.6	185.4	193.5	202.2	102.7
<b>% Distillates Production on Crude Processing</b>	<b>78.9</b>	<b>79.1</b>	<b>79.6</b>	<b>78.9</b>	<b>80.3</b>	<b>79.9</b>

Source: PIB/PPAC

## PETROLEUM PRICING

### OIL IMPORT - VOLUME AND VALUE

	2013-14	2014-15	2015-16	2016-17 (P)	2017-18 (P)	April-Sept 2018 (P)
Quantity, Million Mt	189.2	189.4	202.9	213.9	220.4	112.9
Value, INR ₹000 cr.	864.9	687.4	416.6	470.6	566.0	404.0
Value, USD Billion	143.0	112.7	64.0	70.2	87.8	58.6
Average conversion Rate, INR per USD (Calculated)	60.5	61.0	65.1	67.0	64.5	69.0

### OIL IMPORT - PRICE USD / BARREL

	2013-14	2014-15	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
Brent (Low Sulphur - LS- marker) (a)	107.5	85.4	47.5	48.7	57.5	74.7
Dubai (b)	104.6	83.8	45.6	47.0	55.8	73.1
Low sulphur-High sulphur differential (a-b)	2.9	1.7	1.8	1.7	1.6	1.6
Indian Crude Basket (ICB)	105.52	84.16	46.17	47.56	56.43	73.68
ICB High Sulphur share %	69.90	72.04	72.28	71.03	72.38	74.77
ICB Low Sulphur share %	30.10	27.96	27.72	28.97	27.62	25.23



## INTERNATIONAL PETROLEUM PRODUCTS PRICES EX SINGAPORE, (\$/bbl.)

	2013-14	2014-15	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
Gasoline	114.3	95.5	61.7	58.1	67.8	82.7
Naphtha	100.2	82.2	48.5	47.1	56.3	72.0
Kero / Jet	121.2	66.6	58.2	58.4	69.2	88.1
Gas Oil (0.05% S)	122.0	99.4	57.6	58.9	69.8	88.2
Dubai crude	104.6	83.8	45.6	47.0	55.8	73.1
Indian crude basket	105.5	84.2	46.2	47.6	56.4	73.7

## CRACKS SPREADS (\$/ BBL.)

	2013-14	2014-15	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
<b>Gasoline crack</b>						
Dubai crude based	9.7	11.7	16.1	11.1	12.0	9.6
Indian crude basket	8.8	11.3	15.6	10.6	11.4	9.0
<b>Diesel crack</b>						
Dubai crude based	17.4	15.7	12.0	12.0	13.9	15.1
Indian crude basket	16.5	15.3	11.5	11.4	13.4	14.5

## DOMESTIC GAS PRICE (\$/MMBTU)

Period	Domestic Gas Price (GCV Basis)	Price Cap for Deepwater, High temp Hingh Pressure Areas
November 14 - March 15	5.05	-
April 15 - September 15	4.66	-
October 15 - March 16	3.82	-
April 16 - September 16	3.06	6.61
October 16 - March 17	2.50	5.30
April 17- September 17	2.48	5.56
October 17 - March 18	2.89	6.30
April 18 - September 18	3.06	6.78
October 18 - March 19	3.36	7.67

Source: PIB/PPAC/OPEC

## GAS PRODUCTION

Qty in MMSCM

	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
ONGC	21177	22088	23429	12018
Oil India	2838	2937	2882	1366
Private/ Joint Ventures	8235	6872	6338	2871
<b>Total</b>	<b>32250</b>	<b>31897</b>	<b>32649</b>	<b>16255</b>
Onshore	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
Natural Gas	8845	9294	9904	4999
CBM	393	565	735	353
<b>Sub Total</b>	<b>9237</b>	<b>9858</b>	<b>10639</b>	<b>5352</b>
Offshore	23012	22038	22011	10903
<b>Sub Total</b>	<b>23012</b>	<b>22038</b>	<b>22011</b>	<b>10903</b>
<b>Total</b>	<b>32249</b>	<b>31897</b>	<b>32649</b>	<b>16255</b>
<b>(-) Flare loss</b>	1120	1049	918	394
<b>Net Production</b>	<b>31129</b>	<b>30848</b>	<b>31731</b>	<b>15861</b>
	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
Net Production	31129	30848	31731	15861
Own Consumption	5822	5857	5806	2985
Availability	25307	24991	25925	12876

## AVAILABILITY FOR SALE

	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
ONGC	16076	17059	18553	9534
Oil India	2314	2412	2365	1108
Private/ Joint Ventures	6917	5520	5007	2234
<b>Total</b>	<b>25307</b>	<b>24991</b>	<b>25925</b>	<b>12876</b>

## CONSUMPTION (EXCLUDING OWN CONSUMPTION)

	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
Total Consumption	46695	49677	52253	26944
Availability for sale	25307	24991	25925	12876
LNG Import	21388	24686	26328	14068

## GAS - IMPORT DEPENDENCY

	2015-16	2016-17	2017-18 (P)	April-Sept 2018 (P)
Net Gas Production	31129	30848	31731	15861
LNG Imports	21388	24686	26328	14068
Import Dependency (%)	40.7	44.5	45.3	47.0
<b>Total Gas Consumption*</b>	<b>52517</b>	<b>55534</b>	<b>58059</b>	<b>29929</b>

\* Includes Own Consumption

Source: PIB/PPAC

## SECTOR WISE DEMAND AND COMSUMPTION OF NATURAL GAS

Qty in MMSCM

		2016-17 (P)	2017-18 (P)	2018-19 (P)						
				April	May	June	July	August	September	Total
Fertilizer	R-LNG	7592	7781	660	745	697	729	714	696	4241
	Domestic Gas	7802	6862	516	503	570	527	551	520	3187
Power	R-LNG	2410	2645	235	286	316	236	186	245	1504
	Domestic Gas	9131	9375	814	780	693	763	760	758	4568
City Gas	R-LNG	3030	3881	329	349	331	356	338	317	2020
	Domestic Gas	4276	4659	405	415	404	429	439	427	2519
Refinery Petro-chemical Others	R-LNG	12440	12439	1035	1128	1117	1148	1170	1142	6740
	Domestic Gas	3978	4872	417	394	393	399	427	411	2441

Source:PPAC

## FEDERATION OF INDIAN PETROLEUM INDUSTRY

### CORE PURPOSE STATEMENT

To be the credible voice of Indian hydrocarbon industry enabling its sustained growth and global competitiveness.

### SHARED VISION

For more details  
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- A progressive and credible energy advisory body stimulating growth of Indian hydrocarbon sector with global linkages.
- A healthy and strong interface with Government, legislative agencies and regulatory bodies.
- Create value for stakeholders in all our actions.
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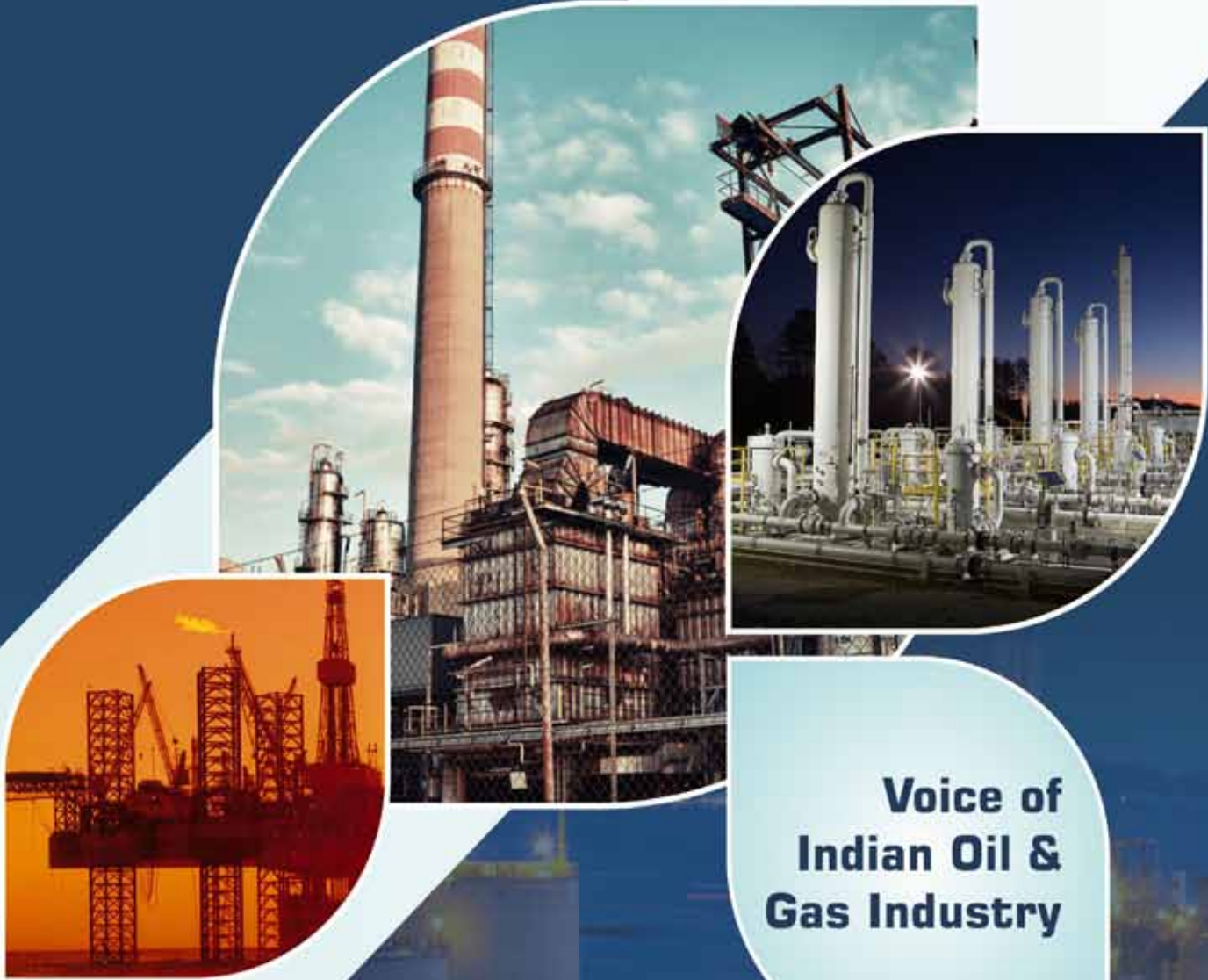
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