

FIPI



The Journal of Federation of Indian Petroleum Industry

Voice of Indian Oil & Gas Industry

Jan-March 2017 | Vol.16 Issue 1



About Us

In the oil industry, we had two societies namely Petrotech Society and Petroleum Federation of India (PetroFed).

The Petrotech Society was conceptualized in 1993 and its biennial International Oil & Gas Conference & Exhibition, Petrotech was launched in 1995. Petrotech Society was holding regular national/international conferences, seminars and study tours in India and abroad for regular exchange of information for the benefit of oil & gas industry.

The Petroleum Federation of India (PetroFed) was registered in 2002 with a wide range of activities which include lectures, workshops and seminars to promote the interest of the petroleum industry besides maintaining a healthy and strong interface with Government, legislative agencies and regulatory bodies.

In an effort to give impetus to the Indian Hydrocarbon sector, a major historical announcement was made on 7 December, 2016 about the amalgamation of two important entities in the sector namely Petroleum Federation of India (PetroFed) and Petrotech Society.

The new body named 'Federation of Indian Petroleum Industry' (FIPI) is expected to be better placed to serve as a strong facilitator of continuous dialogue between various stakeholders of the upstream, midstream & downstream sectors of the Indian petroleum industry including global suppliers, technology providers, service providers, academic entities and relevant agencies for protecting and upholding the interest of Indian petroleum industry.

The significant announcement was made by Sh. D.K. Sarraf, Chairman & Managing Director, ONGC in the presence of Sh. Arun Jaitley, Hon'ble Union Minister of Finance and Sh. Dharmendra Pradhan, Union Minister of Petroleum and Natural Gas (IC) amongst other dignitaries during the Valedictory Session of Petrotech 2016 Conference.

Both the entities i.e PetroFed & Petrotech Society had several commonalities in their stated objectives and activities. Many corporate members as well as members of the Governing Council of the two societies were common. Therefore, the Governing Councils and General Bodies of both the societies thought that it would be prudent, efficient and effective to amalgamate these two societies into a single entity which would better represent the Indian Petroleum Industry.

The amalgamated Federation would multiply their current capabilities, reduce the overlapping activities and bring to the forefront a synergized society which would take India's oil & gas sector to newer heights of professional excellence.



Governing Council

Designation	Name/Organisation
Chairman	Shri D. K. Sarraf CMD Oil and Natural Gas Corporation Limited
Co-Chairman	Shri B. Ashok Chairman Indian Oil Corporation Limited
Vice-Chairman	Shri P. M. S. Prasad ED & Member of the Board Reliance Industries Limited
Vice-Chairman	Shri L. K. Gupta MD & CEO Essar Oil Limited
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Member	Shri M. K. Surana CMD Hindustan Petroleum Corporation Limited
Member	Shri D. Rajkumar CMD Bharat Petroleum Corporation Limited
Member	Shri Utpal Bora CMD Oil India Limited
Member	Shri Sudhir Mathur Acting CEO Cairn India Limited
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Member	Shri Prabh Das MD & CEO HPCL-Mittal Energy Limited
Member	Shri Nitin Prasad Country Chair Shell Companies in India
Member	Shri Sashi Mukundan Regional President and Head of Country, India BP Group
Member	Shri Prabhat Singh Managing Director & CEO Petronet LNG Ltd.



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2	Adani Gas Ltd.	Mr. Rajeev Sharma	CEO
3	Adani Welspun Exploration Ltd.	Mr. Arvind Hareendran	CEO
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5	BG India	Mr. Shaleen Sharma	President & Managing Director
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32	Gulf Publishing Company	Mr. John T. Royall	President & CEO
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42	IOT Infrastructure & Energy Services Ltd.	Mr. Vivek Venkatachalam	Managing Director
43	Jagson International Ltd.	Mr. Pradeep Gupta	Executive Director
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66	Rajiv Gandhi Institute of Petroleum Technology	Prof. P. K. Bhattacharya	Director
67	Reliance Industries Ltd.	Mr. Mukesh D. Ambani	Chairman & Managing Director

S.No.	Organisation	Name	Designation
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70	Schlumberger Asia Services Ltd.	Mr. Sujit Kumar	Vice President & Managing Director
71	Shell Companies in India	Mr. Nitin Prasad	Country Chair
72	Shiv-Vani	Mr. Prem Singhee	Chairman & Managing Director
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83	World LPG Association	Mr. James Rockall	CEO & Managing Director



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From the Desk of the Director General



This is the first issue of our quarterly journal post-merger of PetroFed into Petrotech Society. The new entity called "Federation of Indian Petroleum Industry" (FIPI) has been registered under the Societies Registration Act XXI of 1860 on 2nd December, 2016 and the members of erstwhile Petrotech & PetroFed are automatically the members of FIPI. The activities of erstwhile Petrotech & PetroFed will be carried forward by FIPI and it will continue to deliberate on policy issues and share concerns of its members (if any) with various government departments & regulatory agencies. FIPI will take up more studies & consultancy projects on the important subjects and will also continue to organise seminars, workshops and brainstorming sessions to deliberate on various issues to suggest the way forward. FIPI further propose to increase industry and academia interactions to promote research and innovative developments in the hydrocarbon sector.

The beginning of the year 2017 saw many new proposals of the Government which will help accelerate the growth of Oil and Gas Industry in India. In the proposed budget for the financial year 2017-18, one of the key initiatives included reduction of basic customs duty on LNG from 5% to 2.5% which will help us to move towards our mission of gas based economy. Further, Government announced setting up of the Strategic Crude Oil Reserves at two more locations,

namely Chandikhole in Odisha and Bikaner in Rajasthan which are crucial for energy security in case of any supply disruptions.

This year's budget also had a major announcement related to the integration of the state run oil companies which is certainly a game changing move to create global behemoth(s) that would compete with some of the largest global oil and gas players. It is to be seen that whether it would be one entity or multiple entities which would be formed. We will have to wait till the integration process is rolled out and further announcement is made.

Continuing with the tradition of organising an annual event every year, post announcement of Union Budget, FIPI conducted two workshops for budget analysis and its impact on the oil and gas sector in knowledge partnership with Deloitte on 2nd & 3rd February at New Delhi and Mumbai respectively.

At this time, one of the major issue which is of serious concern to the oil & gas sector is the exclusion of Crude Oil, Natural Gas, Motor Spirit, ATF and HSD from the GST which will leave our companies with stranded taxes to the tune of around Rs. 22,000 crores. FIPI has been vigorously taking up this issue with the Government at various levels requesting them to address the issue suitably. In the month of March, a presentation was also made to Hon'ble Finance Minister Shri Arun Jaitley at Mumbai where he appreciated our concerns and indicated that we need to persuade the states who are not agreeing for the same in the GST Council. I am glad that our Hon'ble Minister Shri Dharmendra Pradhan has indicated that he is hopeful to make the states agree by making them realize that they would not be at a loss in GST regime. We at FIPI are vigorously pursuing and having meetings with the Government officials, i.e. Revenue Secretary, GST Commissioner and Convener of the Working Group for GST besides seeking support of the Ministry of Petroleum & Natural Gas.

Recent important landmarks for our sector included the supply of cleaner transportation fuel when the Hon'ble Minister Shri Dharmendra Pradhan formally launched BS IV fuel from Bhubaneswar on 1st April to mark the supply of such environment friendly fuels across the country. Shri Sanjiv Singh, Director (Refineries) of IOCL has even offered supply of BS VI fuel for testing to vehicle manufacturers in order to prepare for BS VI implementation in April 2020.

Last month, the contracts of the Discovered Small Field (DSF) Bid Round 2016 were also awarded to successful bidders. The peak production from the awarded fields is expected to be around 15000 BOPD of oil and 2 MMSCMD of gas over the economic life. The estimated total revenue would be approximately Rs. 46,400 crores, of which royalty collection and Government's revenue share is expected to be around Rs. 5,000 crores and Rs. 9,300 crores, respectively. It is also estimated that employment for 37,500 persons would be generated through these awarded fields.

Recently, the Cabinet Committee on Economic Affairs gave its approval for marketing and pricing freedom to the Coal Bed Methane (CBM) companies to sell the CBM at Arm's Length Price in the domestic market. It has been mentioned that a transparent and competitive process has to be adopted for sale of CBM with an objective to realize the best possible price of gas with no restrictive commercial practices. This is a welcome move towards gas price freedom.

Oil Marketing Companies (OMCs) have released 3.25 crore new LPG connections during FY 2016-17. This is the highest ever number of LPG connections released in a financial year so far in the LPG history of the country. The connections released included two crore connections released under the Ujjwala scheme which was launched on 1st May 2016 by the Hon'ble Prime Minister. This increase in connections has resulted in a jump in the LPG coverage and

the national LPG coverage is now estimated to be 72.8% with 19.88 crore active consumers.

An agreement between Indian Strategic Petroleum Reserve Ltd. (ISPR) and ADNOC (Abu Dhabi National Oil Corp.) was signed in the presence of His Highness Sheikh Mohamed Bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Hon'ble Prime Minister of India, Shri Narendra Modi on 25th January, 2017 to fill Mangalore SPR facility with 5.86 million barrels of crude (0.81 MMT approx.).

The agreement will facilitate India to have the first right to use the stored oil in case of an emergency while ADNOC will use it for trading purposes.

On 8th March, 2017, Hon'ble Prime Minister of India dedicated ONGC Petro Additions Ltd. (OPaL) to the nation. OPaL is a joint venture company promoted by ONGC, GAIL and GSPC having an investment of Rs. 30,000 crores and the single largest petrochemical plant in India with an annual production capacity of 14 lakh tonnes of polymers and five lakh tonnes of chemicals like benzene.

Another highlight for this quarter was FIPI's 'R&D' Conclave on the theme

"Ideas are Here" which was held during February 16-18, 2017 at Mussoorie.

The conclave was inaugurated by eminent scientist Dr. Anil Kakodkar, Chairman, Scientific Advisory Committee (SAC) of MoP&NG. During the conclave many eminent speakers from various organizations from India and abroad participated and made presentations. A panel discussion on issues related to Policy, Investments and Commercialization, etc. was also held. The conclave covered various on-going R&D activities in the oil & gas industry (Upstream, Midstream & Downstream) as well as emerging technologies and alternative energy sources. About 100 delegates from various oil and gas companies participated in the conclave.

FIPI also organised a workshop on the "EOR- Expanding Horizons: Creating Values" to deliberate on the developments of Enhanced Oil Recovery (EOR) activities across globe and its potential in India. Although, Government of India has taken a number of policy initiatives to enhance Exploration & Production activities, still it is important for India to focus on mature fields to expeditiously enhance production and arrest decline in

production. Shri Dharmendra Pradhan, Hon'ble Minister of State (I/C) for Petroleum & Natural Gas, who graced the occasion during the concluding session, announced that Government will come out with a new progressive EOR policy which may include some incentives.

In this first edition of our journal in the name of FIPI, we have included articles on technical, managerial and commercial topics and I would like to thank all the organizations, freelancers and academic/educational institutes who have contributed towards this journal. We are also carrying a special feature in this edition which includes view point of the senior executives of oil & gas sector on the "Future of Oil & Gas".

I am sure you will enjoy reading this issue of FIPI's journal.

Dr. R. K. Malhotra
Director General

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

- » 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.
- » Enablers of collaborative research and technology adoption in the domain of energy and environment.
- » A vibrant, adaptive and trustworthy team of professionals with domain expertise.
- » A financially self-sustaining, not-for-profit organization.

For more details, kindly visit our website: www.fipi.org.in

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Special feature on 'Future of Oil & Gas Sector in India



Mr. D. K. Sarraf

CMD

Oil and Natural Gas Corporation Limited

“The Indian growth story is one of the few rare ones that has eluded uncertainty during a period of increased volatility in global energy markets and continuing sluggishness in the international economic landscape. India has emerged as the fastest growing economy and is expected to remain so for the next few years. Leading international institutions and economists have rightly conferred on India the distinction of being 'one of the few bright spots' at the global level.

In this context, considering the country's per capita energy consumption, accessibility and availability of energy emerges as a key determinant for India to pursue its development goals aligning with the trend of robust growth.

Despite the increasing focus on renewable energy initiatives, India's energy basket largely remains dependent on conventional fossil fuels. During FY'16, our crude oil consumption grew by more than 10 percent over the previous year (FY'15). Although, it was partly fuelled by the drop in global crude prices, but any conspicuous drop in consumption is not expected even if prices firm up. FY'17 numbers are a testimony to this view point. IEA predicts a robust rise in our oil consumption – expected to touch 10 million bopd mark by 2040 from current levels of 4 million bopd. Oil therefore is expected to remain an integral part of our energy mix in the years to come.

Natural Gas which today accounts for just about 7 percent of the country's energy basket, is expected to play an increasingly significant role in catering to the domestic energy requirements, especially in the aftermath of COP 21 agreement in Paris during 2015. Natural Gas is the cleanest of the conventional fossil fuels and its resource base is also substantial in India, supported by the promising deep-water gas finds in the country's east coast. Endeavours to increase share of gas in energy mix to 15 percent in the next few years would be important in the national context. It will foster infrastructure development such as pipeline networks and LNG regasification facilities as well as motivate domestic oil and gas operators to step up exploratory and developmental activities.

The need for more and more of oil and gas is becoming greater than ever. This is not merely on account of anticipated rise in India's domestic fuel demand but also due to the country's reliance on high volume of hydrocarbon imports which jeopardizes domestic energy security. In this scenario, role of ONGC as an upstream oil and gas company assumes critical importance. As the country's flagship energy explorer and producer, accounting for nearly 70 percent of domestic oil and gas supplies, the company views Indian oil and gas market with significant opportunities for growth. India has emerged as the world's largest demand hub for the foreseeable future and the prospects of E&P activity in our sedimentary basins also appear quite promising.

One of the key reasons for the positive outlook is the fact that basins in the country are still relatively under-explored and offers an opportunity to step up exploratory efforts. On behalf of MOPNG, ONGC is leading the National Seismic Program to assess the hydrocarbon potential of unapprised sedimentary basins. Out of total 48,243 LKM of 2D seismic Acquisition, Processing & Interpretation (API), ONGC would be carrying out 40835 LKM, in different on land situated in 18 states/ Union Territory while remaining would be carried out by Oil India.

Discovery in Kutch Offshore is emerging with significant potential. Aggressive drilling campaign targeting Tertiary & Mesozoic play presently underway to augment reserve base aims to bring this new basin on production in a 2-3 year time frame.

The Hon'ble Prime Minister's vision to achieve a 10 percent reduction in imports by 2022 will be the primary driver of planning and activity in the domestic hydrocarbon sector in the medium term. An ambitious goal, but achievable. Government in the last 2-3 years has been facilitating a conducive business and operating environment in the oil and gas sector. A progressive policy framework has been put in place – striking a right balance between regulatory requirements and fiscal incentives. This is expected to foster an enhanced level of activity and long-term capital commitment. The newly launched HELP regime that replaces the erstwhile cost-recovery based NELP system with a revenue-sharing model is one such major reform, among several others. At a time of low oil and gas prices that have hampered development of new greenfield projects globally, the decision to allow premium prices for gas from difficult areas (Deep/Ultradeepwater/HP-HTetc) and the recent announcement of pricing and marketing freedom for CBM, is a statement of the Government's intent for rapid monetization of domestic gas reserves.

Finally, the Indian oil and gas companies, supported by a favourable and remunerative environment, are also working proactively to support the nation's growth vision. In the past three years, including FY'17, ONGC has approved projects worth over Rs 82,000 Crore which are expected to produce incremental oil and gas production close to 190MMtoe. This has come at a time when global energy operators are either deferring projects or imposing significant cutbacks on investment. The Indian oil and gas industry remains steadfastly committed in taking the country's energy story forward.

ONGC is determined to promptly develop the large reserves in the deepwaters off the country's eastern coast. Cluster 2 fields in KG-DWN-98/2 block is a pointer to that – with a capital outlay of over USD 5 bn. It is the single largest investment ever in the history of the company and is expected to significantly change the country's energy fortune. At its peak, the project is estimated to produce 16.3 MMSCMD of gas and 77,000 bpd of oil. ONGC is expediting the development of the entire Eastern Offshore resources in the KG-DWN-98/2 block including development of the Ultra-deepwater UD-1 block which, upon implementation, is expected to more than double the output from KG basin block. Development of the Eastern offshore is a big step in the direction of achieving greater energy security vision as articulated by the Hon'ble Prime Minister of India.





“India today is the fastest growing major economy in the world. And the Indian oil & gas sector is gearing to fuel this unprecedented growth.

As one of the largest importers of oil, India has benefitted from the prevailing low crude oil price regime in the global markets. The prices of major petroleum products have been deregulated and LPG subsidy for domestic consumption has been innovatively streamlined and rationalised to benefit genuine customers. Through the Pradhan Mantri Ujwala Yojana, 50 million deposit-free LPG gas connections are being released to women folk from below poverty line (BPL) households in three years, bringing them into the clean energy fold. Of these, over 19 million BPL connections have already been released till date.

India is self-sufficient in refining as of now, but in view of the projected high demand for petroleum products till the year 2040, there is a need to raise the current refining capacity through both brownfield and greenfield routes. In a major development, IndianOil, Bharat Petroleum and Hindustan Petroleum, the three oil PSUs in the downstream sector, are collaborating to build a 60 million tonnes per annum refinery-cum-petrochemicals complex on India's west coast.

Natural gas across its value chain is the most clean & efficient of fossil fuels and the Government is committed to ushering in a gas-based economy. With large gas import terminals, additional cross-country gas pipeline infrastructure of 15,000 km and scores of piped natural gas and city gas networks underway, many user segments are going to benefit from this in a big way.

The upstream sector has also been overhauled and the new investment-friendly HELP policy is in place to give a fillip to domestic exploration efforts. The 67 small discovered fields and the huge still to be proven Oil & Gas reserves of India are attracting investors to join the efforts in tapping India's considerable hydrocarbons potential, especially in view of our goal to reduce oil imports by 10% in the next five years.

As I see it, the major imperatives of the Oil & Gas sector are: Inclusive growth of all sections of society through alleviation of energy poverty, by addressing accessibility, availability and affordability issues; developing an integrated, secure and diversified mix of energy sources; using technology & innovation to optimise refinery output and value-added products; investing in R&D on new and renewable energy sources; upgrading to cleaner & greener fuels; and mainstreaming energy conservation & energy efficiency efforts across all user segments.”



Mr. B. Ashok

Chairman
IndianOil

“

In the last couple of years, despite slowing down of Global economic activity, Indian economy has shown strong resilience registering highest GDP growth rate among major economies surpassing that of China. India is already 3rd largest oil consuming country in the world and showing stable and robust growth in Energy demand.

India is growing fast. Energy is central to achieving India's development ambitions, to support an expanding economy, to bring electricity to those who remain without it, to fuel the demand for greater mobility and to develop the infrastructure to meet the needs of what is soon expected to be the world's most populous country. What happens in India will increasingly influence the global energy economy.

India's energy consumption has almost doubled since 2000. India, home to 18% of the world's population, uses only 6% of the world's primary energy. At present, India is dependent upon Oil imports to the extent of 80%. With robust growth in economy, the demand for Energy and Oil consumption is expected to grow strong.

The persuasion of energy security by India will also see growth in Refinery in Asia as Import of crude oil is always preferred by a country as compared to import of products. Though there is lot of focus on diversifying into alternate energy sources such as solar and wind, nuclear energy, but, in the foreseeable future, refined products from Refineries will remain one of the most important source of energy to support the high energy demands.

Out of the 1.2 MBPD growth in 2016, India accounts for more than 25% (330KBPD). Therefore, India holds a lot of relevance for the world economy. Our aspiration to achieve double-digit economic growth will come to its full potential with continuous reforms and incentive for investments in the refining sector.

Indian refining capacity stands at 230 MMT with consumption expected to rise from ~185 MMT last year, i.e. FY 2015-16 to almost 300 to 350 MMT over the next 10 years. This will require Refinery Capacity addition of nearly 200 million tons if we were to meet our own demand and continue to maintain our exports. This will need investment in excess of ~USD 150 billion in capex along with Petrochemical integration. This in itself is enough to fuel ~1% growth in GDP even during construction period. This can also be a great push for Make in India as almost 80 % of the capex will be local. India needs to focus more on maximizing the recovery using most advanced technologies in the most cost effective way and high value addition with integration of Petrochemicals with Refineries. To improve the efficiency and make energy more affordable, India need to focus more on creating common pool of existing energy Infrastructure assets for optimum utilization.

India's exports of petroleum products today account for what was almost its total refining capacity in 1998-1999. This reflects the India's growing Refining Industry and its role in World's Trade of Refined Products in a short span of time.

We at Essar have set up a state-of-the art highly complex 405,000 Barrels per day refinery which is supported by a captive power plant which runs on low calorie / low Sulphur coal reducing the consumption of crude oil besides being cost efficient. I am confident that, with our committed efforts, the leadership of the honorable Prime Minister Shri Narendra Modi and the guidance of the Ministry of Petroleum and Natural Gas, Indian Refining Industry will seize this golden opportunity in refining growth and fuel the fast growing Indian Economy.

”

Mr. L. K. Gupta

Managing Director & CEO
Essar Oil Limited



“Technology will play an enabling role in shaping the future Oil & Gas landscape in India. The future will be defined by our pace to adopt and adept to technological changes. For example, Renewable energy sector and battery storage are undergoing a technological renaissance with transformational impact. Battery storage technology will be a multi-sector, ultimate disrupter with notable ramification on the Oil & Gas sector. With significant demand and a leader in oil demand growth, India will be a key playing ground.



Mr. Sudhir Mathur

Acting Chief Executive Officer
Cairn India Ltd.

Technology will play a leading role in stemming India's consistent production decline. For example, FY 2016 was the fourth continuous year of decline in crude oil production and fifth for gas production. This has resulted in an increase dependence on imported Oil & Gas. India, however, offers tremendous, untapped potential which will be leveraged only through swift technology adoption.

Deploying cutting-edge technologies will help India monetize tight resources, maximize economic recovery from our ageing fields and thereby achieve Hon'ble Prime Minister's vision of reducing import dependence by 10% by 2022 and GOI target to raise the share of gas in primary energy to 15%.

Government of India (GOI) on its part is cognizant and hard at work to address energy security. GOI has already embarked on a reform path. Over the last more than 2 years, GOI introduced series of reforms which will likely reduce the administrative and regulatory burden on the upstream sector. Efforts of MoP&NG to further streamline execution of existing contracts and imparting greater degree of freedom will lead to streamlined and efficient operations.

At Cairn India, we share a common vision with the Government - progressively enhancing India's energy security. We are well-positioned to play an increasingly important role in future by enhancing production and deploying the best-in-class technologies to maximize India's resource potential.

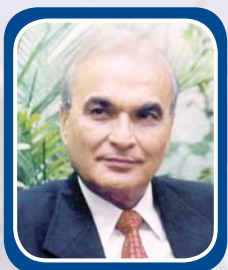




'The future depends on what we do in the present.'

...Mahatma Gandhi

“We are living in the times where change and sustainability are intertwined. The pace of change today has surpassed the traditional paths while sustainability is the bottom line for million dollar businesses. However, Energy an essential commodity for the survival and development of human race always had been at the forefront of economic growth and will continue to be so. World Economic Forum in its' Global Energy Architecture Performance Index Report 2016, has also accentuated that the economic development; environmental sustainability and enhanced energy security are three vital pillars of 'Energy Triangle'; benchmarking the energy access.



Mr. M.A. Pathan

Management Consultant &
Former Chairman
IndianOil & Former Resident
Director, Tata Group

Today, when globally 1.1 billion people lack electricity access and 2.9 billion people still using firewood for cooking and heating, Oil and Gas industry has an arduous task ahead for eradicating energy poverty. Though, the economic proliferation driven by emerging economies including India will play an important role to lift more than two billion people out of poverty by 2035 (BP Energy Outlook 2017), however the challenge of sustainable energy supplies is likely to continue. At the same time with the emergence of alternative energy resources, Oil and Gas companies are undergoing a challenging time where they need to strike a balance between social accountability and altering business atmosphere.

In the context of India; our industry has formidable task given the fact that India's per capita energy consumption stands close to only 533 kg per annum as against the world average of 1795 kg per annum. Thus, for a more secure and sustainable energy system amidst our limited resources, climate commitments; it's the time for Oil companies for strategic collaborations and investments (absolute and relative) in new energy resources to become integrated energy companies of future.

Friends; what the new world will look like will be entirely dependent on the choices we make today; be it our approaches towards conducive policies; enhancing equitable energy access; sharpening our capabilities to tackle digital and physical security threats. As India's energy demand will continue to witness an upward curve; it is important that we look beyond short term market landscape to longer horizons and make strategic choices so that fossil fuel industry can remain relevant to build and deliver affordable energy solutions.

”



“Oil and Gas sector has been the lifeline of the Indian Energy system and a major pillar of Indian economy accounting for more than 1/3rd of India's primary commercial energy supply.

Strong economic growth coupled with growing lifestyle and consumer needs will drive hydrocarbon demand in the country. The demand for Oil and Gas is expected to increase at over 5%, spurred by population growth, rising income levels, increased urbanization and rapid industrialization on the back of Policy reforms and Liberalization by GoI to reach a volume of about 500 Million tonnes by 2030.

Significant rise in passenger vehicle ownership and affordability of air travel will propel the transport fuels and lubricants demand. LPG is likely to witness a high growth with government policies like PMUY, DBTL, GiveltUp, etc. aimed at providing cleaner cooking fuels and encouraging a move away from solid biomass for cooking. Industrial consumption of oil & gas products will also grow due to government's continued thrust on manufacturing sector through Make in India and expansion of road infrastructure.

Demand for Natural Gas in India is likely to increase in many sectors, from power generation to transport, while retaining an important role as a feedstock for the fertilizer industry. For feedstock, the petrochemicals industry in India relies heavily on domestic naphtha and imported Gas. Growth of petrochemicals industry will be a major demand driver of gas consumption in India in future. Natural Gas is likely to be a game changer and will impact demand of oil products in transportation, cooking and petrochemical sectors through fuel switching with MS, HSD, LPG and Naphtha.

Recognizing the need for expanding refining capacity in the country, the PSU oil companies are undertaking expansion and bottom upgradation of existing refineries to produce BS V/VI Fuels and are also setting up a new greenfield mega refinery on the West Coast.

India's voluntary commitment towards climate change mitigation has created a substantial space of growth for alternative energy sources in our energy system. Renewables will compete primarily with fossil fuels in Power sector. Alternate Mobility solutions like Electrical/Hybrid vehicles and new business models like shared transportation will impact the demand of motor fuels.

Against this background, the Industry needs to evolve, and overcome the twin challenges of energy affordability and accessibility through consistent focus on supply chain agility, innovation and building a 'hard to replicate' human resource based competitive advantage.

The government's thrust to increase share of clean energy is giving rise to new future challenges which will be determined by the 'Sustainability of fossil fuels' and 'Viability of alternate fuels and energy solutions'. Sustainable growth requires production of low carbon alternative fuels which properly balance economic, social and environmental drivers and also enable energy security and industrial growth.

Going forward, finding a balance between deepening of energy access and widening of energy mix will be crucial for Indian Oil & Gas sector. The key will be to achieve sustained value creation through innovation and development of new technologies / products by Integration of processes across the energy value chain from research, lab technologies, exploration, production, transportation, distribution to consumption.

”

Mr. Pushp Joshi

Director-HR
Hindustan Petroleum
Corporation Ltd.



Mr. Naresh Kumar

Chairman
Dynamic Offshore Drilling
Ltd. / Deepwater Drilling &
Industries Pvt. Ltd.

“The oil and gas sector is among the six core industries in India and plays a major role in influencing decision making for all the other important sections of the economy. India's energy demand is expected to outpace that of Brazil, Russia and China, according to the latest BP Energy Outlook released in end January, 2017.

In 1997-98, the New Exploration Licensing Policy (NELP) was envisaged to fill the ever-increasing gap between India's energy demand and supply. After nine NELP licensing rounds and the recently concluded DSF bid round, exploration activity is expected to increase many folds. Government's plan, announced in Budget for 2017, to merge state-owned companies to create integrated oil majors to attain economy of scale can stabilize the Indian oil & gas sector.

As India's economic growth is linked to energy demand; need for oil and gas is projected to grow in years to come thereby making the sector conducive for investment. The Government of India has adopted several policies to fulfill the growing demand of energy. It has allowed 100 per cent Foreign Direct Investment (FDI) in segments such as: natural gas, petroleum products, and refineries, among others. Prevailing low crude oil prices has boosted the demand of refined products demand by 9% which is unmatched since past 15 years. (Source: Industry Trade Journals)

Demand for petroleum products in India is expected to touch 10m (b/d) by 2040, the biggest rise projected for any country. (Source: International Energy Agency). The Paris-based energy policy advisor to the OECD countries cites the 100 Smart Cities mission and the manufacturing boost expected from the Make in India campaign as factors that will drive the country's oil appetite in coming years.

State-owned refining companies in India have benefitted from the fast-growing domestic market and phasing out of subsidy on diesel and liquefied petroleum gas (LPG).

The government is in the process of overhauling the exploration and production contract regime in a bid to attract foreign investment. Several upstream reforms, such as uniform licensing policy, which enables companies to explore and produce all kinds of hydrocarbons from a single block; open acreage system, which allows companies to bid for blocks throughout the year, are all encouraging. Effective implementation of these policies will determine the success of reforms.

The future of oil & gas sector looks promising as India will be among the biggest buyer and consumer of energy with ever increasing demand. Development of infrastructure for the growth of gas sector is critical for the sector.



“The current hydrocarbon value chain – from oil exploration, refining to marketing has become a highly integrated process and is being increasingly expected to deliver fuels at reasonable cost to underpin the growth and stability of the Indian economy, which will remain dependent on fossil fuel imports for the foreseeable future well into the 2030s.

The petroleum refining industry is experiencing a sea change in its production environment since last decade. Due to increased environmental awareness, product specifications as well as emission standards from the refinery as well as at the points of use are becoming increasingly stringent. Driven by global and regional mandates, refineries are also becoming conscious towards emissions of greenhouse gases (GHGs), the energy footprint of the refining processes themselves being a significant contributor.

The Indian refineries of the future would have to be necessarily smart in terms of understanding these challenges and to be able to adopt their designs and operations to take advantage of rapidly changing conditions in the globalized hydrocarbon economy. For example, high conversion processes would be needed to take advantage of differential low prices of heavy, sour or waxy crudes, maximize energy efficiency, minimize CO² footprint and encourage use of hydrogen free technologies. There is also a need to synergistically integrate current operations with petrochemical production to create a flexible and fungible product slate. Such refinery conversions will require development of innovative technologies and significant in-depth knowledge of the existing technologies and of interdependence across refinery process units and utilities.

Hydrogen is a relatively expensive commodity in India compared to international markets. One option to reduce hydrogen consumption in the refinery is to replace existing hydrotreating technologies with alternative technologies, for example adsorptive separation of streams or oxidative desulphurization. Value addition is of paramount importance and it is therefore not surprising that refiners are looking at options to upgrade their product slates by optimal utilization of their existing assets. To survive – and possibly to thrive – in this competitive market scenario, refiners would be seeking options to maximize conversion of such streams to more valuable products. For example, light naphtha, Light Cycle Oil, Clarified Slurry Oil, carbon residues etc become opportunity intermediates and should be perceived as drivers of innovative new processes and applications. With the progressive replacement of subsidized kerosene with LPG in India, refiners will also be looking for alternative utilization of light distillate pools.

A relatively new challenge is the emerging international regulation around marine (bunker) fuels, where sulphur content is being pushed down to well below what can be achieved in residual fuels, compelling refiners to explore distillate blending. The diversion of high sulphur residual fuel oils is also likely to be of limited scope, as many Asian countries like China, Taiwan and Japan have already restricted sulphur content in fuels for boilers, kilns and furnaces to 1% in a bid to mitigate air quality issues.

Renewable fuels in India have been largely oriented to oxygenates such as biodiesel (also referred to as Fatty Acid Methyl Ester or FAME) and ethanol. In this, India is several years behind the US, EU and South Asian nations like Thailand and Indonesia who have already recognized, provided policy support for, and in several countries commercialized renewable hydrocarbon fuels (green diesel and green jet fuel) for facile use in unmodified diesel vehicles and existing jet engines to 50 percent and higher biofuel blend levels. Over 4 million tons per year of such “drop-in” fuels are in commercial production internationally. Such an initiative would significantly benefit both consumers who have older vehicles where the emission benefits of a switch to Euro-VI fuels would be limited, and user industry sectors such as automobiles, gensets, farm vehicles etc who would then be able to focus on fuel systems for new vehicles without having to worry about retrofits.

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Dr. Anjan Ray

Director, CSIR
Indian Institute of Petroleum



Dr. Shrikant M. Nanoti

Former Head
Refining Technology Division &
Retired Chief Scientist

Recent Crude and Product Supply/ Demand Changes in the American Region and Potential Impact on Global Markets

(Based on 2016 study which was a joint effort by M.J. Lappinen, Terrence S. Higgins and Argus media)



M.J. Lappinen

Consultant at
Lappinen Energy Consulting LLC



Terrence S. Higgins

THiggins Energy Consulting

Significant crude and product supply changes in the American region will likely drive global product demand flows in the next 5-10 years and perhaps longer. This article analyzes this subject from the following points of view:

- a) growing production of shale oil, natural gas liquids and condensates,
- b) steadily growing Latin America demand growth and associated regional supply shortfalls,
- c) efficiency improvements in U.S. automotive vehicle fuel consumption, and
- d) impact of U.S. lifting crude oil export ban.

These factors are examined quantitatively, and while some of these factors offset each other, accumulation of these changes reveals that naphtha imbalances appear to be of most concern raising the specter of surpluses that will likely impact global markets and Asia in particular. Combined with forecast increased Middle East production of light materials including natural gas liquids (or NGL's) and condensates,

naphtha prices will continue to be weak. As the impact of lifting crude oil export bans is so highly dependent on crude oil prices, a range of scenarios is presented to bracket the expected impacts.

Global Outlook: A Quick Overview

The outlook for global petroleum product demand by major region out to 2025 is briefly discussed in order to put this study, which focuses on the American region, into perspective.

As shown in Figure 1, global refined products demand is on the order of 90 million barrels per day (mbd) with gasoline at 26% of demand, and jet fuel plus diesel at 36%. Demand will grow by 1.2% annually by 2025, increasing total demand by 12 mbd. Growth in gasoline will be a little lower, only 0.9% annually due to fuel economy initiatives in developed countries. Jet fuel and diesel will be the highest growth products, together increasing at 1.7% annually.

Figure 2 displays a regional breakdown where Asia-Pacific refined products demand will dominate future growth, accounting for 52% of the total global increase to 2025.

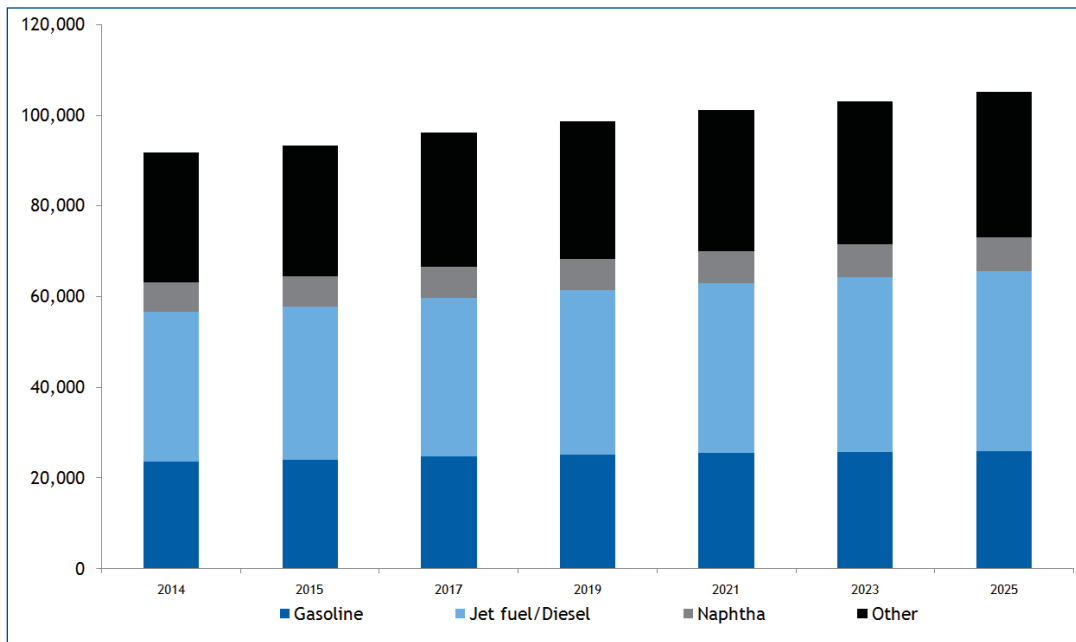


Figure 1 - Global Demand Outlook to 2025, KBD

The region includes high growth countries including China and India, offset by declines in Japan. In terms of annual growth rates, China is forecast at almost 2.5% while India grows by nearly 3.5% amounting to an additional 2.9 and 1.7 mbd in China and India respectively. The Middle East will be the second-highest growth region in terms of volume, accounting for 18% of total growth while demand in Latin America will grow by 1.6% annually.

Demand in North America and Europe will be flat and furthermore, Europe refining will continue to contract, with growing product supplies from the Middle East. Refinery capacity expansion plans will primarily involve Asia-Pacific region and the Middle East.

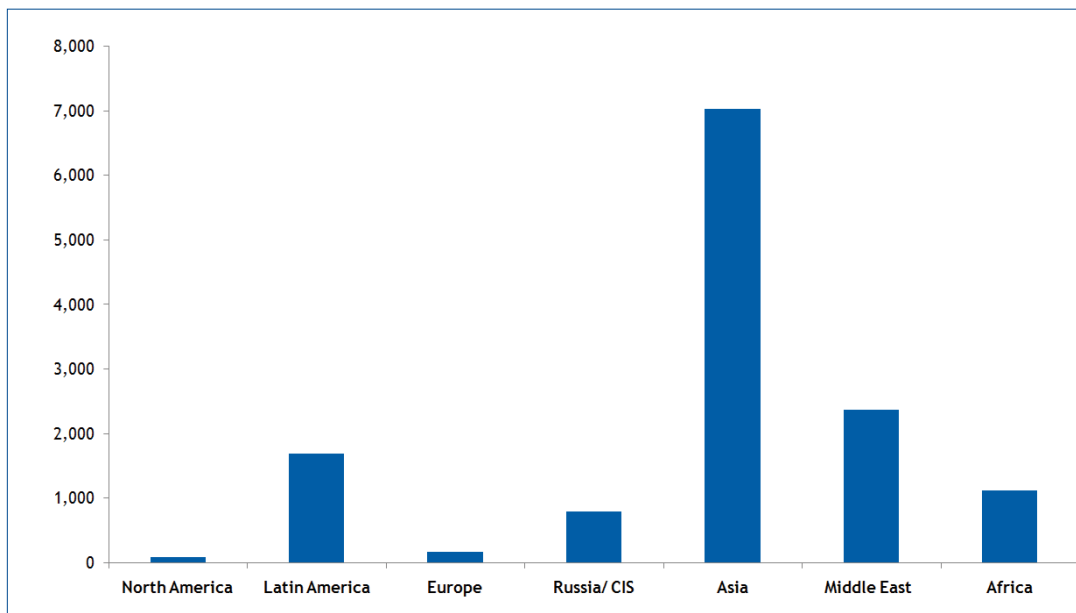


Figure 2 - Growth by Region, KBD

U.S. Refined Product Demand

U.S. refined products demand as highlighted in Figure 3, will be driven by modest distillate growth offset by a decline in gasoline demand. Overall demand will grow by less than 1%/yr out to 2025. Lack of growth in demand, and in particular demand for gasoline,

will limit the capability of the U.S. to accommodate the growing volumes of light refinery feedstock streams like light tight oil (or LTO), NGL's and condensates referred to earlier.

Following a few years of decline, U.S. gasoline demand has recently rebounded in the wake of lower crude and product prices. However, over time fuel-economy standards will reduce

demand with mandated increases in the corporate average fuel economy. U.S. gasoline demand will reduce by more than 10% or over 0.950 mbd by 2025. U.S. diesel demand will grow with improved economic outlook and will be enhanced by dieselization of passenger and commercial vehicle fleets.

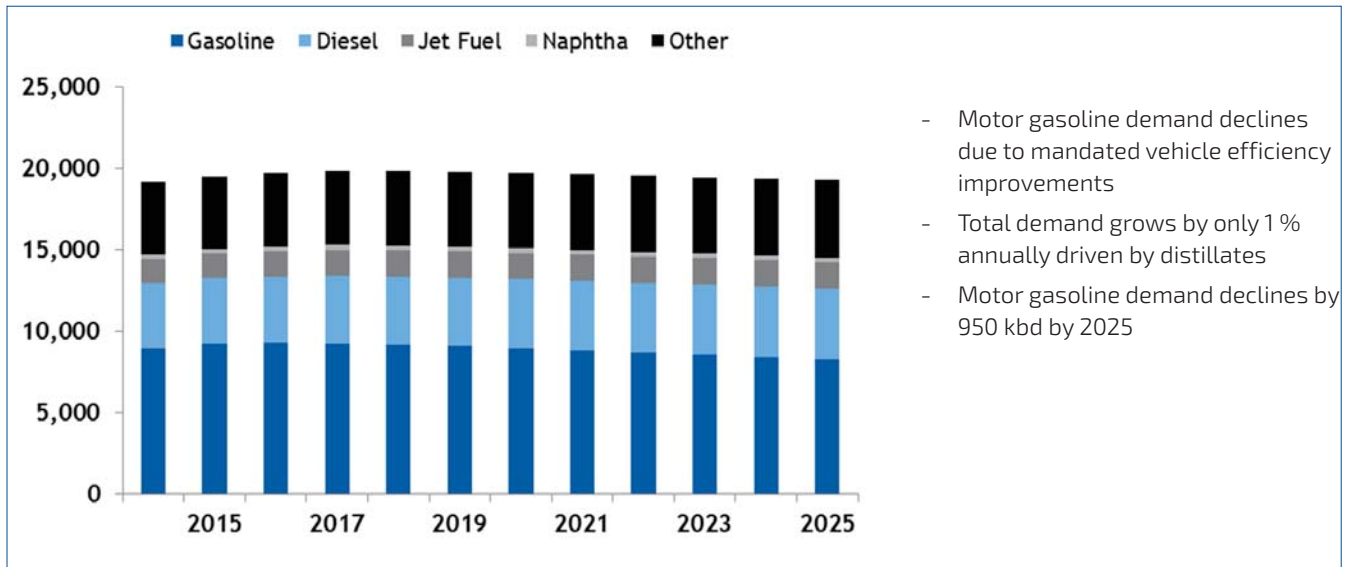


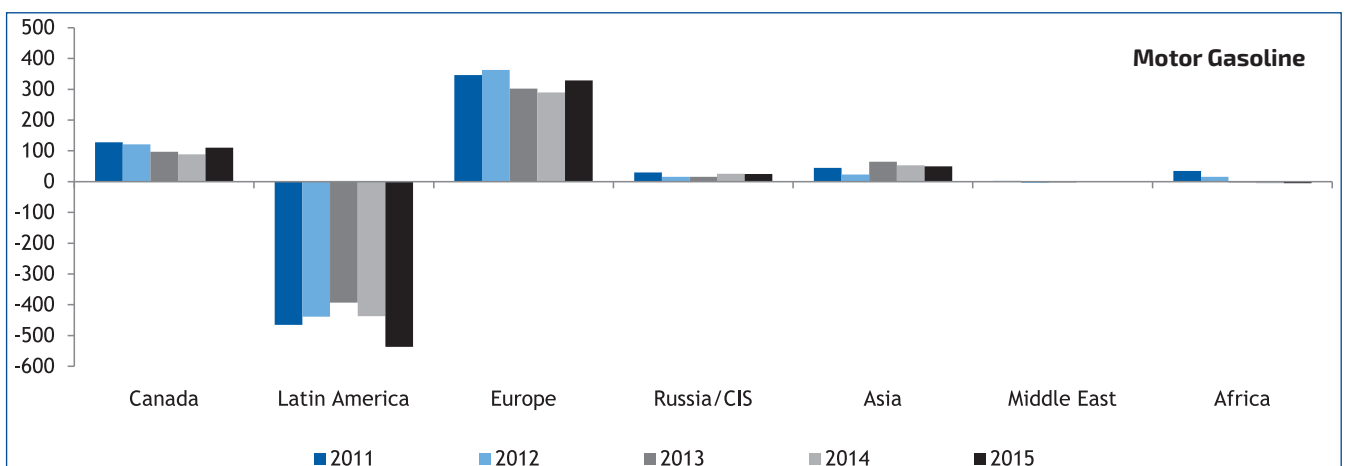
Figure 3 - U.S. Petroleum Product Demand Outlook, KBD

On the other hand, three primary factors reduce demand, firstly, substitution of natural gas in the transportation market and secondly fuel-economy improvements for diesel vehicles and thirdly natural gas substitution in the home heating oil market.

The upper half of Figure 4 depicts U.S. motor gasoline imports and exports over the last five years and it shows that the U.S. is both an importer from

Europe into demand centers on U.S. East Coast, and exporter of gasoline to Latin America from the U.S. Gulf Coast (or USGC). Europe has a surplus of gasoline due to their domestic transportation fuels taxing policies with gasoline tax much higher than diesel fuels. Aside from the low cost of surplus European gasoline, it is cheaper to ship from Europe to the U.S. East Coast than from the USGC. This is due to a logistics anomaly reflecting

the differences in U.S. domestic and international shipping. Shipments between U.S. ports are mandated by the Jones Act, to be serviced by U.S. flag ships. The U.S. shipping industry rates are higher primarily due to manning costs. So the bottom line is that it is cheaper to ship gasoline from Rotterdam to the New York harbor than it is to ship gasoline from Texas even though the shipping time is twice as long.



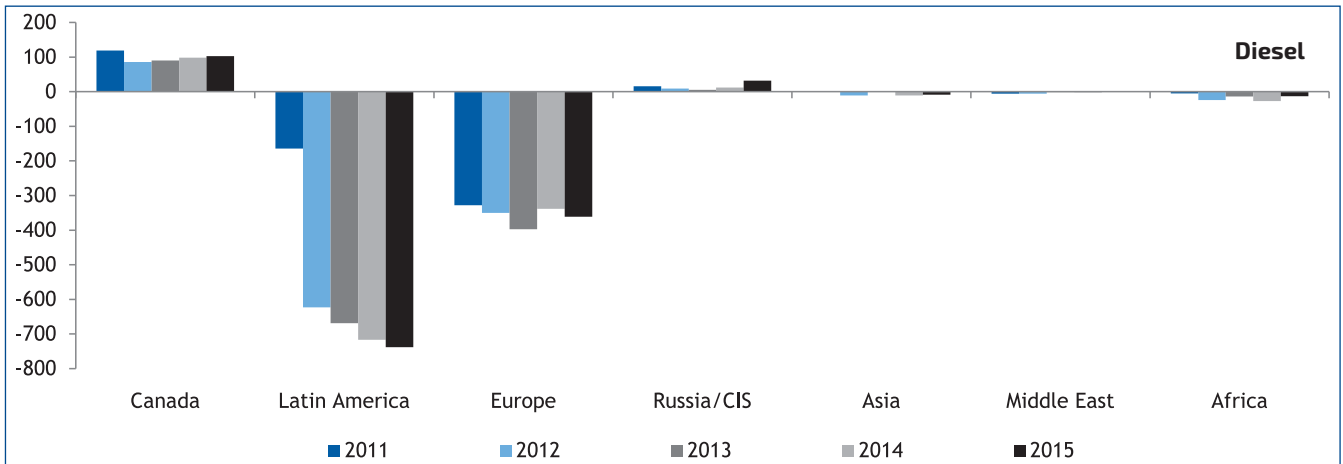


Figure 4 - U.S. Motor Gasoline and Diesel Trade Flows, KBD

The lower half of Figure 4 shows diesel fuels where the U.S. is a major exporter of diesel fuels both to Europe and Latin America approaching 1 mbd.

The other motor gasoline and diesel fuel regional import / export volumes are small compared to these major trade flows.

North America Crude Oil Production Forecast

North American liquids production forecasts, depicted in Figure 5, will be dominated by growth in unconventional crude oil which industry refers to as LTO and Canadian bitumen. LTO includes crude oils with names like Bakken and Eagleford and Permian. All of these crudes are categorized by unconventional production processes which require innovative techniques like directional drilling and fracking in order to extract the oil from the low permeability geological reservoirs. Figure 5 also provides an outlook for North American condensate and NGL production growth.

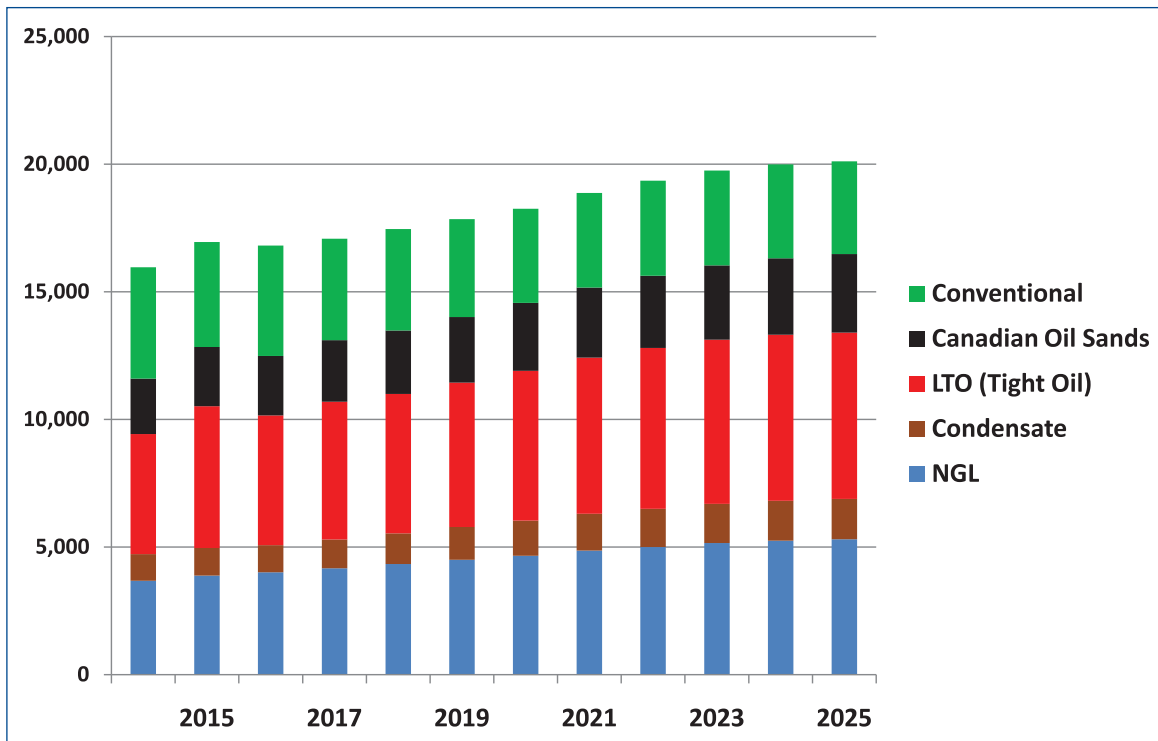


Figure 5 - North America Crude Production Outlook, KBD

LTO will account for 40% of the increased production growing from 4.7 to 6.5 mbd, and Canadian oil sands will account for 16%, growing from 2.1 to 3.1 mbd. NGL will increase by more than 40%. Note that in 2016 a dip in production occurred coincident with the weak oil prices that were experienced during the year. While most of the added LTO and Canadian oil sands production will be processed in the U.S., the added Canadian oil sands production result in declining imports of heavy crudes from other regions, particularly South America. Regarding light crude oils, the required U.S. balancing mechanism of reduced light crude oil imports has occurred, but more importantly from a yield perspective, naphtha imbalances will be exacerbated as the shale oil naphtha yields are nearly double those of the replaced African light crudes. The shift in composition will increase the yield and supply of naphtha to the market. The average gravity of U.S. crude is projected to increase by 1.5 oAPI over the period and will add about 1 mbd naphtha supply from domestic production.

Challenges for U.S. Refiners

The expansion of LTO and shale gas production in the U.S. has presented challenges related to increased quantities of natural gas liquids, condensate into LTO crude oil supplies and refiners have taken several steps to respond:

- 1 reductions in light crude oil imports [e.g. 1.5 mbd of primarily light African grades],
- 2 condensate exports which were initiated in 2014 and have reached 0.15 mbd,
- 3 higher U.S. refinery utilization and exports of marginal surplus products [including motor gasoline, diesel, jet fuel and LPG fuels],
- 4 low crude oil prices have stimulated U.S. gasoline demand amounting to over 0.5 mbd in the last couple of years,
- 5 coincident with growing production volumes of Canadian oil sands, the U.S. increased diluent exports to Canada up to 0.3 mbd,

- 6 LPG has also played a major role as the U.S. has transitioned from a LPG importer less than 10 years ago to an exporter, recently exceeding 0.9 mbd of LPG, and
- 7 availability of surplus lighter NGL fractions (C2-C4s) has stimulated an unprecedented expansion of domestic steam cracker capacity and has transitioned the U.S. to an ethane exporter nearly reaching 0.1 mbd in recent months.

Figure 6 highlights the U.S. crude run forecast.

Refinery utilization is forecast to increase by 0.6 mbd up to 16.2 mbd by 2019 followed by a partial decline by 2025. This primarily reflects the impact of the growing distillate demand for both domestic and export markets and strong gasoline export demand.

The decline in crude run primarily reflects the fact that with the lighter crude slate less crude is required to make the distillate requirements. If it were not for the lighter crude slate with LTO, the crude run demand would have been higher yet.

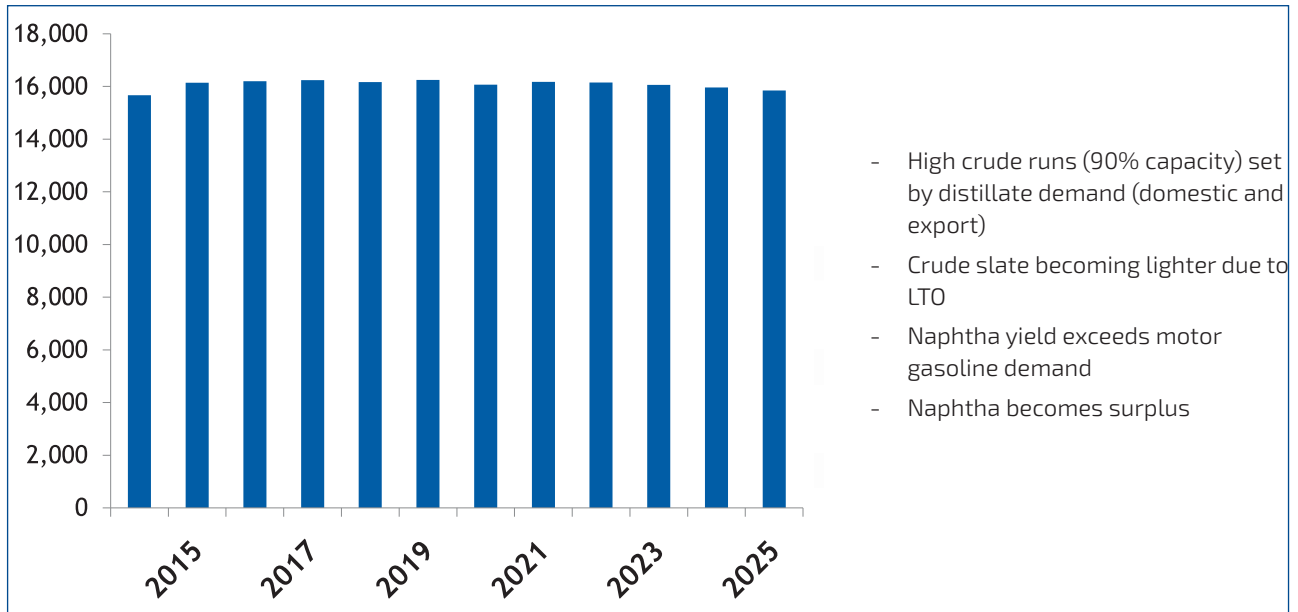


Figure 6 - U.S. Refinery Crude Runs, KBD

Figure 7 displays refinery gasoline and diesel supply and demand. Production for each is shown with the surplus production going to the export market. Gasoline demand is initially slightly below production resulting in the net import position and the balance reverses to a net surplus (exports) of 0.35 mbd by 2025. Note that while gasoline production is declining, diesel production is increasing.

This factor underlies the projected naphtha imbalance in the U.S. which is shown in Figure 8 which shows growth in surplus naphtha type liquids out to 2025.

This naphtha balance incorporates three separate supply elements: the naphtha volumes surplus to motor gasoline production, naphtha contained in processed condensate exports and in Canadian diluents.

The condensate export projections will increase from 0.15 mbd to 0.33 mbd in 2025.

Canadian diluent demand is projected to increase over 0.3 mbd coincident with an assumed 1.0 mbd increase in Canadian oil sands production. The diluent is necessary to safely pump the very high viscosity bitumen crude type.

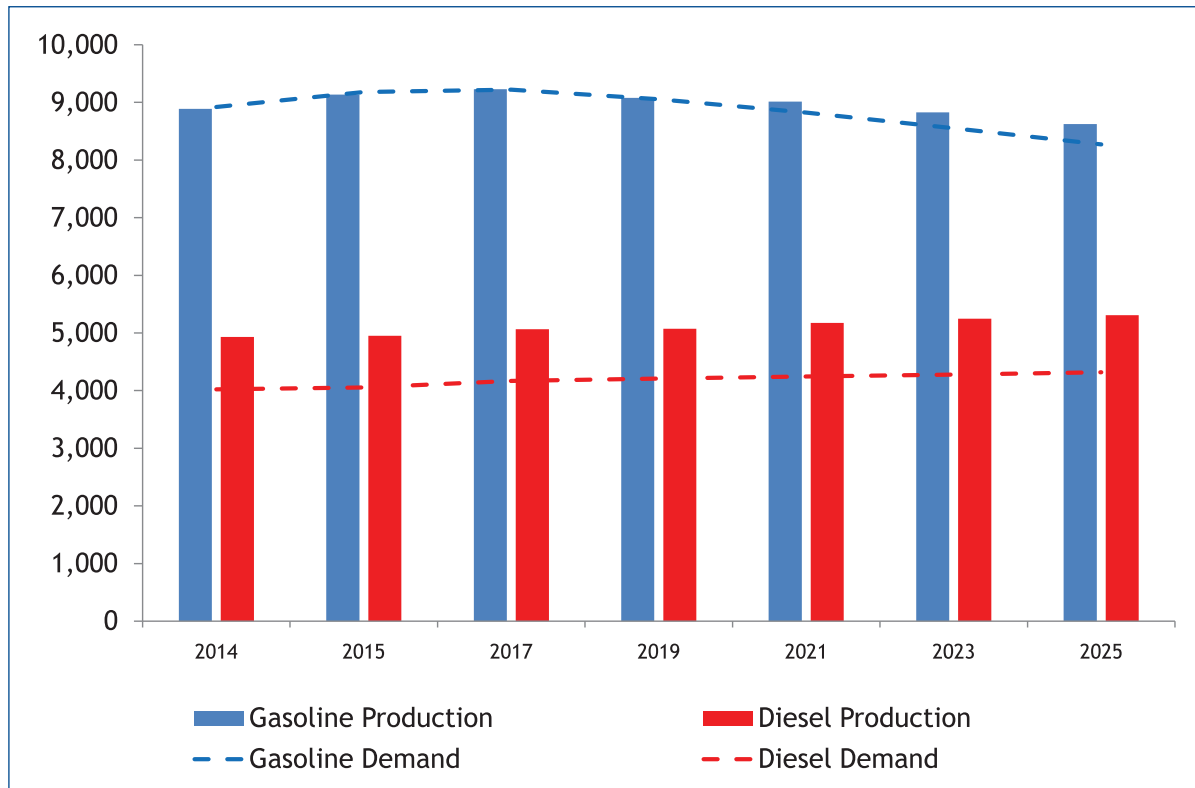


Figure 7 - U.S. Gasoline/Diesel - Refinery Production vs Domestic Demand, KBD

Total naphtha exports will reach 0.99 mbd in 2025 and the majority of these export volumes will be destined to Canada, Europe and Asia and China in particular. For reference, China alone consumes over 1.0 mbd of naphtha for steam cracker feed or about 20% of the total world. Furthermore, these U.S. exports will have to compete with growing volumes of light product exports from the Middle East who are also witnessing increased exports of naphtha and condensates including Qatar production from the Ras Laffan terminal and growing Iranian production.

The bottom line is that continued weakness in long term naphtha prices are forecast due to these factors. Furthermore, even with the forecast strong growth in gasoline demand in Asia and Africa, on a global supply / demand basis the % gasoline yield on crude is reducing from 26 to less than 25% in 2025 or a decline of over 4%.

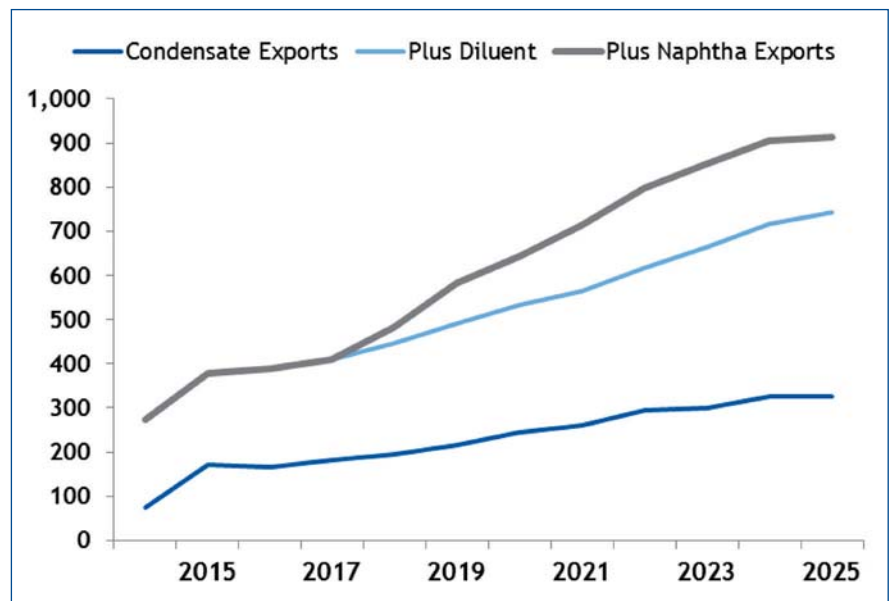


Figure 8 - Outlook for U.S. Naphtha Exports, KBD

Impact of Latin America

As noted earlier, the growth of U.S. product exports to Latin America is having big impact in supporting U.S. refining capacity utilization over 90% for the last several years. Aside from exports of diesel fuels to Europe which are ongoing, more importantly and more recently the exports of motor gasoline and diesel fuels are growing into Latin America. Although there are opportunities to expand refining capacity in Latin America to improve self-sufficiency, capital projects have experienced numerous problems including multi-year delays, overruns and charges of corruption and project

mismanagement. And looking toward a future with lower crude prices, it is perhaps unlikely that Latin America will be able to afford the \$10B price tag for a world class sized refinery any time in the near future.

As summarized in Figure 9 in total, demand in Latin America is on the order of 9.4 mbd or about 10% of the global demand. Brazil, having the largest economy in Latin America which ranks 8th in the world, has nearly 3.0 mbd of demand at 33% of the region followed by Mexico at 22% Venezuela at 8% Argentina at 7% Chile at 4%. In terms of the major products, motor gasoline and diesel fuels account for 55% of total with gasoline

and diesel both at 2.7 mbd. Figure 10 details the demand out to 2025 for motor gasoline is forecast to grow by 0.5 mbd and diesel fuel demand grows by 0.7 mbd for a total of over 1 mbd, met mostly by increased imports.

Refinery capacity as 7.5 mbd compared to demand for products of 9.4 mbd creating a sizeable imbalance.

Figure 11 shows that Brazil has the largest capacity of over 2 mbd followed by Mexico about 1.6 Venezuela at 1.3 Argentina 0.6 mbd. In total, nearly 0.6 mbd of added capacity is in the works or about 8% of the total. This includes the Abreu e Lima refinery which started up in late 2014 in Brazil with the capacity of 0.12 mbd.

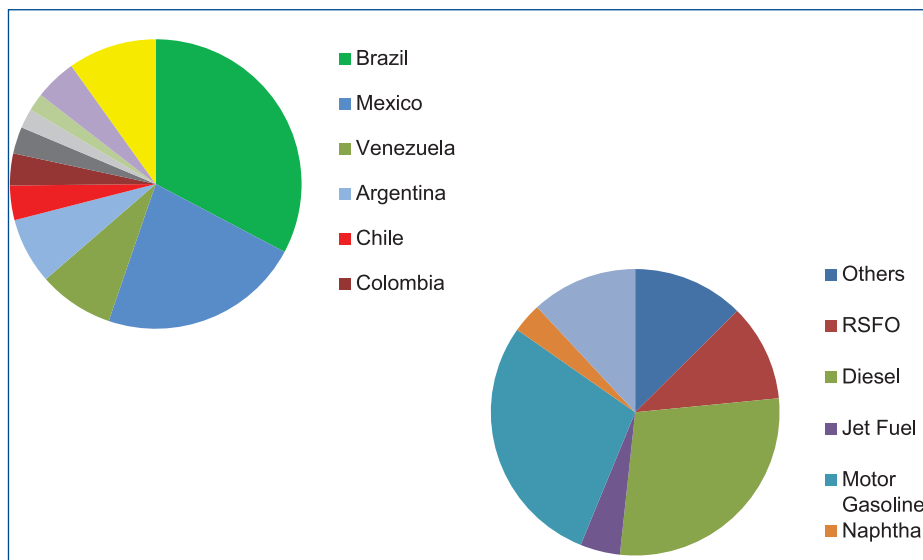


Figure 9: Latin America 2014 Petroleum Product Demand: 9,100KBD

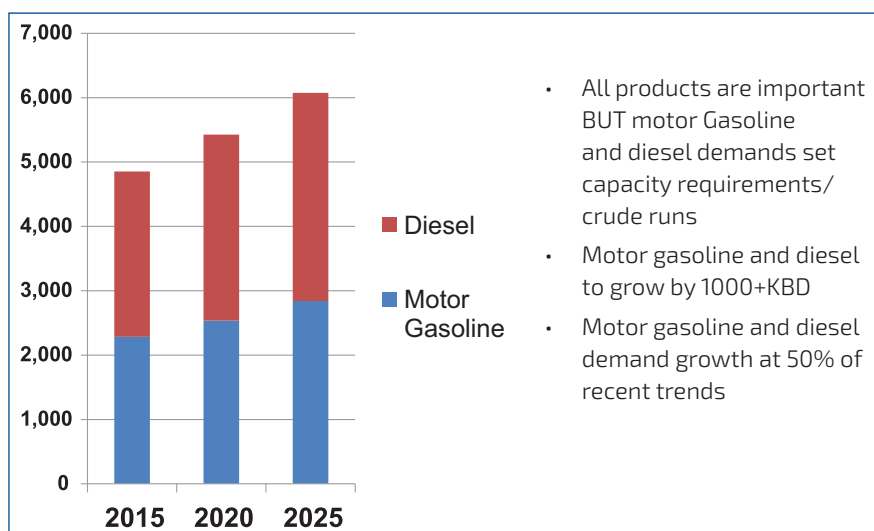


Figure 10 - Latin America Key Product Demand Outlook, KBD

Also, Colombia has doubled the capacity of its Cartagena refinery from 0.08 to 0.16 mbd. An additional 0.28 mbd is scheduled to come onstream in Brazil in the next couple of years but considering the economic difficulties the outlook is not firm.

Imports play a major role in balancing product demand. Figure 12 shows the major balancing steps for motor gasoline. Motor gasoline and naphtha trade flows originate from the U.S. Gulf Coast, Europe and North Africa. Figure

13 shows that diesel trade flows to the Latin America region originate from the U.S. Gulf Coast, the Middle East and Asia Pacific regions.

However, the supply role of Middle East and Asian refineries is growing. In the last 3 years, the Middle East have added 1.6 mbd of new refinery capacity for internal demand growth and exports and a number of other large projects are on the horizon. These Middle East projects will further increase participation in the export

markets to Asia, Europe and Africa but also including Latin America.

Latin America Product Imbalances

Figure 14 depicts major product shortfalls by country. Mexico is the dominant factor in gasoline imports with over 50% of their total demand supplied by imports. As regards diesel fuels, Brazil is forecast to be the predominant followed by Chile, Argentina and Mexico.

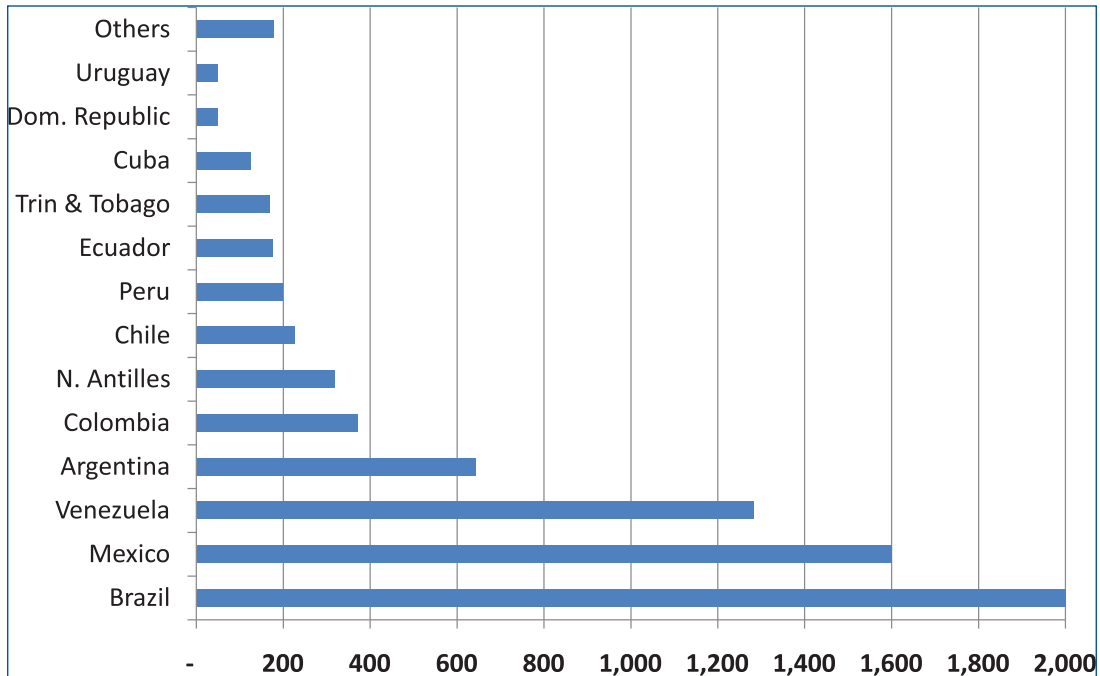


Figure 11 - Latin America Refinery Capacity - 7,500 KBD

One key message for Asian product price outlook is that if Latin America refinery motor gasoline production projects materialize then Asian naphtha imports will get cheaper as U.S. naphtha surpluses will increase.

Export Ban Lifting

U.S. Congress lifted the 40-year-old ban on U.S. crude oil exports in December 2015.

Previously, crude oil exports have been permitted to Canada and Alaska and certain California crude oil have been exported to Asia.

As a result of cancelling the export ban, no significant impact is expected on global crude oil prices but U.S. crudes will improve with expanded market outlet.

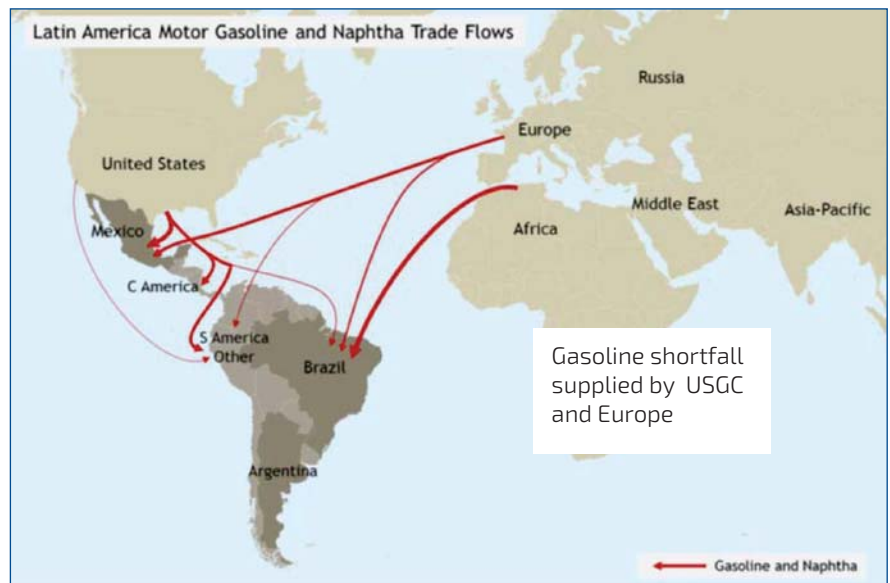


Figure 12 - Latin America Motor Gasoline Imports

U.S. LTO production may provide for a market price cap until global product demand increases in the next several years. Crude oil exports are expected to gradually grow to Latin America and Europe in the range of 0.3 to 0.6 mbd. Spot LTO cargoes may find themselves being exported to Asia but those are expected to be limited.

A key driver in the exports of LTO will be to minimize surplus naphtha in the U.S. As LTO crude oil exports grow the U.S. will rebalance with imports of lower naphtha yielding crudes perhaps Nigerian grades, which have been historically processed in the U.S. The reduction in surplus naphtha will also lead to a slightly lower crude oil throughput in the United States. The slightly heavier crude oil mix will allow diesel production to remain constant despite the small reduction in crude oil throughput. Under the crude oil export scenarios and naphtha surplus will decline but will not be eliminated.

Figure 15 presents an outlook for naphtha exports from 2010 to 2025 for the base case and the 2 crude export scenarios, i.e. 0.3 to 0.6 mbd of LTO exports. The naphtha exports include naphtha product, condensate exports and diluent exports. By 2025 crude oil throughput is reduced in the range of 0.1 to 0.2 mbd depending on the volume of LTO exports. Total naphtha exports are projected to decline from 0.9 mbd in the base case to 0.85 or 0.79 mbd depending on the volume of LTO exports. The reduction in naphtha exports is attributed entirely to the reduction in product naphtha. Condensate and diluent exports are assumed to remain constant across scenarios.

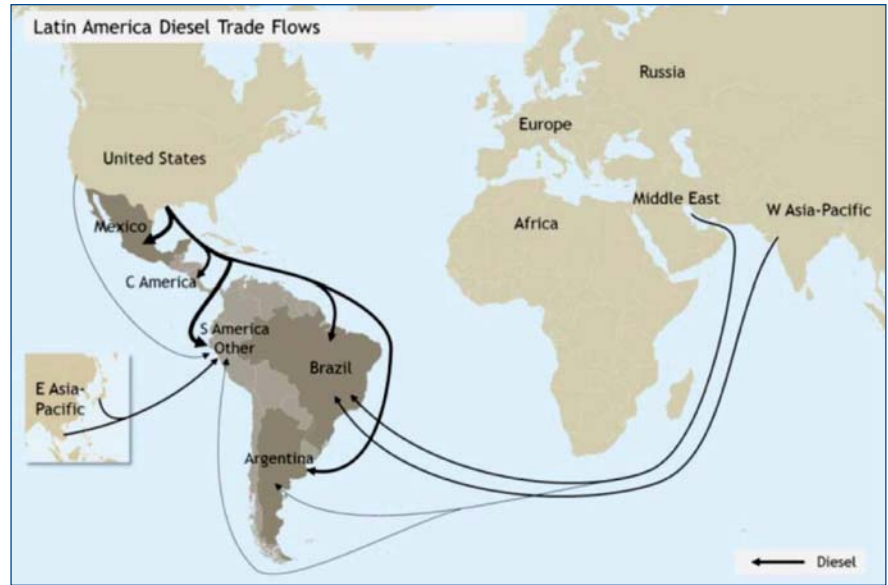


Figure 13 - Latin America Diesel Imports

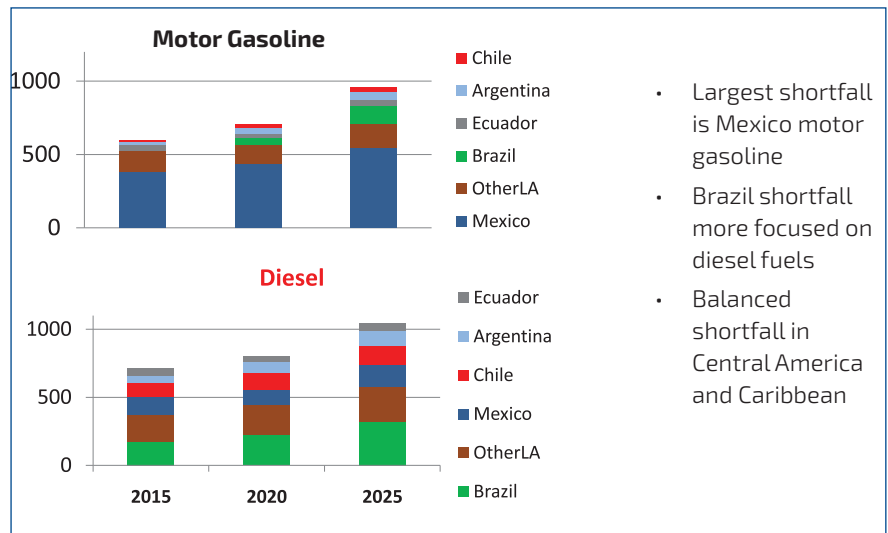


Figure 14 - Latin America Product Imbalance Outlook, KBD

- Largest shortfall is Mexico motor gasoline
- Brazil shortfall more focused on diesel fuels
- Balanced shortfall in Central America and Caribbean

Major Sensitivity Cases that Impact Forecast Naphtha Surplus

The outlook for U.S. refining is heavily dependent on several key assumptions including Canadian bitumen production, Latin American exports and refinery expansion plans, and perhaps the ongoing impact of low crude oil prices which could stimulate

demand growth for motor gasoline and diesel fuels.

The sensitivities involving Latin American product imports will also directly impact naphtha surpluses. If motor gasoline demand growth

does not meet forecast then naphtha surplus will grow almost barrel for barrel. But if Latin America manages to expand refining capacity that will also result in growing naphtha surplus as U.S. refineries will lose naphtha export outlets.

There are two sensitivity cases involving Canadian crude oils worth of mention. Firstly, if Canadian bitumen or oil sands production is maintained by export pipelines for example to the Pacific Ocean then the U.S. naphtha surplus will be reduced drastically because the diluent steams will not return to the U.S. for reprocessing. On the other hand, if Canadian crude oil forecasts do not materialize then the assumed outlet for diluent to Canada will not grow and the naphtha surplus in the U.S. will grow. Recent indications from the Trump administration suggest that Canadian bitumen exports to the U.S. will continue with construction of the Keystone XL Pipeline.

So these will be two important variables to keep in mind in the future as supply demand balances change.

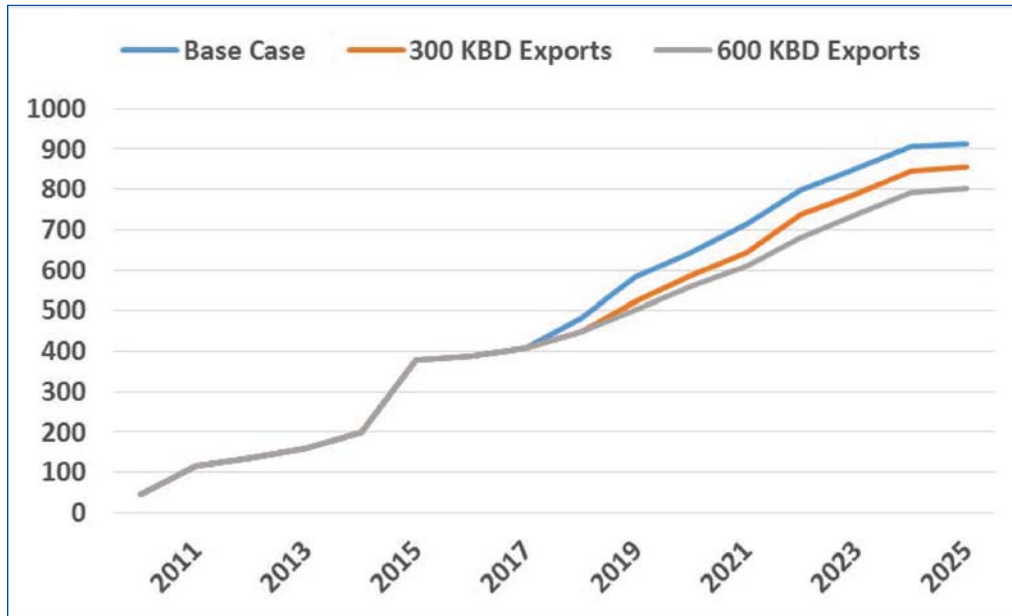


Figure 15 - Export Ban Lifting Impact on U.S. Naphtha Surplus, KBD





The EU Winter Energy Package establishes the grounds towards the decarbonization of the European economy



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Over the last years, the EU has had several attempts to put forward a solid legal framework to fight climate change and transit towards a clean and sustainable energy system. It has only been after the release of the Energy Union and the ratification of the Paris Agreement in 2015-2016 that the EU has finally set a clear path to make European energy more secure, affordable and sustainable. It now remains to be seen what the final text will be and whether it will be strong enough to make its way through Member State legislation and meet its objectives.

In 2015, the then elected European Commission (High officials of the European Commission, President, Vice-president and Commissioners are elected every five years) released the EU's Energy Union, a strategy built on five interlinked pillars: security, solidarity and trust, a fully integrated internal energy market, energy efficiency, climate action and decarbonizing the energy, and finally research, innovation and competitiveness.

It is clear that Europe lacks of vast indigenous energy sources and that the continent needs to diversify its sources of energy to ensure energy security while considering the specificities of each Member State. Solidarity and cooperation between countries should be seen as a tool to plan a European wide energy mix. Also, enabling a free flow of energy

throughout the EU through adequate infrastructure and without any technical or regulatory barriers is an efficient way to secure supply and give consumers the best energy deal.

But in the strategy is was also considered that another important way to reduce Europe's dependence on energy imports and reduce emissions is improving energy efficiency, which has to be increased at all stages of the energy chain, from generation to final consumption. EU measures should however focus on sectors where the potential for savings is greatest such as buildings.

Another great pillar for the Energy Union is climate policy. The EU Emissions Trading System (EU ETS), which is based in the cap and trade principle, is the cornerstone of EU's policy to fight climate change and reduce greenhouse gas (GHG) emissions. The EU ETS has gone through a large modification over the past years in order to optimize its functioning and achieve a carbon price that can send the right signals in the economy. Additionally, the EU has national targets in place to cut emissions for sectors outside the ETS, together with roadmaps towards low-emission mobility and renewable energies.

The EU is also convinced that only by increasing support for research and innovation a breakthrough in low-carbon and clean energy technologies will be achieved.

EU institutions hope that with these measures Europe will also increase competitiveness to be able to play a significant role internationally.

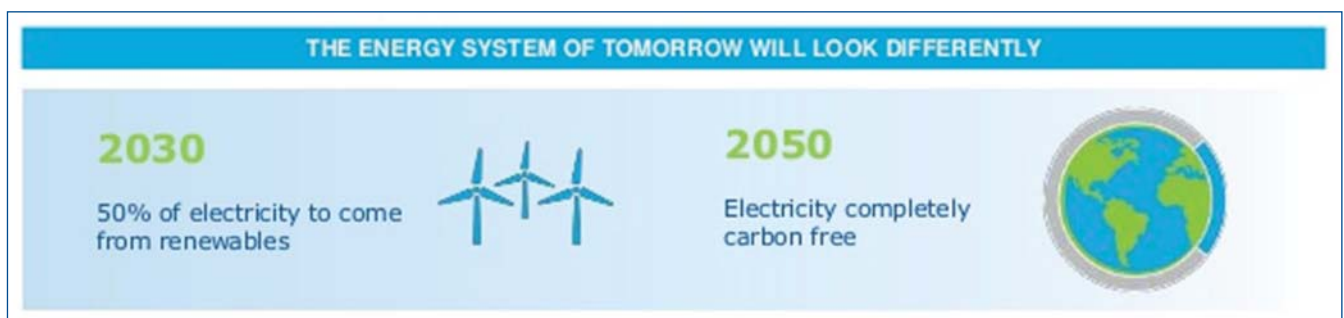
During the past year and a half the European Commission has been preparing a package of measures to implement the Energy Union strategy, with the objective of making concrete proposals to keep the EU competitive as the clean energy transition is changing the global energy markets. Last November the famous Winter Package was released, with the name of Clean Energy for All Europeans – unlocking Europe's growth potential. This vast amount of documents, including revisions to directives, impact assessments, new regulations and communications will not only determine the future of energy in the EU up to 2030 but will set the footage for the whole energy market in 2050. It touches upon subjects including renewables, coal subsidies, bioenergy,

grid access, efficiency in buildings and rights for individual energy producers.

The proposed legislation in the Winter Package will unlikely remain as it is now, since it is currently being negotiated with the European Parliament and the Council of the EU before it becomes official. The process can take up to 18-24 months, depending mostly on how many controversial issues the Member States find. The package will then probably not be adopted before 2018/19 and then it will have to be implemented into national legislation, which usually takes up to 18 months. All in all, the Winter Package will enter into force in Member States in 2020/2021.

With this draft of legal framework, the EU has committed to cut CO₂ emissions by at least 40% by 2030 while modernizing the EU's economy and delivering on jobs and growth for all European citizens. The other

two main objectives are the increase of 30% in energy efficiency and 27% in renewable energies in final energy consumption by 2030. Another important qualitative objective of the European Commission is to put consumers in the center of the energy market of the future. They should have a better choice of supply, access to reliable energy price comparison tools and the possibility to produce and sell their own electricity. Increased transparency should give consumers the opportunity to be more active and become more involved in the energy system, responding to price signals. Global markets are changing at a very fast pace while electricity markets are being challenged by the need to decarbonize. At a time when current wholesale electricity prices in Europe are at the lowest levels in a decade, attracting investment to modernize Europe's electricity system poses a real challenge.

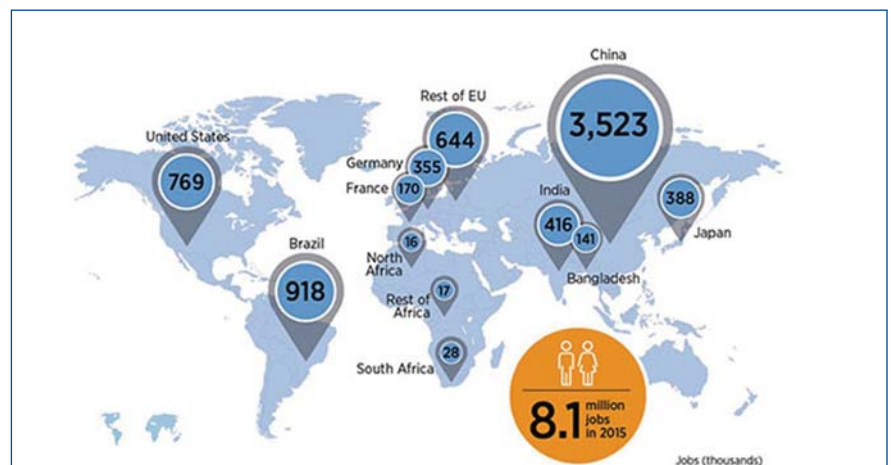


Source: European Commission, 2016

Figure 1: EU's Winter Package Objective

Investing in the clean energy transition

Over the period 1990-2014, EU's GDP increased by 48%, while its emissions intensity was reduced by almost half. Thanks to the increase of energy efficiency, the EU saved around 25bn EUR in energy imports in 2015. According to the European Commission, 70bn EUR more can be added to the economy and 400,000 new jobs can be created if a 30% target in energy efficiency is achieved. But a business as usual scenario won't be enough to leverage the additional 177bn EUR per year needed just to meet the 2030 objectives.



Source: IRENA Annual Report, 2016

Figure 2: Renewable Energy Employment in Selected Countries and Regions

A more ambitious scenario to trigger the necessary investment to make the clean energy transition happen is required. The Clean Energy Package has been designed in a way as to unlock Europe's green growth potential. If made right, the European Commission believes that the GDP can increase 1% by 2030 adding 190bn EUR into the European economy and creating as many as 900,000 jobs.

A more flexible market for a more flexible demand

The electricity market will be increasingly dominated by variable renewables and by a more flexible demand, for which the right incentives to invest in the new market should be generated. For that, the European Commission has proposed how to strengthen the carbon price signal by revising the ETS. Prices should react quickly to reflect changes in variable generation and shifting demand. But this can only happen if prices are able to rise when demand is high or generation scarce, and if constraints on pricing are removed. Flexible demand needs also to be able to reach to changes in the generation to avoid the enormous costs for back-up generation.

Therefore, the system should reward flexibility and bring tangible benefits to EU consumers by allowing active participation and demand-response. For that, better integrated short-term markets, EU-wide intraday and cross-border balancing markets are required. The Clean Energy Package seeks to

remove roadblocks to innovation in order to enable the natural development of new energy services and to open the door to non-traditional actors to the market. This will increase growth in employment and investment, creating value in a market usually closed to new business models.

The deep transformation of the energy system will change the way consumers engage with their energy system. The new developments will help consumers make the most of the energy transition and reduce their electricity bills.

Empowering consumers

Consumers will be able to participate in the market, generating renewable electricity onsite to consume it, store it, or sell it to the grid. They will play a key role in achieving the flexibility that the system needs to integrate abundant renewables and to provide quick and efficient demand response.

Consumers should trust the system but they still face huge barriers to fully engage in today's energy system. The European Commission will promote measures that empower consumers and that facilitate their active participation in the electricity market:

- Retail competition should be increased to improve consumer engagement, reduce energy bills and ensure there are enough services so that all kinds of consumers have access to them.
- The grid should be made more flexible at both generation and

consumption to foster self-generation and demand-response so that consumers can adjust their consumption to price fluctuations resulting from variable wind and sun, and can benefit from lower electricity prices.

- Consumers should be allowed to switch providers more easily, get clearer billing and comparison tools, and reduce restrictions and switching fees.

Altogether, these measures will incentivize consumer engagement with the market, help consumers save money in their bills, and allow them to benefit from new added-value services.

Better integrated markets

Empowering consumers need a system where energy can flow quickly and without barriers. This is why the European Commission is promoting better regional and cross-border cooperation on energy policies and support schemes to ensure security of supply. Full market integration is not only about increasing interconnections with isolated systems such as the Iberian Peninsula or the Baltic states, but also about integrating wholesale markets making them more efficient.

The European Commission seeks to get rid of bottlenecks in the grids and the existence of fragmented and uncoordinated national mechanisms to remunerate generation capacity.

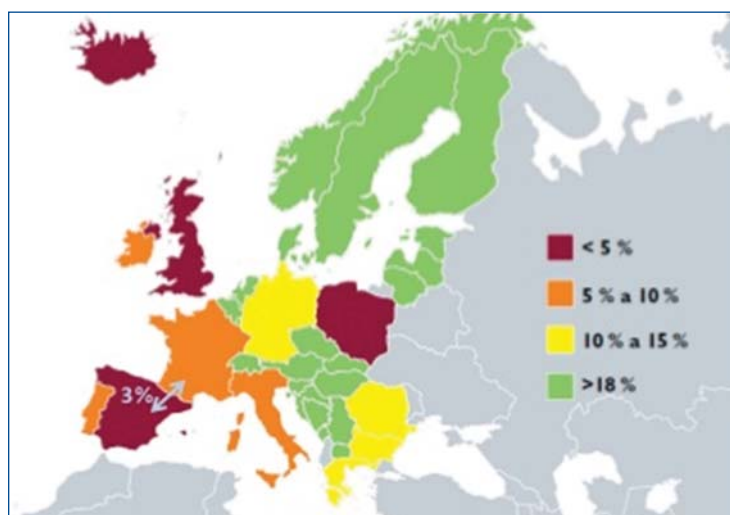


Figure 3: Ratio Interconnection Capacity in Europe Source: ENTSO-E, 2016

The European Commission is proposing high level principles of harmonization at European level with a framework for capacity remuneration mechanisms to ensure coherence, cross-border participation and avoid market distortions.

Some Member States have already a mechanism in place to remunerate capacity and not generation as it is thought that with the higher penetration of renewables into the grid it is important to have a way to ensure there is enough capacity to ensure supply.

However, payments to keep coal capacity online can be seen as a subsidy for some of the polluting plants that should be withdrawn of the system to meet the decarbonization targets. The European Commission should be aware that these capacity mechanisms don't serve as an excuse to subsidize high-polluting generation assets. Therefore, strict environmental criteria be included, such as emissions limits on what can receive payments under capacity mechanisms. New capacity is only eligible if it emits less than 550 grams of CO₂ per kilowatt hour (CO₂/kWh), although existing plants are initially exempt from this rule. This all but rules out new coal plants from getting paid through capacity mechanisms. Five years after the regulation has entered into force, this limit applies to all plants given capacity payments. The European Commission will also develop a new Risk Preparedness proposal to

guarantee that all Member States duly prepare for crisis situations and co-operate with one another to prevent electricity crisis situations.

Priority of access and dispatch of renewables

The EU package changes the rules on what types of energy should be given priority ("dispatched") in the grid.

Renewables have had priority of access and dispatch over fossil fuel generation under the Renewable Energy Directive adopted in 2009 ensuring a market for renewable power.

This advantage is revoked in the proposed legislation. All new renewable plants will be treated in the same way as fossil fuel power when it comes to the order in which it is dispatched to the grid. A few exceptions will still be allowed to have priority of dispatch, being the small renewable energy installations with a capacity of less than 500kW (a threshold that shrinks to 250kW from 2026), demonstration projects for innovative technologies, and existing installations (unless they are modified or expanded).

With this amendment, the EU says that a level playing field is being set, however for all technologies to operate on the same conditions, other aspects of the system should also be changed. Fossil fuel technologies have had decades to mature, more definitely than renewables.

In any case, renewables have low variable costs which should make them the first dispatching regardless of the legislation.

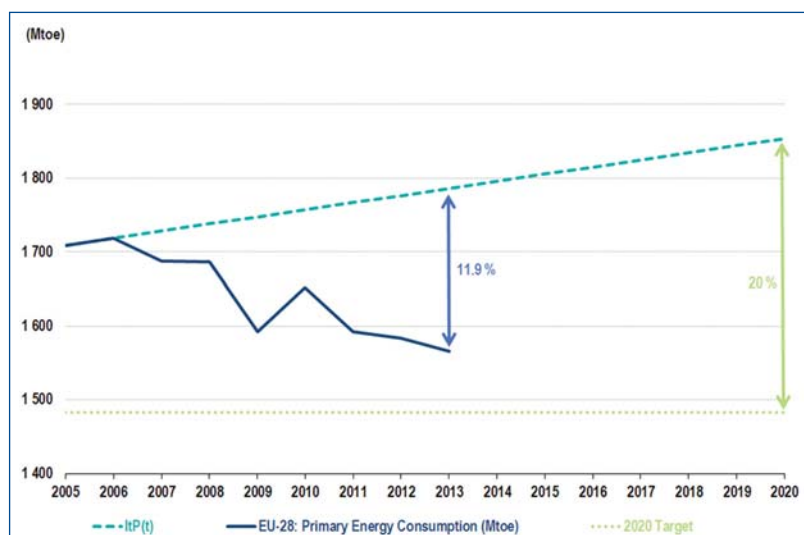
There are concerns that abandoning the principle of priority of dispatch could start to cause problems in times of overcapacity — if the grid is too congested, then the flexibility of renewables means that they could be the first to be curtailed.

Energy efficiency first

The Energy Union operates under the principle of "energy efficiency first" but the target has long been the subject of conflict. In 2014, the European Council agreed a 27% energy efficiency target by 2030, with a review before 2020. After the impact assessment results, the European Commission agreed to increase the target to 30%.

The proposal says that Member States should continue with the previous pathway of achieving the overall target through incremental improvements of 1.5% per year. This would be sufficient, the document says, to take the EU to — but not beyond — the 30% objective. According to the impact assessment, the 30% target will lead to a €9bn increase in energy system costs compared to the 27% target.

However, it'll make this back in the long run, as the same amount would be saved as a result of the higher target between 2021 and 2050.



Source: Carbon Brief, 2016

Figure 4: Energy efficiency progress towards objective in the EU

For many, the 30% target is still not enough. The European Parliament has called for 40% energy efficiency target by 2030, saying this would result in net savings of €239bn per year on energy bills.

Bioenergy

Bioenergy has triggered a heated debate in the EU for the past 8 years due to the sustainability criteria of biofuels mostly. By 2020, bioenergy is expected to contribute 57% of the EU's total renewable energy, but there are serious concerns about whether considering fuels from well to wheel the alternative is much more sustainable than fossil fuels.

The revised legislation proposal introduces new sustainability criteria

for bioenergy production, including new rules aimed at ensuring forests are harvested sustainably and conservation areas are protected. It also establishes new thresholds for the amount of GHG emissions that must be saved by switching to biofuels.

Governance

While the EU has set region-wide targets for 2030, there are no individual targets for Member States for renewable energy or efficiency. The EU has proposed new governance regulations to ensure that the targets are met.

If it looks like the EU is off-track for its emissions, renewables or efficiency targets, then the European

Commission will be able to issue recommendations to Member States to ensure targets will be met. Examples of actions that could be taken include financial contributions by Member States that could be used to support new renewable energy projects across the EU.

Conclusion

Reforming EU's electricity market should not be seen as an isolated action, but as a cornerstone of the EU's climate and energy strategy.

The clean energy transition should be ambitious, so that Europe can lead again the fight against climate change and benefit all European citizens.



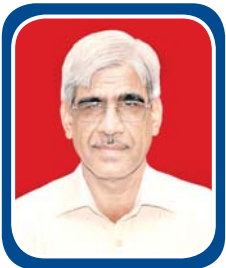
Opportunities of Multiproduct Generation from high ash Indian coal through Gasification



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Introduction

Energy is a key indicator of growth and productivity. The current per capita energy consumption in India is almost one third of the global average per capita, but driven by the rising population, expanding economy and societal quest for improved quality of life. It is an acknowledged fact that fossil fuels will continue to dominate the energy mix of the country, and 'opportunity', resources will be required. With the increasing shortage of natural gas and crude oil in India, coal provides a viable alternate feedstock for energy and chemicals.

As far as India is concerned, it is imperative that future developments be based on abundant reserves of lower grade non-coking coals.

According to the US Energy Information Administration, the current and projected world prices (nominal 2007 US\$) of low-rank coal are significantly lower than the competitor fossil fuels (Figure 1). This feedstock differential cost between low-rank coal and natural gas is the key business opportunity driving the use of low-rank coal as an economical replacement for natural gas in an existing (or new) plant.

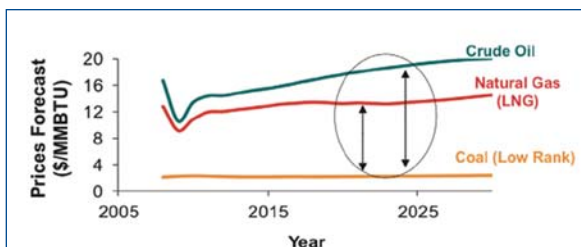


Figure 1. Current and projected global prices of fossil fuels



At present, coal accounts for 55 % of India's and 28 % of the world's primary energy mix. In India, Coal reserves are available in Jharia underground mines (Jharkhand), North Karanpura, Korba mines, Singrauli, Talcher, Gopalpur, Raniganj, Bokaro, etc. Indian coal has the advantage of relatively low sulphur content. One problem with Indian coal is that, it has a much higher average ash content (33-50%) and lower average calorific value, however it is highly reactive in nature, which can be gasified at moderate temperature gasification process, like fluidised bed gasification.

Multiproduct generation from coal

In India, currently, 75% of domestic coal is used for power generation, 6% for the cement industry, 5% for the steel sector and 14% for other industries. To utilise coal for chemicals or fuels or petrochemical feed stock, the first step is gasification of coal to synthesis gas. Technologies for converting synthesis gas, are well developed and have been in use for a long time. Of these, SNG, methanol etc. has great potential, since it can be directly utilised as in fuel, or

methanol can be easily converted to dimethyl-ether (DME), which can be a substitute for LPG. Also it can be converted to light olefins, ethylene and propylene. There is also an opportunity through coal-to-liquids conversion technologies (via gasification & Fischer-Tropsch routes) to use widely available reserves of coals to partially replace imports of oil for the production of transport fuels. As shown schematically in Figure 2, Syngas is a precursor to an extensive range of energy and chemical products.

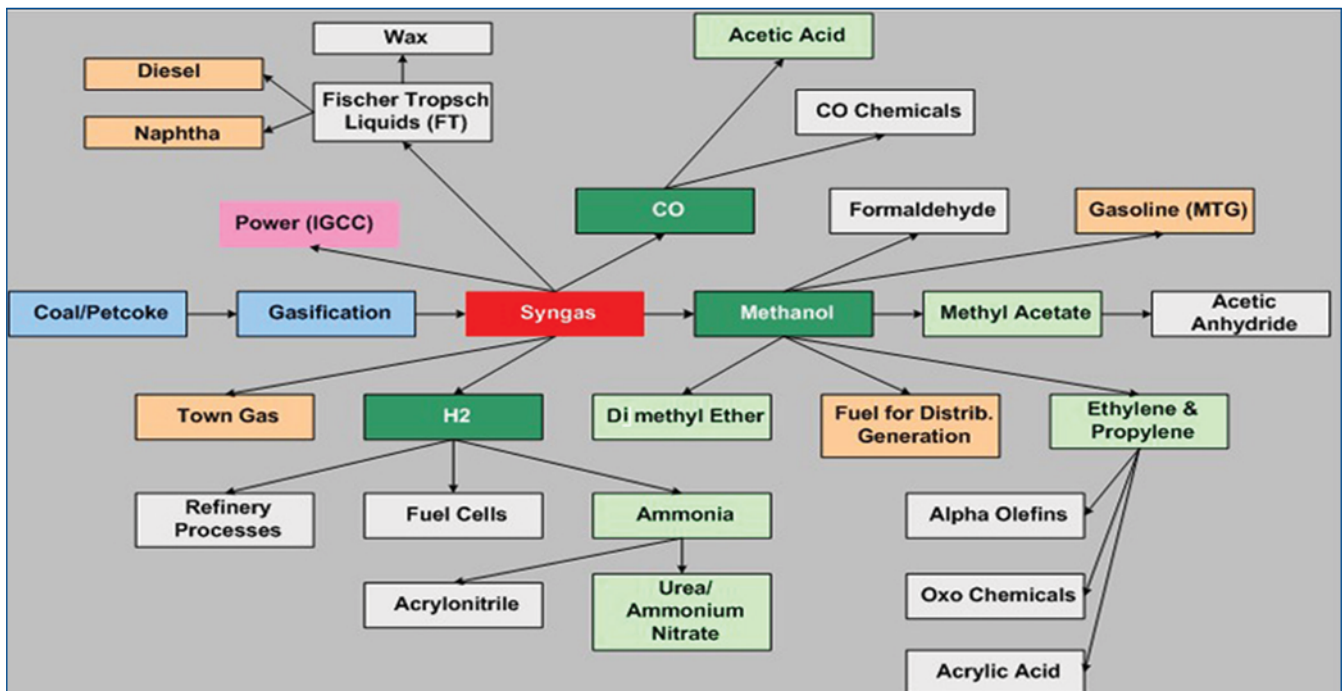


Figure 2: Multi-products from coal gasification

a) Coal to liquid fuels

Both the Fischer-Tropsch and Methanol to Gasoline (MTG) processes convert coal into synthesis gas before converting it to the final liquid products. However, their respective product slates are very different. The Fischer-Tropsch process produces a broad spectrum of straight chain paraffinic hydrocarbons that require upgrading to produce diesel fuel, lube feedstock and paraffinic naphtha for petrochemical applications. In contrast, MTG selectively converts methanol to one simple product: a very low sulphur, low benzene

high quality gasoline. Due to the unique low sulphur and low benzene characteristics of the MTG gasoline product, it can be a valuable blending component for meeting environmental regulations specific to sulphur and benzene. Due to decline in crude oil prices this option must be evaluated with respect to competitive feedstock.

b) Coal to Substitute Natural Gas (SNG)

Factors that drive for Substitute Natural Gas (SNG) from coal

- Natural gas consumption is significant

- Demand outpacing production
- India - fourth largest LNG importer
- Imports expected to rise ~30% in 2015
- National coal reserves is the key
- Costly LNG import substitution
- Easy to implement- Technology well developed
- Conventional fuel - Infrastructure already in place

Natural gas demand is growing at an average of 6.8% /year. The expected growth is shown in the table 1:

Table 1. Source wise supply of Natural Gas

MMSCMD	2012-13	2016-17	2021-22	2026-27	2029-30
Domestic sources	101.1	156.7	182	211	230
LNG Imports	44.6	143.0	188	214	214
Gas Imports (Cross-border pipeline)	0.0	0.0	30	30	30
Total	145.7	299.7	400	454	474

(Source- Vision 2030 Natural Gas Infrastructure in India)

Coal to Chemicals- Methanol and Dimethyl Ether (DME)

Methanol and Dimethyl Ether (DME) are emerging as alternative liquid fuels for transportation. While methanol could be used directly or blended with Gasoline, DME is suitable for Diesel engines. Feedstock availability as well as pricing of natural gas and naphtha at competitive cost is major constraints. As a result, the industry is primarily dependent on import of methanol, the basic building block, from Middle East and China.

Current methanol consumption in India is 1.5 Million Tons per annum. The demand is growing at about 10% and is expected to continue to be met through imports. The current production and imports are shown in Table 2.

Table 2: Production, consumption and import of Methanol in India

Year	Installed Capacity	Actual production in 1000 Ton	Consumption in 1000 Ton
2013-13	474.3	254.9	1469.22
2013-14	474.3	307.26	1534.78
2014-15	474.3	209.83	1801.99

It could be seen that India has almost double production capacity than what is produced. The increase in demand is met by import, which is steadily increasing. The two major end-use segments for methanol are chemical and energy. In the chemical segment, methanol is used for production of Formaldehyde, Acetic acid, Di-Methyl Terephthalate (DMT) and a range of solvents. The consumption of methanol in the energy segment is as blending component for petrol and Methyl Tertiary Butyl Ether (MTBE), Tertiary Amyl Methyl Ether (TAME) and Dimethyl Ether (DME).

In India, the usage pattern for methanol has remained unchanged over a period of time, with formaldehyde sector accounting for the bulk of the consumption, while usage in the energy segment is not picking up.

Coal to Ammonia

Ammonia is a basis of industrial fertilizer production and accounts for 80% of natural gas consumption which is a petrochemical feedstock. India has emerged as World's largest importer of urea and second largest for ammonia; urea import running at ~8 m tonnes. Availability and price

of feedstock (gas)-a key challenge for new investments in fertiliser and chemical in the country. In China 92 % of Ammonia is produced through Coal against 0 % in India.

Commercial Attractiveness of Products from Coal Gasification Technology

Following are the comparison of product yield/benefits using 1 ton of sub-bituminous coal (Table 3). For the presented case, out of various products ammonia production through coal gasification is beneficial over gasoline, methanol, polypropylene, SNG and power.

Table 3: Commercial attractiveness of products from coal gasification technology

Product	Product/MT of sub-bituminous coal or 1600m3 (STP) Syngas	Market price	Specific revenue
Ammonia	0.98t	333 EUR/t	327 EUR
Gasoline	360l	0.685 EUR/l	247 EUR
Methanol	0.72t	333 EUR/t	240 EUR
Polypropylene	0.19t	1170 EUR/t	222 EUR
SNG (LNG competitor)	420m3	0.038 EUR/KWH	159 EUR
Power	2.4MWh	44.4 EUR/MWH	107 EUR
SNG (Shale gas competitor)	420m3	0.0009 EUR/KWH	37 EUR

(Source- Morehead, H. (2013) Siemens gasification: progress and innovation. Proceedings of the Gasification Technologies Conference, October 13-16, 2013, Colorado Springs)

In Indian context, however, the economic decisions must be based on careful evaluation of coal quality, the technology employed, source of production, end usage, cost of competitive feedstock, and policies in place, etc. along with environmental footprint in mind.

Efforts towards development of CTL technology by EIL

Despite the technology is available for coal conversion to liquid, only a few players are available who can license their technology for coal conversion especially for high ash coal. EIL in association with BPCL, M/s Thermax Ltd. and centre for High Technology engaged in development of all the components of CTL process viz. coal gasification, syngas cleaning, synthesis of transportation fuel and pilot plants of larger sizes are being installed to address the issues of CTL process.

Fluidized Bed Coal gasifier with capacity of 150 kg/hr. coal is designed

and installed at EIL-R & D centre Gurgaon. The plant consists of coal crushing & feeding system, high pressure gasifier with ash removal system, cyclones, syngas cooling systems, air separation unit, etc. for studies of gasification of coal and mixture of coal & Petcoke at high pressure. Other associated facilities like syngas cleaning system, etc. are also installed.

Conclusion

The fact that coal is the dominant energy resource in India will not change for a long time. Syngas generated through gasification of high ash Indian coal is an umbrella term for varieties of products not only power (IGCC) but also for H₂, CH₄ (SNG), transportation fuels, Methanol & Methanol based fuels, fertilizers etc. It is becoming increasingly evident that countries like India, with large reserves of coal will need to explore utilisation of coal not simply for power generation but also as a feed stock for valuable petrochemicals.

Conversion of coal to SNG is becoming an attractive option due to high natural gas prices and domestic energy security concerns. It is gaining popularity round the globe, especially in countries having substantial amount of coal reserves.

Methanol demand is growing at a robust 6 to 8 % annually. The demand for DME is also increased and much of the methanol demand is because it is used to produce DME. In India, the use of both methanol and DME as fuel component is very low at present. Currently, there is surplus production of methanol in the world but the demand in India is much more than the indigenous production.

Gasification of high ash Indian coal is the cleanest way of utilization of coal. Coal gasification always appears as an attractive option if competing energy carriers experience high price levels or national independence of energy supply plays a role. EIL along with partners is developing a fluidized bed coal gasifier for Indian high ash coal.



Withholding tax issues on payments to non-residents



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India imports major part of its oil requirements and globally ranks third in crude oil import. India's crude oil import bill is estimated to increase by 12.5 per cent from USD 64 billion in the financial year 2015-16 to USD 72 billion in the financial year 2016-17. This plays a major role in India's Gross Domestic Product (GDP).

In the recent Budget for the fiscal year 2017, Hon'ble Finance Minister announced various proposal sand measures to strengthen the present outlook of India's Oil and Gas (O&G) Industry and boost its domestic capability considering the global economic scenario. Some of the key proposals of the Budget are as under:

- Government to enhance setting-up of Strategic Crude Oil Reserves facilities

- Setting-up of an integrated Crude Oil Major that can add fire power to India's ability to aggressively build strategic reserves and enhance energy security
- Encouraging digital payments through creation of digital payment infrastructure across all fuel stations by setting up facilities for digital payments

To boost O&G Sector and to encourage domestic manufacturing, the Government of India has made several policy reforms. The Government has recently awarded contract in 31 contract areas (44 fields – 28 onland and 16 offshore) of discovered small fields (DSFs) of Oil and Natural Gas Corporation and Oil India Limited and are planning to award more blocks in due course to ensure optimum

utilization of domestic resources, boost local production and to reduce its oil imports dependency by 10 per cent by 2022.

For the purpose of undertaking oil and gas exploration, production and refining activities, O&G Companies may import technology for operations, maintenance and management of sector assets. For operating these assets, foreign technicians and experts may be deputed in India to operate or train personnel in India.

Amongst other things, analysis of jurisdictional tax is one of the key components before such technology is made available to the Indian Company or its subsidiary. Either, the Indian Company or the Foreign Counterpart is contractually made responsible for payment of taxes in India.

In this article, we have discussed few of the withholding tax issues encountered in import of such foreign technology, foreign goods or receipt of technical services.

Issues on withholding taxes

i. Determination of withholding tax on payments to non-residents

Tax is required to be withheld and deposited with the Indian Government's treasury for any sum paid or payable to a non-resident, which is chargeable to tax in India. In the event such sum is not chargeable to tax in India, in terms of the decision of the Supreme Court, no tax is required to be withheld on the payments.

Where such sums are chargeable to tax in India, the taxes are required to be withheld at lower of the rates provided under the Income-tax Act, 1961 (the Act) or rates provided under the tax treaty of the non-resident, to whom payment is to be made. The non-resident is eligible for beneficial rates under the tax treaty only if Tax Residency Certificate (TRC) is available from its resident country.

There can be circumstances, where the payments are composite in nature i.e. the foreign company may have rendered services as well as sold the goods to the Indian company. In these cases, the Indian payer would be required to ascertain the portion and the amount of withholding tax on such payments. In such situations, as per various judicial pronouncements, the payer is required to approach the tax authorities to determine the rate of taxes on the payments to be made. On analysis of the application of the payer, the income tax authorities issues certificate/s prescribing the rate at which tax is required to be deducted. Here, it is relevant to note that the recipient of income is also eligible for making an application to income tax department for determination of rate of withholding on the sums to be received by it.

The composite or business payments to foreign service provider (eligible for taxation under presumptive

tax regime) are common aspect in O&G industry. In these cases, it is incumbent on the payer to approach the tax authorities to determine appropriate rate of withholding tax. If the taxes are withheld without obtaining certificate from the income tax department, the payer can be held as assessee in default for non-deduction of tax or short deduction of taxes. This would result in levy of interest and penalty on payer (which is discussed in subsequent paragraphs).

ii. Withholding tax at higher rate in the absence of Permanent Account Number (PAN)

To strengthen the PAN mechanism, a new section 206 AA was introduced in the Act with effect from 1 April 2010. Section 206 AA starts with 'non obstante' clause to provide that any person whose receipts are subject to withholding tax in India, shall mandatorily furnish PAN to the person responsible for withholding tax (deductor). Where, PAN is not furnished, tax shall be withheld at the higher of the following rates:

- Rate prescribed in the Act;
- 'Rates in Force' (i.e. rate prescribed in the Act or rate specified in the Tax Treaty); or
- 20 per cent

Applicability of section 206 AA on various payments to non-residents

Here, it is pertinent to note that provisions of section 206 AA are not applicable in respect of payments made to a non-resident towards interest on long term bonds and royalty, interest, fees for technical services and payments on transfer of any capital asset subject to furnishing of TRC and other prescribed conditions.

Litigation around section 206 AA on applicability of tax treaty benefit

As the aforesaid section prescribes for withholding tax rate in excess of beneficial provisions of the tax treaty, the application of the aforesaid section was challenged before various tax authorities and tribunals. Some of the key issues of litigation are as under:

- a. Whether Section 206 AA overrides provisions of the tax treaty?
- b. Whether Section 206 AA shall apply where the income is not taxable under the provisions of tax treaty, but taxable under the Act?

Recent Ruling of the Tax Tribunal in the case of Nagarjuna Fertilizers & Chemicals Ltd. has analysed the aforesaid aspects and held that:

- If the withholding rate under the tax treaty is lower than the rate prescribed under section 206 AA, tax to be withheld at such lower rate even if the non-resident has not furnished his PAN
- Tax treaty override Section 206 AA to the extent the section is inconsistent with tax treaty
- Obligation to withhold tax arises when there is a sum chargeable to tax. Income charging provisions control and override the machinery provisions of section 206 AA

Thus, the Tribunal decided that the payer can deduct tax under the beneficial provisions of the tax treaty. Here, it is pertinent to note that though aforesaid ruling is beneficial to the tax payer, the tax department can still challenge the ruling before the higher Courts and thus the deductor needs to be cautious of this aspect.

iii. Lower withholding rate on interest on External Commercial Borrowing

Indian companies, who have obtained External Commercial Borrowings in foreign currency, are liable to withhold tax at a concessional rate of 5 per cent on the payment of interest, subject to fulfillment of certain conditions. The Finance Bill, 2017 has also proposed to extend the benefit of concessional rate of withholding tax of 5 per cent to interest payments in respect of Rupee Denominated Bonds (RDBs) issued outside India.

It is important for the O & G companies seeking debt from outside India to analyse that the conditions for availing concessional rate of withholding tax on interest is satisfied.

iv. Withholding tax on reimbursements

Reimbursements to Group companies

Typically, foreign holding companies enter into several inter-group arrangements with its Indian subsidiary to provide onshore or offshore supply of materials and services for extraction, production or other operation.

These services are provided either by itself or through other entities. In these cases, it is typically claimed that reimbursement of expenses cannot be treated as income in the hands of the recipient and hence withholding tax provisions do not apply on such reimbursements.

In certain circumstances, the Indian subsidiary receives services from its global holding company abroad and payment to such holding company is routed through its immediate holding company or any other group company abroad by way of reimbursement. In this case, withholding tax may continue to apply as if the Indian Company has made payment to such Global holding company.

Withholding tax aspect also needs to be analysed with respect to cost allocations received from the group companies. The tax authorities in India typically allege that such cost allocation may have certain profit element and hence such cost allocations needs to be taxed in India either as royalty or as fees for technical services.

In the aforesaid scenario, it is important for the companies to maintain documentation that reimbursements to foreign companies do not involve any profit element and thus these reimbursements are not taxable in India.

Reimbursements to services providers

There is also litigation involved with regard to whether withholding tax provisions will apply to reimbursements made to foreign service providers, who are taxable under presumptive tax regime. One possible interpretation is that reimbursements are not the income of the recipient and hence withholding tax provisions do not apply on these reimbursements. However, the tax authorities do take a position that the reimbursements do form part of gross receipts of the foreign company for computation of presumptive taxation and hence withholding tax needs to be deducted on such amounts.

O&G companies are required to study the reimbursement arrangements carefully in each of the case and need to analyse withholding tax implications on the basis of fact pattern in each case.

Other compliance issues

i. Requirement of Tax Deduction Account Number (TAN)

For the purpose of withholding tax and depositing the same with the Government, the deductor is required to obtain a TAN in India. TAN is also required for filing withholding tax returns.

ii. PAN of the person responsible to deduct tax

PAN of the deductor is mandatory for filing withholding tax returns and at the time of generation of withholding tax certificates. This is applicable even in the case where the deductor is a foreign national.

iii. Refund of excess tax deposited with the Indian Government Treasury

The Finance Minister, in the Budget 2017, has proposed to grant interest at the rate of 0.5 per cent per month on withholding tax refund. There may be occasions where tax was deposited at a higher rate pursuant to the provisions of section 206 AA of the Act or because of any other reasons. This excess deposited amount can be claimed as refund from the Government along with interest.

Consequences for non-compliance of withholding tax provisions

i. Levy of interest and penalty

Deductor is responsible to withhold tax on sums chargeable to tax and deposit the same within the prescribed time with the Government Treasury. The Act provides for levy of interest for non-withholding / short withholding or non-deposit of such tax with the Government as under:

Defaults	Rate of Interest	Duration for which Interest is Levied
Non-withholding of tax / short withholding of tax	1 per cent per month	From the date when the tax is required to be withheld to the date when the tax is actually withheld
Non-deposit of tax	1.5 per cent per month	From the date when the tax is withheld to the date when the tax is actually deposited

The Tax Authority may also levy penalty for non-compliance of withholding tax provisions. The penalty can be in the range of 100% to 200% of the amount of default.

ii. Consequences for non-deposit of withholding taxes

The Act provides for initiation of prosecution proceedings in case where the taxes withheld by the deductor is not deposited with the Indian Government Treasury. The Prosecution proceedings are criminal proceedings in terms of which the defaulter can be liable for punishment of rigorous imprisonment which shall not be less than three months but which may extend to seven years. In case of a company, depending upon the factual pattern, prosecution proceedings can be initiated

against the directors of the company or against the person responsible for withholding tax compliance. The deductor may be liable for prosecution irrespective of the period of retention of such tax by the deductor.

Presently, the tax department has been issuing notices to deductors for default in withholding tax payments. In addition, the Central Board of Direct Taxes has directed to the tax department for spot verification or survey based on the compliance background of the deductor where withholding tax payments in the current year are lower than 15% of withholding tax payments in previous year .

The deductor may file an application for compounding of defaults in deposit of withholding

taxes pursuant to the prescribed guidelines and by making payment for taxes, interest, penalty and compounding fees.

Considering the contentious withholding tax issues associated with the payments to non-residents, it is necessary to streamline the withholding tax compliance procedures by the O&G Companies. The O&G sector deals with various grey areas with regard to the taxability of the recipient on account of supply of material and services, issues of permanent establishment, attribution of profits, etc. Considering the time and cost involved in the litigation, it is important to comply with the procedural issues within the prescribed time and manner. Standard Operating Procedures, internal checks, independent reviews should be introduced into the system to keep a check on the compliance procedures.



Performance Optimization of Tail Gas Treating Unit by Eng SulFTG Technology by

Venkata Srinu G, Saptarshi Paul, Karthik B & Sheoraj Singh
Engineers India Limited

Refineries are facing growing challenges in meeting stringent SO_x emission restrictions imposed by the environmental agencies. In this regard, sulphur recovery units (SRU) are often targeted directly by SO₂ emission limits imposing sulphur recovery efficiencies in excess of 99.9 wt%. It requires dedicated Tail Gas Treatment Units (TGTU) at the downstream of sulphur recovery unit to meet this ultra-low SO_x emission standards.

There are number of technologies being used for removal of sulfur species from Claus tail gas such as Liquid Redox Process – CATSOL, Sulphur Oxide Removal (SOR) process, amine based Tail gas treating unit (EngSulFTG). Liquid Redox Process – CATSOL, licenced by EIL, converts H₂S to elemental sulfur directly in presence of metal chelates. Figure 1 depicts schematic diagram of a typical liquid redox process.

Even though this process is highly flexible to process wide variations in H₂S concentration in the feed gas, it produces sulphur of low quality and has high operating cost, thereby causing limitation to use this technology for higher capacity plants.

SOR (Sulphur oxide removal) process, licenced by EIL, captures SO_x from

incinerator off gas by using proprietary amine solution, and returns SO_x to main combustion chamber of sulfur recovery unit. Figure 2 depicts a schematic diagram of SOR process.

Although the process provides 99.9 wt % sulphur recovery, the major problem of this unit is low pressure of incinerator off gas and use of high cost blower to drive the gas to the unit. This process has wide acceptance in metallurgical industries for removal of SO_x from flue gases which is used in the production of sulphuric acid.

The most common technology in industries for treating Claus tail gas is amine based treating technology such as EngSulFTG technology. The technology has been developed and commercialized by EIL. The process has unique features in its adaptability to different configurations of sulphur recovery units and has high operational flexibility. This paper describes EngSulFTG process, novelty of the process, industrial application with different SRU configurations and EIL's capability towards implementation of this technology.

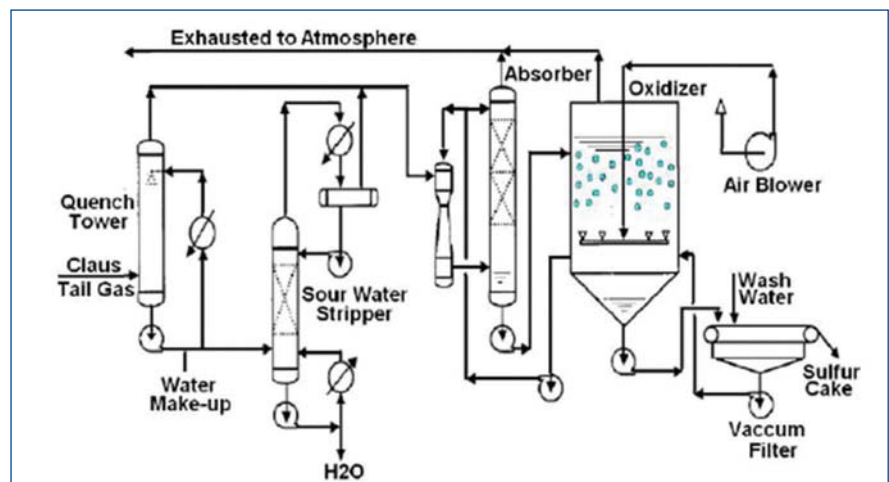


Figure 1: Schematic diagram of tail gas treatment using liquid REDOX process

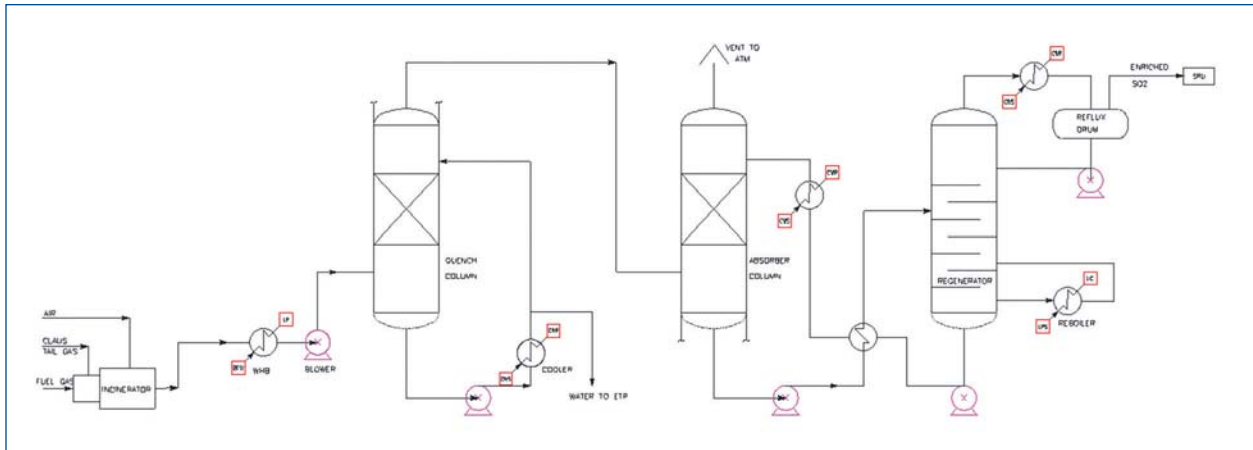
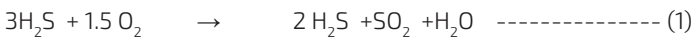


Figure 2: Schematic diagram of SOR Process

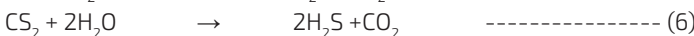
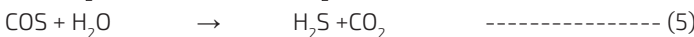
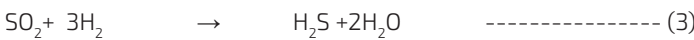
EngSulfTG Process

In refineries, Claus based sulphur recovery unit processes H₂S formed by sulfur contained in the crude feedstock. The SRU relies on the modified Claus process to convert H₂S to sulphur, H₂S reacts with SO₂ to form elemental sulphur by the following reactions,



Reaction (2) is thermodynamically limited, so conversion in the initial thermal stage is limited to about 50-70%. The conversion is pushed further in catalytic stages. Typical SRU configurations include two or three catalytic stages which usually allow overall conversion of 96-98 wt%. The Claus tail gas from final condenser contains ~4 wt% of unreacted sulphur species mainly in the form of H₂S, SO₂ and some other components like COS and CS₂ in less quantity. Since, SO_x emission is regulated by environmental agencies to achieve 99.9 wt% of overall sulphur recovery, the Claus tail gas is subjected to tail gas treating unit for removal of sulfur bearing components.

Designers often encounter problems in design of tail gas treating unit because tail gas from SRU has very low pressure. In tail gas treating unit, the gas is first heated up before hydrogenation of sulfur species to H₂S in additional reactor. The following reactions takes place.



All these reactions are carried out in presence of sulphided Co-Mo catalyst. EngSulfTG uses low temperature catalyst, which reduces heat load of tail gas preheater. Since the reactions are exothermic in nature and water is formed from the reactions, the tail gas passes through tail gas waste heat boiler and quench column for recovery of water and heat. EIL's developed packing is used in the quench column and amine absorber column. The packing provides effective mass transfer during phase change at minimum pressure drop.

In some cases where the gas does not have sufficient pressure, dedicated blower is provided to drive the gas in amine absorber. Figure 3 and figure 4 depict schematic flow schemes of tail gas from two stage Claus unit and three stage Claus unit/MCRC based SRU respectively.

Process gas from quench column is treated in amine absorber by using MDEA solution (40-45wt %) before its burning in incinerator. The rich amine is regenerated in amine regenerator after heating to the desired temperature in lean rich exchanger. EngSulfTG maintains ultra-low lean amine loading for optimized operation of amine absorber and regeneration section.

Novelty of the process (EngSulfTG)

EngSulfTG has number of benefits with respect to installation and TGTU operation.

- Grass root 2 Claus SRU integrated with EngSulfTG based TGTU ensures 0.35 kg/cm²g pressure of the Claus tail gas required to overcome a pressure drop of 0.25 kg/cm² in TGTU and provides smooth functioning of TGTU.
- Revamp of existing CBA or MCRC based Claus unit for implementation of TGTU encounters pressure problem because of ultra low pressure of tail gas. To avoid major shutdown, EngSulfTG can be integrated with existing SRU by installing dedicated tail gas blower.

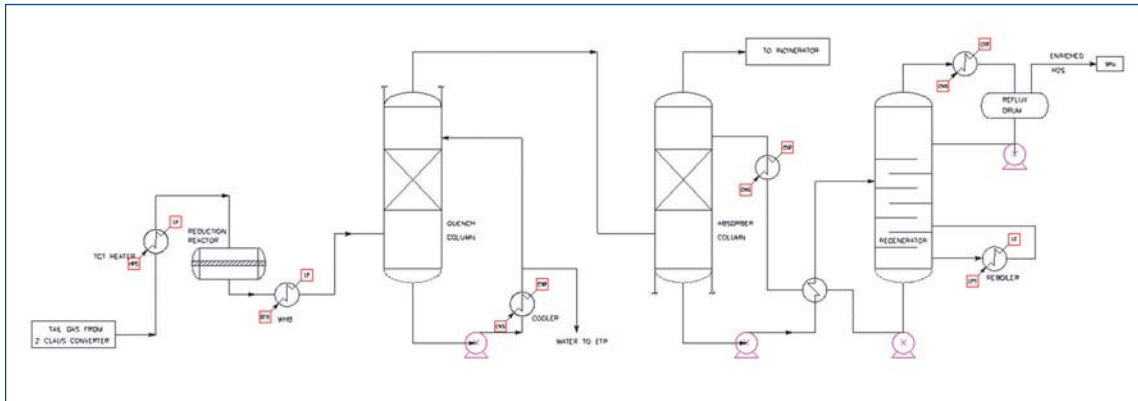


Figure 3: Schematic diagram of TGT section to process tail gas from 2 Claus SRU

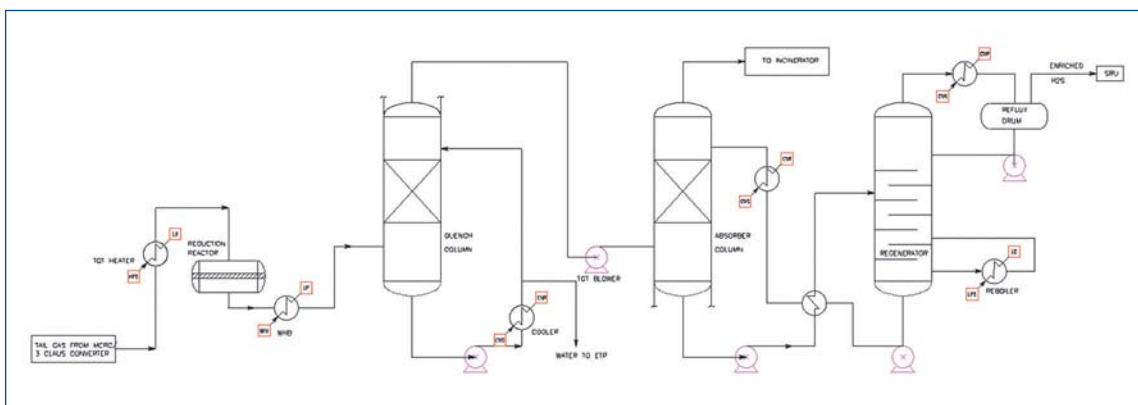


Figure 4: Schematic flow diagram of tail gas from MCRC/ three stage Claus unit

- Operation of TGTU depends on the tail gas pressure drop across the unit. EngSulfTG uses EIL's proprietary packing in both quench column as well as amine absorber for low pressure drop.
- It is a common problem in TGTU that the quench column bottom gets substantial sulfur formation due to slippage of SO₂ from hydrogenation reactor. EngSulfTG uses caustic dosing to quench column for pH neutralization to prevent sulphur formation.
- In the process the quench column and amine absorber are stacked together for space conservation and minimize piping.
- The process uses low temperature catalyst which has good activity towards hydrogenation of SO₂, S_x, as well as towards hydrolysis of CS₂ and COS. Therefore, any additional COS and CS₂ formation in reaction furnace of SRU can also be processed in TGTU.

- The process can also use amine from existing amine treating units, which saves capital cost for TGTU installation.

Industrial Applications

EngSulfTG has been used in commercial level for revamp of existing SRUs and grass root units. The first grass root TGTU unit has been integrated with two Claus sulfur recovery unit having capacity of 10 TPD. The unit uses amine from refinery amine treating unit. Overall sulphur recovery has been improved from 96 to 99.9 wt%. The same design has been implemented for grass root units of SRU capacity- 20 TPD and 185 TPD, at two different Indian refineries.

In one of the revamp cases, EngSulfTG based TGTU has been integrated with MCRC based SRUs having capacity of 160 TPD and 90 TPD respectively with the overall sulphur recovery of 99.9 wt%. The plant has been designed under vacuum condition for quench column and its downstream equipments. The tail gas blower

installed downstream of quench column pushes the gas at positive pressure into amine absorber.

Even at vacuum operation of hydrogenation reactor, extent of hydrogenation and hydrolysis reactions are not affected. In another revamp case, the existing CBA based SRU originally having four reactors has been modified to two Claus based SRU configuration before its integration with TGTU, to enhance the sulfur recovery from 99 to 99.9 wt%.

The temperature profile across TGTU is shown in figure 5 for grass root and revamp units. It shows that the temperature profile remain identical in both the cases because the inlet temperature and gas composition of the tail gas are remained same.

Figure 6 shows the pressure profile across the unit. It is interesting that in revamp case, the pressure across preheater, hydrogenation reactor, waste heat boiler and quench column are under vacuum. However, the pressure is increased for absorption of H₂S in amine. All these equipments are designed with full vacuum.

EIL's Experience

EIL has designed number of sulfur recovery units and tail gas treating units. EIL provides technical support in conceptualization of tail gas treating unit for existing SRUs and design of grass root TGTU and also technical support towards detailed engineering, procurement, installation, pre-commissioning, and commissioning. Use of in-house simulator for design and monitoring/ optimization of TGTU is an additional benefit.

Conclusion

In order to meet stringent environment regulations, refineries require tail gas treating unit as part of sulfur recovery unit to meet SO_x emissions standards. Different technologies like CATSOL, SOR are offered by EIL for this purpose. However, EngSulfTG is one of the most techno economically viable process for this application. It can be retrofitted to the existing SRUs at minimum shutdown and minimum modification of existing units. In addition, major

operating issues are resolved by this technology through usage of caustic to counter sulphur formation in the quench column, low temperature catalyst for energy saving, proprietary packing in absorber and quench column for low pressure drop, use of stack for space conservation.

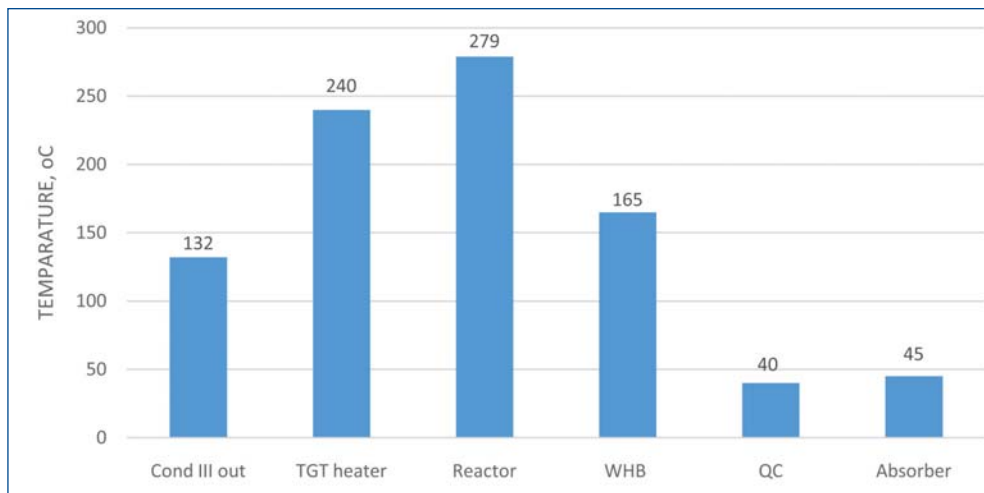


Figure 5: Temperature profile for grass root and revamp TGTU

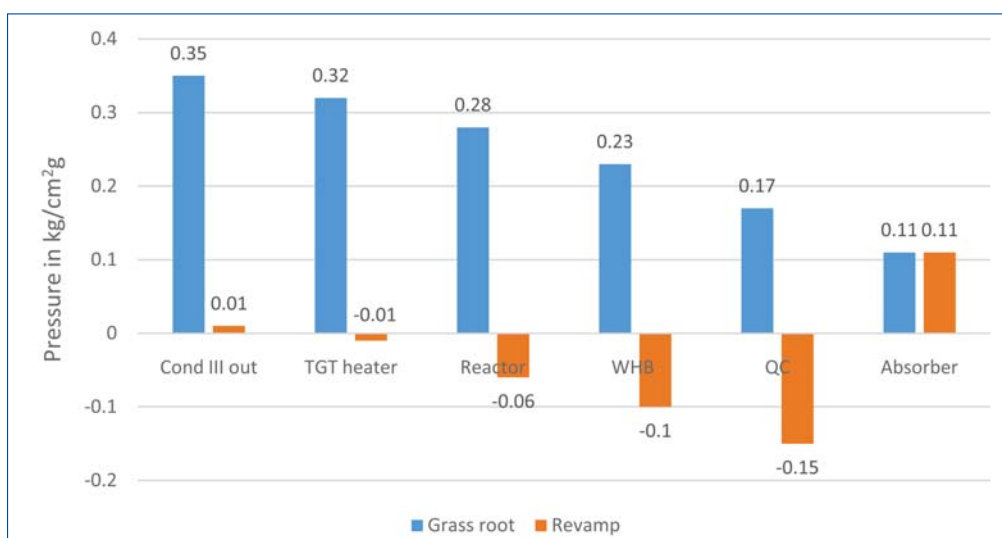


Figure 6: Pressure profile for grass root and revamp TGTU

रुडयार्ड किपलिंग ने
उन्हें अपनी कल्पनाओं
में बसाया और अब हम
उन्हें बसा रहे हैं,
एक नए परिवेश में।



“ओएनजीसी बारासिंघा (ईस्टर्न स्वैम्प डीअर) संरक्षण परियोजना”
एक दुर्लभ प्रजाति को विलुप्त होने से बचाने के लिए
ओएनजीसी की सीएसआर पहल।

असम में पाये जाने वाले बारासिंघा या ईस्टर्न स्वैम्प डीअर (*Rucervus duvaucelii ranjitsinhi*) आज विलुप्त होने की कगार पर है। प्रसिद्ध लेखक रुडयार्ड किपलिंग ने जिस से मंत्रमुग्ध हो कर उसकी सुन्दरता को अपनी दूसरी किताब 'द सेकंड जंगल बुक' में कैद किया हो, उस जीव के लिये यह काफी दुखद स्थिति है।

ओएनजीसी ने इस प्रजाति को विलुप्त होने से बचाने के लिये अपने कदम बढ़ाये, और वो भी बिल्कुल सही समय पर।

इसके पहले चरण के अन्तर्गत इनकी अनुमानित आबादी, अनुकूल पर्यावरण, पशु-चिकित्सा अंतःक्षेप एवं सामान्य अध्ययन और जागरूकता अभियान किया गया। इनके स्थानांतरण के लिये मानस राष्ट्रीय उद्यान को चुना गया, जो इनके रहने के लिये बिल्कुल उपयुक्त स्थान था।

काजीरंगा राष्ट्रीय उद्यान से 19 बारासिंघो को मानस में स्थानांतरित करना बहुत ही कठिन काम था। योजना के इस अत्यंत कठिन दूसरे चरण को दक्षिण अफ्रीका से बुलाये गये वन्यजीव विशेषज्ञों ने बहुत खास तरीके से अंजाम दिया। 19 बारासिंघो का स्थानांतरण खास तंबुओ में किया गया, जिनको अन्दर से उनके प्राकृतिक आवास जैसा ही बनाया गया था। कुछ ही महीनों में 6 नवजात बारासिंघो ने झुण्ड में जुड़कर, स्थानांतरण की खुशी को दुगना कर दिया।

इस योजना के विस्तार के तीसरे चरण के अन्तर्गत 20 अतिरिक्त बारासिंघो का स्थानांतरण किया जा रहा है।

यह परियोजना संतुलित पर्यावरण की ओर ओएनजीसी की एक शुरुआत है। लुप्तप्राय प्रजातियों का संरक्षण करने के लिये प्रेरित, हमारा संगठन प्रकृति की असली सुंदरता को बनाये रखने के लिये प्रतिबद्ध है।



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Budget 2017 – Boon or Bane for Oil and Gas Sector?



Hemal Zobalia

Partner with
Deloitte Haskins and Sells LLP

India has an overwhelming dependence on fossil fuels, particularly on coal, which caters to 58% of primary energy. Although the country has ample reserves of thermal coal, due to environmental concerns and our commitment to the 2015 Paris Climate Conference, the government has been trying to diversify sources of energy. Currently, we import 80% of our oil and almost 50% of our gas requirements. Given our low per capita consumption and our expected energy growth, India has been identified as the fastest growing oil and gas consuming countries in the world by all major energy forecasters.

BP Statistical Review of World Energy expects that by 2035, India's oil consumption growth will be the fastest among all major economies. Given India's dependence on oil and gas, government has taken several



Pankaj Bagri

Director with
Deloitte Haskins and Sells LLP

steps in recent Budget to increase domestic production of oil and gas and secure resources abroad for energy security.

PSU merger

To help make these investments, in the Budget, the Government announced creation of an integrated oil company. In his Budget speech, Union Finance minister emphasised that possibilities of restructuring are visible in the oil and gas sector. "We propose to create an integrated public sector oil major which will be able to match the performance of international and domestic private sector oil and gas companies. Merging the existing oil and gas companies will give them "capacity to bear higher risks, avail economies of scale, take higher investment decisions and create more value for the stakeholders," he said.



Shailvi Singhal

Manager with
Deloitte Haskins and Sells LLP

In a recent interview, Oil Minister Dharmendra Pradhan said that "the government was looking at the option of creating multiple integrated state oil companies, not just one large firm. It is an in-principle decision taken by the government to develop a few integrated state oil companies, which will have better risk management capacity and the clout to compete in international markets."

Although the details (having one larger company or multiple integrated oil companies) are awaited, the pros and cons need to be studied. There are definite advantages of creating a large company which will have a larger balance sheet to absorb major risks and price variations. However, challenges will remain on governance processes.

On the one hand, combining some or all of these companies into a single major entity would give them the ability to bid for major exploration and production assets in India and overseas as size does matter, especially in the oil and gas industry where capital investments tend to be huge, and the risks, even higher. The merged entity or entities will have greater risk appetite and the ability to negotiate better with bundled service offerings in the competitive international market. On the other hand, the proposal to merge has raised doubts and triggered scepticism. As is known, PSUs operating in the oil sector have multiple stakeholders (including central and state govt.) and while the idea is certainly commendable, the key challenge will be integration issues especially on the human resources side. The government will not only be required to overcome cultural differences among PSU enterprises, but also reach consensus among various stakeholders. Balancing the expectations of all stakeholders and the management in formulation of the roadmap would be the key challenge to this decision.

Interesting to note, the Budget's plan for single integrated oil PSU is a decade-and-a-half old proposal. It was considered twice in the past by two previous governments. Both time, on recommendation of select committees, the idea of forming an oil giant, was scrapped saying it will not only create market monopoly but also affect the efficiency created by individual companies. In past, the idea of a merger also faced strong opposition from management of PSUs. It is important to consider that in the last decade-and-a-half, since the idea was promulgated, the business nature of the PSUs has undergone a sea change. In some cases, the PSUs have also ended up in closely competing with one another or creating duplicative assets. Further, the geographical influence and size of balance sheet of these organizations has also shown different growth rates. Thus, it is an important consideration to thoroughly evaluate the merits of status-quo vis-à-vis creation of integrated entity or entities.

Globally, the concept of state-owned oil majors is well known, which confers quite a few advantages to the stakeholders. However, as one says, devil lies in the details. It would be critical to articulate the benefits of merger, identify PSUs that can be integrated to deliver the benefits, develop a vision of new set-up, chalk the roadmap and finally most critical would be to weave the threads to create a new fabric!

Other policy announcements

The government also announced setting up of two new strategic oil reserves to enhance country's energy security, taking strategic reserve capacity to 15.33 MMT. Increasing the strategic oil reserve to 15.33 MMT will create stock of almost a month to meet emergency requirements.

In its attempt to diversify its energy sources, government is trying to increase share of gas in the economy from current 6.5% to 15%. As a symbolic step, the government has reduced BCD on LNG from 5% to 2.5%. Reducing duty on LNG is an indication that the government wants to encourage use of cleaner fuels. However, they could have waived off the duty altogether. Cutting the import duty by half is not going to make much of a difference in the landed price for consumers unless matched by an increase in duty on polluting fuels.

To provide connectivity of gas in eastern India and incentivize industrial and fertilizer plants in the region, the government has agreed to provide 40% monetary support of capital cost to GAIL for implementation of Jagdishpur- Haldia pipeline of almost 1,850 km. Under the Pradhan Mantri Ujjwala Yojana launched on 1 May 2016, the OMCs have provided 16.6 million free LPG connections to below poverty line (BPL) families as of January 2017, increasing the overall coverage of LPG to 70%.

Government has promoted production of biofuels in India by promoting production of ethanol from non-food feedstocks. Various online initiatives has been introduced for cashless payment for petroleum products including petrol, diesel, LPG and even PNG.

Tax proposals

Corporate tax rate for Financial Year (FY) 2017-18 remains unchanged @ 30% plus surcharge and education cess for domestic companies [except for Small & Medium Enterprise (SME) companies]. Corporate tax rate for FY 2017-18 proposed to be reduced to 25% plus surcharge and education cess for SME companies with turnover or gross receipts not exceeding INR 500 million in the FY 2015-16. The proposed effective maximum marginal rate for such Indian SME companies would be 28.84%.

In line with India's strategic national interest, the government has been building underground storage facility for storage of crude oil. Finance Act 2016 exempted income arising to foreign companies from storage in such facilities and sale of crude oil to Indian companies. Exemption is now proposed to be extended to sale of leftover stock of crude oil, if any from a facility in India even after expiry of the said agreement or arrangement subject to fulfilment of conditions as may be prescribed.

It is proposed to tax income by way of transfer of carbon credit at the rate of 10% (plus applicable surcharge and education cess) on gross basis. This provision is likely to put an end to controversy of taxability of carbon credits. The long standing demand of companies of abolishing MAT is not met in this Budget. Though, interim relief has been proposed, i.e. to extend the time period for carry forward of MAT and AMT credit from existing 10 assessment years to 15 assessment years. Considering that, most of the companies, which are availing tax holiday and not able to utilize the MAT credit post expiry of tax holiday, would likely to be benefitted from this.

To attract foreign borrowings, currently, concessional rate of 5% is applicable on interest payable on borrowings made before July 2017. Eligible period for the concessional rate is proposed to be extended in respect of borrowings made before July 2020. The proposed extension would encourage foreign lenders to put more debt funding in India and therefore, provide ease in raising funds by oil and gas sector.

Similarly, to give effect to the Press release dated 29 October 2015, a concessional rate of 5% is extended to interest on rupee-denominated bond issued outside India.

Thus, in view of liberalized provisions and concessional rates, it shall enable sector to raise foreign funds with better interest rates.

In line with the Base Erosion and Profit Shifting plan, provision of limit on interest deduction have been introduced. Where debt has been issued by non-resident associated enterprises (AEs), the maximum amount of interest deductible would be total interest less 30% of earnings before interest, tax and depreciation or actual AE interest, whichever is less. The rule also seeks to cover soft lending / guarantee by associated enterprises to third parties.

Against the industry demand, General Anti Avoidance Arrangement Regulations (GAAR) are not deferred and continue to be effective from FY 2017-18. Other provisions such as determination of residency of foreign companies on the basis of Place of Effective Management (POEM) and Income Computation and Disclosure Standards (ICDS) are also applicable from assessment year 2017-18. In view of the same, oil and gas sector would be required to evaluate their existing legal structures, funding instruments

etc. to ensure the applicability of the above provisions and tax consequences thereof.

The Budget has also proposed to rationalize time limits of assessments, re-assessments, re-computation and search assessments. It is also proposed to reduce the time limit of filing revised tax return to one year from end of financial year (from existing two years).

From transfer pricing perspective, Budget has introduced Secondary Adjustment by re-characterizing the primary transfer pricing adjustment, as a deemed advance made by the assessee to the associated enterprise in case the excess money is not repatriated to India within the prescribed time, leading to imputation of notional interest. Thus, in case of transfer pricing adjustment, companies would be required to bring back the money within prescribed time to avoid any notional interest and consequent taxes.

On indirect tax front, government re-affirmed its commitment to introduce the Goods and Services Tax (GST). Based on recent developments and commitment, it is likely to be effective from July 2016. Research & Development Cess, as levied on import of technology, is proposed to be repealed from 1 April 2017. Standard ad-valorem rate for Excise and Customs duty is maintained and there

is no change in the headline rate for Service Tax.

Condition No. 40 A corresponding to Entry No. 357 A of the Notification No. 12/2012 – Customs has been amended to resolve the ambiguity with regard to demand of customs duty on unused, surplus or obsolete goods for oil and gas exploration, which were imported by claiming full exemption from BCD. In view of this amendment, such unused, surplus or obsolete goods can be disposed off on payment of applicable customs duties, on the depreciated value calculated as per straight line method (subject to depreciated value not being less than 30% of the original value) of such goods.

Sum up

On an overall basis, the Budget provision offers substantive promises to oil and gas sector. However, as has been seen with earlier Budgets, more detailing is required for implementation/delivery mechanism and follow-up of the Budget promise.

Creation of an integrated oil company is a major step. However, it needs to be ensured that we do not end up creating a large inefficient behemoth. Considering the resources involved in terms of time and wealth, the pros and cons of such a move needs to be assessed carefully.





Lucky Nurafiatin

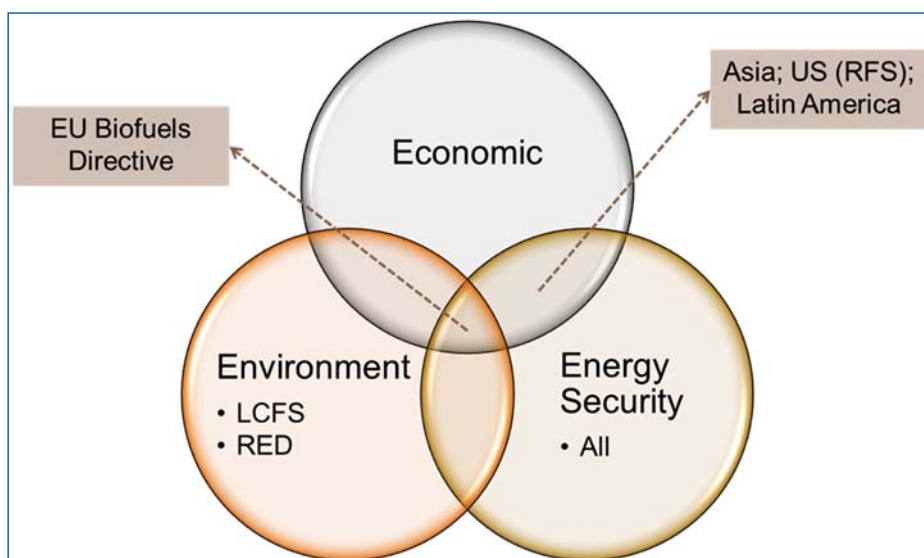
Manager,
Stratas Advisors

Biomass-based Diesel Growth to Outpace Ethanol by 2020

Stratas Advisors' **Global Biofuels Outlook to 2040** was released at the end of January 2017. The outlook analyzes biofuels supply and demand projections from the present through 2040 for the main markets around the world by country.

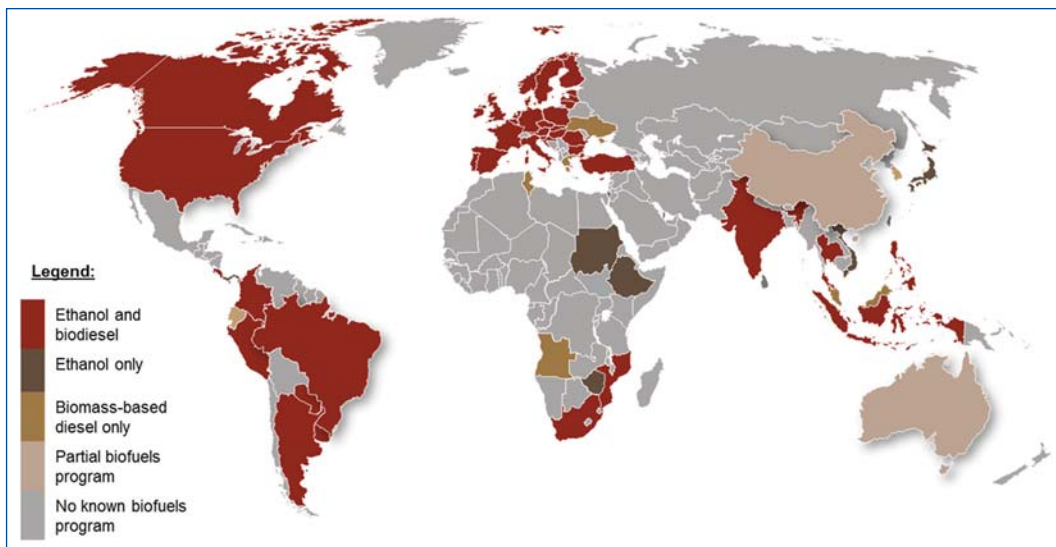
While drivers for adopting biofuels differ per country, there are three primary motivations: to increase economic activity (particularly in rural areas), boosting energy security/energy diversification, and environmental factors. For petroleum importer countries with abundant agricultural resources, biofuels are seen as a key measure to reduce petroleum imports and increase rural economic development at the same time. Other regions/countries have limited resources but prioritize environmental issues; they will mainly look at biofuels from the environmental point of view only. These include Japan, California, and the European Union (EU). The figure below shows the main drivers behind countries looking to incorporate biofuels into their transportation fuels pool and which regions they generally apply to.

There are two common biofuels used globally - bioethanol and biomass-based diesel. While many countries blend both fuel ethanol and biomass-based diesel, some countries prefer only fuel ethanol and some other prefer only biomass-based diesel added into their fuel pool. The figure below shows global biofuels mandates as of the end of 2016.



Source: Stratas Advisors, 2017

Global Biofuels Mandates in 2016



Source: Stratras Advisors, 2017

Global Supply and Demand

The use of biofuels in the transportation fuel pool is spreading across the world, including Africa and the Middle East regions. Usage has just started in several African countries, and the use of biofuels in the Middle East is limited to bulk consumers in the United Arab Emirates (UAE), so volumes in both of these regions is still quite small.

Although, we observed increase in biofuels consumption across the world over the past ten years, the market share of biofuels, both ethanol and biomass-based diesel, has hovered around 4% of total petroleum consumption since 2008. In the short-term, biofuels share in gasoline and diesel consumed by the transportation sector will increase, reaching 4.5 vol% by 2020. Over the long term, however, biofuels are not expected to quite keep pace with base fuel demand, and will likely see a gradual decline in market share by 2040.

Global biofuels demand is expected to grow from around 2.4 million barrels per day in 2016 to 2.8 million barrels per day by 2025, an increase of 17%.

Stratas Advisors projects that ethanol will remain the dominant biofuel, even though it will see a limited volume growth compared to current levels. In 2017, we expect 1.7 million barrels per day (100 billion liters) of ethanol will be blended with gasoline.

By 2025, ethanol demand is expected to see an increase of over 100 thousand barrels per day.

Biomass-based diesel is expected to grow at a faster pace than ethanol due to expansions in Asia and the Americas and the fuel's greater blending flexibility compared with ethanol. Stratras Advisors expects biomass-based diesel demand will reach close to 0.7 million barrels per day (40 billion liters) in 2017. Demand growth by 2025 is expected to be upwards of 25%, helping biomass-based diesel to reach a 2.7% market share of the global gas oil pool.

As depicted below, even though biofuels growth is mostly positive throughout the study period, ethanol growth was negative at -26 thousand barrels per day in 2011 and -22 thousand barrels per day in 2012, mainly influenced by decline of ethanol consumption in Latin America. On the biodiesel side, biomass-based diesel growth is generally positive throughout the study period except in 2015, when it declined -10 thousand barrels per day compared to 2014. This negative growth was influenced by a significant drop in biodiesel consumption in Indonesia during 2015.

The Americans are expected to keep their dominance over the global biofuels market. However, Asia's share post-2025 may more than double compared to the present.

Biofuels in Asia

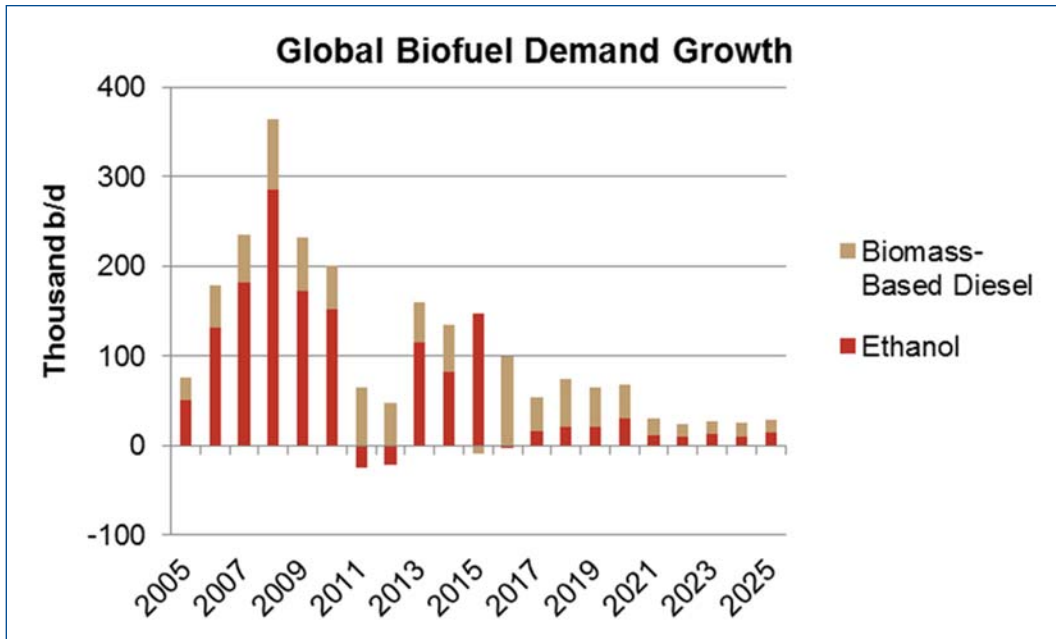
Unlike other regions, Asia is a very diverse region where fuels and biofuels policy are at different stages depending on the country. This region is very active in implementing biofuels program and utilizing its abundant agricultural resources to produce biofuels that meet increasing domestic demand and also exports.

Many countries in Asia have set biofuels targets; some of them are more ambitious than others. However, such targets are difficult to meet due to the following key issues:

- Price gap of crude oil vs. biofuels feedstock
- Long-term stability of feedstock supply
- Logistics and infrastructure
- Consumer confidence
- Vehicle compatibility

While the drivers for biofuels use in Asia are similar to countries in other regions, most countries in Asia are heavily dependent on oil imports. Thus, they are looking to use their domestic resources including biofuels to replace conventional fuels to reduce trade deficits and support domestic industries.

Some countries such as Australia, Japan, New Zealand, South Korea, and Taiwan have aimed to reduce CO₂ emissions under the Kyoto Protocol, regardless of whether the targets are binding.



Source: Stratias Advisors, 2017

Programs to promote biofuels in those countries mostly rely on setting production or consumption targets. Countries with limited land to grow crops including Japan, South Korea and Taiwan are taking a cautious approach to their biofuels program as long-term feedstock supply is a major issue.

On the other hand, countries such as China, India, Indonesia, Philippines, Thailand and Vietnam aim to utilize their domestic agricultural feedstock to produce biofuels and reduce their dependence on conventional fuels. At the same time, these governments hope that biofuels will provide income stability to farmers and parts of the fuels and chemicals industries. In addition to the domestic economy, the use of domestic biofuels is also seen as a way to reduce foreign debt load by improving trade imbalances.

One key country with abundant palm oil production is Malaysia. However, unlike other countries in this region, Malaysia originally planned to utilize palm oil resources to increase national revenue by producing and exporting biomass-based diesel to meet demand from Europe and other markets. However, exports to the EU saw a decline in the late 2000s and the Malaysian government eventually mandated biomass-based diesel blending starting in 2011.

Asia's Biofuels Policy

Most key economies in the Asia Pacific region have biofuels mandates or targets in place, whether it is nationwide or limited to some provinces or cities in the country.

Australia and China implement partial biofuels mandates, meaning ethanol and biomass-based diesel blending requirements are only applicable in certain provinces or cities. Other countries such as India, Indonesia, the Philippines, and Thailand have nationwide mandates on ethanol and biomass-based diesel, although full enforcement has yet to be achieved. The government of Japan set a target of certain volume of ethanol to be consumed by the transportation sector, but nothing on biomass-based diesel. In Japan, ethanol is converted into ETBE (Ethyl Tertiary Butyl Ether) before blending with gasoline. In fact, Japan is the only country in Asia Pacific region doing so. On the other hand, Malaysia and South Korea have a nationwide mandate on biomass-based diesel but no mandates on ethanol blending.

Indonesia doubled its ethanol blending mandate from 1 vol% of total gasoline consumed in the country in 2015 to 2 vol% in 2016. However, there has been no significant ethanol blended with gasoline since 2010 due to various

reasons, including price and the availability of supply.

The government of India's plans for meeting its national 5 vol% ethanol mandate has still not been fulfilled due to supply issue triggered by the fuel ethanol pricing mechanism. Despite this, the government has increased the mandate for ethanol to 10 vol% of total gasoline consumed in India.

The Philippines currently implements E10 nationwide, though higher gasoline grades of RON 98 and above are allowed to be sold without ethanol.

In June 2015 the government also allowed RON 95 gasoline to be sold without ethanol due to high fuel ethanol imports, mainly as a temporary measure until the government can find a way to increase fuel ethanol supply in the country without relying too much on imports.

Vietnam's ethanol industry is currently operating at less than 10% of name plate capacity as domestic uptake of fuel ethanol has been very slow since it was introduced in 2007.

The government has mandated E5 nationwide since December 2015 but the uptake is still very small. Even though there is no biofuels mandate in Pakistan, its ethanol industry is capable of producing fuel ethanol in

addition to industrial ethanol. It currently exports anhydrous ethanol, extra neutral alcohol and industrial ethanol, mainly to the EU.

With regard to biomass-based diesel, several countries including Indonesia, Malaysia, the Philippines, South Korea and Thailand have nationwide mandates. Indonesia currently has the highest mandate for biomass-based diesel blending, requiring the fuel to account for 20% of total diesel sold in the transportation, commercial, and industrial sectors, and 30% of total diesel used by the power generation sector. While there is no biofuels mandate in New Zealand and Taiwan (both countries revoked their mandates in 2008 and 2014 respectively), biofuels blends are still available in their markets. E10, E85,

and B5 are available in New Zealand and up to B5 is available for bulk customers in Taiwan.

In the rest of the region, Pacific island nations such as Fiji and Vanuatu aim to use their agricultural resources to produce biodiesel mainly for power generation purposes in remote areas. The figure below summarizes biofuels mandates in Asia Pacific.

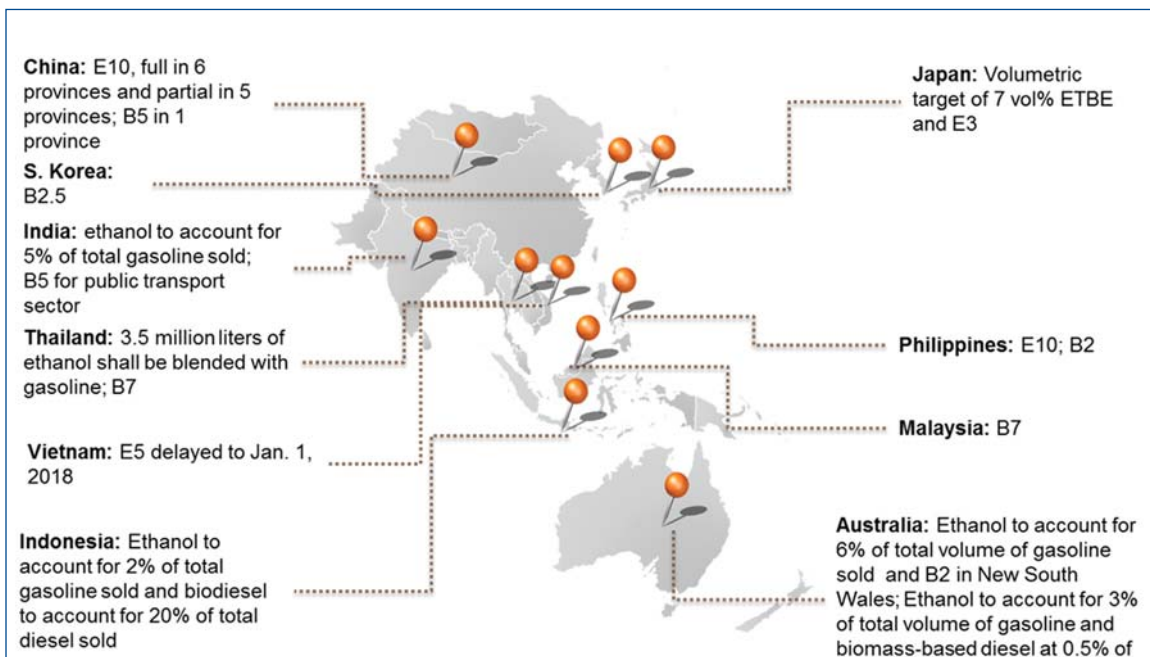
Feedstock

Many countries in Asia Pacific are significant agricultural producers and have excess production of commodities that could be used for biofuels production, particularly sugarcane, cassava, oil palm and coconut. In fact, the world's largest palm oil producers—Indonesia and Malaysia—have huge potential for biomass-based diesel production.

In addition, the Philippines is the world's largest coconut exporter. China and India are in the top four global ethanol producers behind the U.S. and Brazil. Thailand also has a large agriculture sector which is able to grow various kinds of crops as feedstock to meet national and global biofuels demand.

Compared with other regions, a wide array of feedstocks are available in Asia, creating a significant potential for biofuels production. In addition to the feedstocks above, wastes including cellulosic materials and waste cooking oil are also available. The table below summarizes types of feedstock available in Asia Pacific's key countries/economies.

Summary of Biofuels Mandate in Asia Pacific in 2016



Source: Stratias Advisors, January 2017

Primary and Potential Feedstocks in Asia Pacific Countries

Country	Ethanol	Biodiesel	Potential Feedstocks
Australia	Molasses, grains	Tallow, waste cooking oil	Agricultural waste, algae
China	Corn, wheat, sweet sorghum	Waste cooking oil	Agricultural waste, jatropha, algae
India	Molasses, sugarcane	Palm oil, non edible oils, acid oil, waste cooking oil, palm fatty acid distillate	Sorghum, jatropha, pongamia, agricultural waste
Indonesia	Molasses, cassava	Palm oil, waste cooking oil, palm fatty acid distillate, acid oil	Jatropha, sugar palm, algae
Japan	Molasses, grain, food waste	Waste cooking oil	Agricultural waste, wood and wood waste
Malaysia	Not applicable	Palm oil, palm fatty acid distillate	Palm biomass
New Zealand	Whey	Tallow, waste cooking oil, canola	Shrubby willow, switchgrass, wood and wood waste, straw, algae
Philippines	Molasses	Coconut oil	Cassava, sorghum, jatropha, algae, palm oil
Singapore	-	Waste cooking oil, palm oil, fish oil	Agricultural waste
South Korea	-	Waste cooking oil, palm oil, soybean oil, pork oil	Jatropha, algae
Taiwan	-	Waste cooking oil	Jatropha, algae, agricultural waste
Thailand	Molasses, cassava, cassava waste/pulp	Palm oil, waste cooking oil, palm fatty acid distillate	Jatropha, algae, agricultural waste
Vietnam	Cassava	Fish oil	-

Source: Stratias Advisors, 2017

Future Biofuels Demand

While countries in the region are adding biofuels into their fuel pools to reduce petroleum imports, biofuels will only contribute to a small portion (less than 3%) of Asia Pacific's refined petroleum products demand through 2025.

Comparing ethanol and biomass-based diesel growth, ethanol continues to account for a slightly higher share in the gasoline pool than biomass-based diesel in the gas oil pool. This is partly because diesel is also used in other purposes such as power generation, industry, agricultural, mining, construction and other off-road engines in addition to the transportation sector and some sectors are allowed to use conventional diesel without biomass-based diesel (B0). As such, even

though the total volume of biomass-based diesel blended with diesel is higher than that of ethanol, the market share of biomass-based diesel is slightly lower than ethanol.

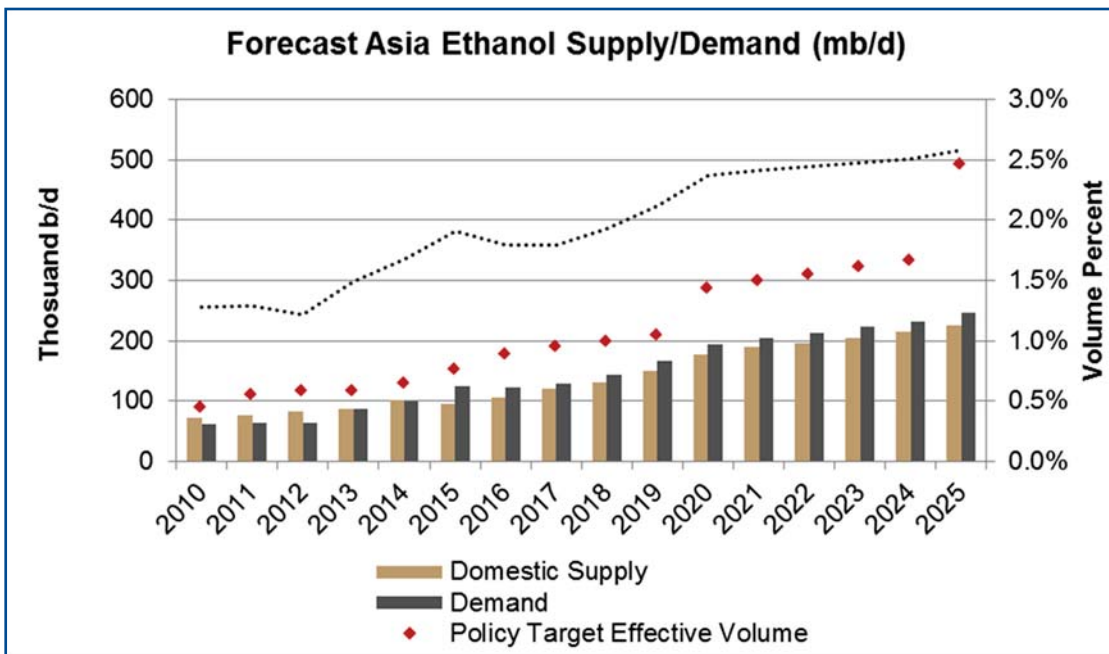
Asia will remain a net importer of ethanol but is expected to have a long supply of biomass-based diesel throughout the study period. The supply-demand gap of biomass-based diesel is expected to be narrower in the long-term as local demand increases over time.

China will continue to lead the region in ethanol production, followed by Thailand and India. Overall, the three countries will account for more than 70% of Asia's ethanol production in 2020.

Most countries in this region are moving towards levels of 5 vol% and

10 vol% ethanol blends. However, domestic supply will not meet total market demand throughout the study period. Unless proposed plants proceed with construction and existing capacity is expanded to meet demand, ethanol imports will have to come from outside the region, likely from either the U.S. or Brazil.

In 2017, fuel ethanol demand is projected to reach 130 thousand b/d (7.5 billion liters) against supply of 120 thousand b/d, creating potential imports of around 10 thousand b/d (500 million liters). Demand is expected to increase, well exceeding 200 thousand b/d in 2025, with potential imports of around 25 thousand b/d (1.3 billion liters) into the region. Market share of ethanol in gasoline is expected to increase from 1.8% in 2017 to 2.6% by 2025.



Source: Stratas Advisors, 2017

With regard to biomass-based diesel, most countries in this region which mandated the use of biomass-based diesel have increased blending levels in 2014-2016. The highest blending level at 20 vol% of total diesel consumed has been set by the Indonesian government beginning in 2016. The second-highest blending level at B7 has been implemented by Thailand and Malaysia.

Domestic biomass-based diesel supply within the region is expected to meet market demand throughout the study period. It is important to

note that most countries in this region do not allow imports of biomass-based diesel. In addition, biomass-based diesel supply projections are very much dependent on feedstock prices, yield, and supply stability, as can be seen from the number of inactive plants and low operating rates. Therefore, domestic supply is not expected to meet the combined policy targets which were set by the governments, unless renewable diesel from Singapore is utilized within the region.

In 2017, biomass-based diesel, including renewable diesel demand, will reach 150 thousand b/d (8.8 billion liters) against supply of close to 200 thousand b/d, creating potential exports of around 50 thousand b/d (2.7 billion liters). Demand is expected to rise to over 250 thousand b/d by 2025, with the share of biomass-based diesel in Asia's total gas oil pool rising from 1.6% in 2017 to 2.3% by 2025, an increase in market share of over 40%.



Environmental Law Issues in Upstream Sector



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Environmental protection is an integral part of the process of achieving sustainable development with reference to Oil and Gas Industry. The objective of this write-up is to provide an overview of the environmental management, the related policies, regulatory and legal framework with respect to the upstream sector with a view to identify certain key issues and challenge areas.

Introduction

Energy is significant for accomplishing the objective of higher economic growth as being related by its consumption. At present the fossil fuels, viz. oil, gas and coal meet around four-fifth of world's total energy demand, which will continue to be dominant in the next two decades. India's primary energy share in global energy consumption (around 13,047 MTOE) is its highest ever, being the third largest energy consumer in the world. Amongst the fuels within primary energy, Coal remains dominant at 58.1%, Oil around

28.5% and gas about 6.5%. Among the non-fossil fuels, nuclear and hydro have shares around 1% and 4% respectively and renewables 2.2% in 2015. However, in the coming years, it is set to contribute more to energy demand than any other large country with sustained economic growth and great industrial activity .

As the concern is mounting globally for the anticipated climate changes, mainly due to increased consumption of fossil fuels, the challenge is to meet the energy demands, with minimum impact on the environment by conforming to the best practices.

The exploitation of the oil and gas reserves has also some adverse ecological side effects. The environmental issues faced by the oil and gas exploration and production industry mainly include oil spills, damaged lands, accidents and fires, incidences of air emissions, pollution/contamination of marine, soil and fresh water and social impact of the operations. The Oil and Gas Industry has emphasized on establishing effective management systems to ensure that habitat protection, biodiversity, and the environment issues area significant component of the corporate cultures of the organisations.

Oil and Gas Exploration Process

The Oil and Gas Industry comprises two broad streams – Upstream i.e. exploration and production of crude oil and gas and Downstream i.e. refining, processing of crude oil and gas products, their distribution and marketing. The upstream sector deals with geophysical surveys, drilling, etc. In order to appreciate the potential impacts of oil development on the environment, it is important to understand the associated activities.

- a) **Exploration Survey**– involves the desk studies of geological maps of major basins to identify favourable hydrocarbon bearing rocks.
- b) **Exploration Drilling**– of the promising structure to confirm the presence or absence of hydrocarbons, as also thickness and internal pressure of the reservoir. In case of a land based prospective reservoir, a pad is constructed at the site to accommodate the drilling equipment and support services. The operations over the water are conducted by using self-contained mobile offshore units depending on the depth of water, seabed conditions and prevailing meteorological conditions etc. After drilling and testing, the rig is dismantled and moved to other site. A well head assembly is installed upon discovery of commercial quantities of hydrocarbons, otherwise the site is decommissioned and restored to original state.
- c) **Appraisal**– to determine whether the reservoir is economically feasible to develop with evaluation of size and nature of the reservoir.
- d) **Development and Production**– Oil and Gas is produced by formation of pressure, artificial lift, and various recovery techniques till the feasible reserves in the reservoir get fully relinquished. The hydrocarbon fluids are processed at the production facility where oil, gas and water are separated.

The oil thus produced is kept free of any dissolved gas before export and the gas must be free of liquids and unwanted components like Hydrogen Sulphide and Carbon Dioxide.

- e) **Decommissioning and Rehabilitation**– Plugging of wells, demolishing and removal of equipment to environmentally sound conditions. Measures are taken to encourage site re-vegetation and continued monitoring after closure.

Potential Environmental Impact

The exploration and production of Oil and Gas have the potential for various impacts on the environment. The potential impacts of oil and gas production depends upon factors such as the number and size of wells, the amount of land disturbed by drilling activities, the amount of land occupied by facilities over the life of the oil and gas field, the field's location with respect to other resources (e.g. wildlife use, distance to surface water bodies), and so forth. The likely type of impacts can be human, socio-economic, cultural, atmospheric, aquatic, terrestrial, bio-spherical, etc.

The early phases of exploration, i.e. desk studies, aerial survey, seismic survey and exploratory drilling are short term and transient. However, the assessment of potential impacts during the drilling, discovery and production stages which are quite longer needs a proper planning, design and control of operations in order to avoid, minimize or mitigate the impacts. The operations require regular monitoring, safety and security programmes, maintenance and servicing tasks, depending upon the stage of the process, the size and complexity of the project, nature and sensitivity of the surroundings, and the effectiveness of planning, mitigation and control measures to prevent pollution.

The potential environmental impacts of the exploration and production activities are summarized as under:

- a) **Human, Socio-economic and Cultural Impact** - The changes due to the operations are important

to the local groups whose normal lifestyles get affected, the key impacts being as under:

- Land use patterns e.g. agriculture, fishing, logging, hunting, etc. leading to unplanned settlement and exploration of natural resources.
 - Increase in local population levels due to migrating labor force, increased opportunities.
 - Socio-economic systems due to new employment opportunities, inflation.
 - Socio-cultural systems due to change in value systems such as social structure and cultural heritage also influenced by foreigners.
 - Availability and access to goods and services, planning strategies, aesthetics, transportation systems.
- b) **Atmospheric Impact**- In the recent past, the atmospheric issues have gained attention, both of the industry and the Government authorities, prompting E&P Industry's focus on the procedures and technology for minimization of the emissions. The sources of emissions are flaring, venting of gases, combustion process, fugitive gases from loading operations and tankages, losses from the operating equipment, airborne particulates due to disturbance of soil during construction and vehicular movement, particulates from burning sources such as testing of wells, etc. The volume and potential impact of emissions depends on the nature of process.
 - c) **Aquatic Impact**- The principal aqueous waste streams resulting from E&P operations are the produced water, drilling fluid, cutting and well treatment chemicals, sewage, sanitary and domestic wastes, spills and leakages and cooling water, etc.
 - d) **Terrestrial Impact**- Potential impacts of the soil arise due to soil erosion, physical disturbance due

to construction, contamination due to spillage and leakage or solid waste disposal and indirect impact arising from opening access and social change.

- e) **Ecosystem Impact** - Plants and animals are also affected by changes in their environment through variations in water, air, soil and sediment quality and through disturbance by noise, extraneous lights and vegetation cover, directly affecting the ecology.
- f) **Potential Emergencies**- Even proper planning, design and implementation of correct procedures with personnel training takes place, the likelihood of incidents like spillage of fuel, oil, gas, chemicals, hazardous materials, oil or gas well blowouts, explosions, fires, unplanned plant upsets/ shutdowns, natural disasters with implications on the plant operations, war, sabotage, etc.

However, with proper application of management techniques and environmental practices, most of the potential impacts can be eliminated or mitigated. The assessment of the potential impacts and management measures is normally carried out through an environmental assessment, either independently or within the framework of HSE management system, in context of national and global protection policies and legislation that provide clear guidance on relative importance of the given issue.

Regulatory Framework

The Regulatory Framework applicable to oil operations in general are the Petroleum laws, Environmental Protection Act, Air (Prevention and Control of Pollution) Act and Water (Prevention and Control of Pollution) Act, Marine Pollution, Control of Major Hazards, Standards for Noise, Radiation and Chemicals, Safety and Fire Regulations, Forest Protection laws, Storage and Usage of Chemicals, Discharge and Waste Management, Public and Worker Health and Safety, Protected Area Laws, Land Contamination or Land Disturbance, Protection of Indigenous and Cultural

Heritage, Fishery Protection, Marine Navigation and Safety and the like.

In context of the Indian E&P Industry, the referred Regulations/Acts/Rules for the purpose of control on the impact on the environment are as under:

- a) **Environment Protection Act, 1986 and The Environment (Protection) Rules, 1986**

This legislation was adopted to implement decisions relating to the protection and improvement of environment and the prevention of hazards to human beings, other living creatures, plants and property taken at the United Nations on the Human Environment held at Stockholm in June, 1972, in which India participated. It provides for prevention, control and abatement of environmental pollution. The Environment (Protection) Rules 1986, provide for the standards for emissions or discharge of environmental pollutants and protecting and improving the quality of the environment and preventing and abating environmental pollution.

- **Noise Pollution (Regulation and Control) Rules, 2000**

The said Rules have been issued by the Central Government in exercise of powers conferred by the Environment (Protection) Act, 1986 read with rule 5 of the Environment (Protection) Rules, 1986. The scope of the Rules is to regulate and control noise producing and generating sources with the objective of maintaining of ambient air quality standards in respect of noise in the areas depending on the specified use of the area.

- **Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2016**

The said Rules have been issued by the Central Government in exercise of powers conferred by sections 6, 8 and 25 of

the Environment (Protection) Act, 1986 and in supersession of the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008. The Rules apply to the management of hazardous and other wastes as specified in the said Rules. The said Rules provide for the procedure for management of hazardous and other wastes; the import and export of hazardous and other wastes; the treatment, storage and disposal facility for hazardous and other wastes.

- **Manufacture, Storage and Import of Hazardous Chemical Rules, 1989**

The said Rules have been issued by the Central Government in exercise of powers conferred by sections 6, 8 and 25 of the Environment (Protection) Act, 1986. It provides for notifying the authority of the storage of hazardous chemicals, major accidents on a site, approval and notification of sites, preparation of safety report and safety audit reports, preparation of on-site emergency plan detailing how major accidents will be dealt with on the site on which the industrial activity is carried on, etc.

- **Ministry of Environment and Forests Notification dated August 30, 2005**

The said notification has been issued by the Ministry in exercise of powers conferred by sections 6 and 25 of the Environment Protection Act, 1986 and provides for guidelines for disposal of solid waste, drill cutting and drilling fluids for offshore and onshore drilling operations.

- **The Environment Impact Assessment Notification 2006**

The said notification has been issued by the Central Government in exercise of powers conferred by the Environment Protection Act, 1986. Offshore and onshore oil and gas exploration,

development and production shall be undertaken only after prior environmental clearance is obtained from the Central Government or the State Government as the case may be. Exploration surveys (not involving drilling) are exempted provided the concession areas have got previous clearance for physical survey.

b) The Air (Prevention and Control of Pollution) Act, 1981, issued by Ministry of Environment and Forests

This legislation was adopted to implement decisions relating to preservation of the natural resources of the earth which, among other things, include the preservation of the quality of air and control of air pollution taken at the United Nations Conference of the Human Environment held in Stockholm in June, 1972, in which India. This Act provides for the prevention, control and abatement of air pollution, for the establishment, with a view to carrying out the aforesaid purposes, of Boards, for conferring on and assigning to such Boards powers and functions relating thereto and for matters connected therewith.

c) Water (Prevention and Control of Pollution) Act, 1974 issued by Ministry of Environment and Forests

The Act provides for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water, for the establishment, with a view to carrying out the purposes aforesaid, of Boards for the prevention and control of water pollution.

d) Forest (Conservation) Act 1980 issued by Ministry of Environment and Forests

The Act provides for the conservation of forests and for matters connected therewith or ancillary or incidental thereto.

In accordance with the said legislation no reserved forest or any portion thereof shall be de-reserved or no forest land shall be used for non-forest purposes except with prior approval of the Central Government.

e) Public Liability Insurance Act, 1991 and Rules made thereunder

The legislation provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling any hazardous substance and for matters connected therewith or incidental thereto.

f) The Wildlife (Protection) Act, 1972

The legislation provides for the protection of wild animals, birds and plants and for matters connected therewith or ancillary or incidental thereto with a view to ensuring the ecological and environmental security of the country.

g) The Oil Mines Regulations, 1984 and the Oil Mines Regulations, 2016 (Draft)

The legislations have been issued by the Central Government in exercise of powers conferred by Section 57 of the Mines Act, 1952. The Oil Mines Regulations 1984 provide for storage of material and protection against pollution of the environment at the site.

The Ministry of Labour and Employment vide Notification dated June 24, 2016 made available the draft of the Oil Mines Regulations 2016 for the information of all persons likely to be affected thereby and the said Regulations of 2016 are still under consideration by the Ministry.

h) The Petroleum and Natural Gas Rules, 1959

The Rules have been issued by the Central Government in exercise of powers conferred by Sections 5 and 6 of the Oilfields (Regulation and Development) Act, 1948 and in supersession of the Petroleum

Concession Rules, 1949. The said Rules provide for regulating the grant of exploration licenses and mining leases in respect of petroleum and natural gas which belongs to Government, and for conservation and development thereof.

i) Petroleum Act, 1934 and the Petroleum Rules, 1976

The legislation provides for law relating to the import, transport, storage, production, refining and blending of petroleum. It further provides for obtaining license for storage of petroleum substances, notification of accidents to the relevant authority, etc.

j) The Explosives Act 1984 and the Explosive Rules, 2008

The legislation provides for regulating the manufacture, possession, use, sale, transport, import and export of explosives, obtaining licenses for storage of explosives, compliance with safety measures during storage and transportation of explosives, etc.

The Explosive Rules have been issued by the Central Government vide Notification dated December 29, 2008 and in exercise of powers conferred by Sections 5 and 7 of the Explosives Act, 1884 (4 of 1884) and in supersession of the Explosives Rules, 1983. The Rules provide for obtaining license for transportation or possession of an explosive. They also provide that only authorised explosives are to be used at the time of transportation of an explosive or at the time of using an explosive, etc.

Approach

There are various approaches employed by governments to minimize the risk of upstream operations on the environment. These approaches are not mutually exclusive in practice and various jurisdictions like Canada, Sweden, Denmark and Australia have simultaneously applied different approaches to minimise environmental impacts of oil exploration in the upstream sector.

Usually, it is noted that a combination of multiple approaches

is a comprehensive and relatively successful mechanism subject to the legal framework of the concerned country.

a) Command and Control approach

In this approach the legal and regulatory framework provides detailed standards that are required to be followed and also provides for enforcement mechanisms like criminal sanctions, injunctions and civil penalties. For example, the competent authority commands and controls the emission standards and determines the method of maintaining these standards. The controls put in place require uniform levels of clean up from specific polluters and operators are obliged only to comply with the checklist provided in the legal framework. These standards are based on, the expected efficiency of the company, health impact of the emissions and ethical grounds.

b) Market-based regulatory approach

This approach primarily involves policy instruments that use economic variables including price prevailing in the market, to provide incentives for upstream operators to reduce or eliminate negative environmental externalities. This approach follows the logic that operators will ordinarily aim to reduce emissions to the extent it is economically viable. Thus, introduction of some form of a pollution tax serves as a deterrent for causing pollution, and extending subsidies serves as an incentive to restrict pollution. For example, USA introduced market incentives like 'emissions reduction credits' whereby polluters earn credits by reducing emissions below their specified rate.

c) Voluntary agreements' approach

Under this approach, the operators, industry groups adopt measures to improve the environmental

standards and usually the operators have an understanding with the host country on the specifics and limits of pollution control measures. The Oil Industry International Exploration and Production Forum (E&P forum) has compiled a set of environmental guidelines that would normally be described as 'best practices', known as ISO Standards, for oil and gas companies. The ISO Standards, Technical Report (TR) and Technical Specifications (TS) are only a core collection of several hundreds of standards available for the oil & gas industry from Brazilian Technical Standard Association (ABNT), American National Standards Institute (ANSI), American Petroleum Institute (API), Standards Australia (AS), British Standards Institution (BSI), Canadian Standards Association (CSA), Norwegian Competitive Position on the Continental Shelf (NORSOK), National French Standard (NF), State Union Standard (GOST), Standardization Association of China (SAC), etc.

d) Self-regulatory approach

This approach requires risk analysis by the operator in respect of emergency preparedness in the upstream activities. For example, in Norway, the operators are required to define their own safety objectives to manage the activities. The authority sets up guiding principles within which the operators may exercise their flexibility in terms of adopting technology for safety and environmental protection. In the Indian context, the Production sharing Contract 'PSC' (which is a contractual regime entered into by the government and the contractor for the purpose of exploration and production of hydrocarbon resources, namely crude oil and natural gas) in the context of environment protection requires:

- compliance with the requirements of applicable laws and government requirements;
- employment of modern oilfield and petroleum industry practices and standards including advanced techniques, practices and methods of operation for the prevention of Environmental Damage;
- carrying out of an environmental impact study; and
- preparation of contingency plans for dealing with Oil spills, fires, accidents and emergencies, designed to achieve rapid and effective emergency response in discussion with the government.

India follows a combination of approaches in order to minimise environmental impact on account of the activities in upstream sector. The questions remain:

- do we have a measure of the environmental impact on account of activities in the upstream sector in India;
- do we have a scale of comparison examining the environmental impact on account of activities in the upstream sector across various jurisdictions; and
- is it economically beneficial for the operators in India to adopt the latest technological advancements for undertaking upstream activities to minimise environmental impact.

A collaborative approach, though easier said than done is a necessity. Collaboration amongst the operators to identify and exchange information with respect to technological advancements for undertaking upstream activities with minimal environmental impact, averting disasters, and effectively handling emergency situations is necessary not only for the sake of greater good but also in recognition of the fact that unless the players help each other, there won't be a future for anyone.



Effect of catalyst pore size on the performance of silica supported Fe-Co catalyst in Fischer Tropsch process



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Sonal

Laboratory scale research reveals that the catalyst composition and its morphology has a significant effect on the activity and selectivity of the catalyst in Fischer-Tropsch reaction. Bimetallic Fe-Co/SiO₂ catalysts were prepared by a different method to get different pore size. A combination of characterization techniques confirmed that the metal crystal size also controlled by the pore. Liquid hydrocarbon product selectivity in Fischer Tropsch reaction was investigated at industrially relevant conditions (T- 220-280°C, P- 2 MPa, H₂/CO ratio 1, and GHSV- 1.2 SL/g-h. Catalyst with average pore size 15 nm showed maximum C₅-C₂₀ selectivity (56%) at 220°C. Water Gas Shift (WGS) activity increases with temperature and was maximum at 260°C with CO conversion of 60%.

Introduction

Fischer Tropsch synthesis provides an alternative route to produce valuable liquid fuel from relatively cheap resources such as coal or biomass. Recently, the interest in coal and biomass has increased immensely due to its several advantages. Presently, 11% of primary energy demand is being accomplished with biomass which is estimated to increase up to 15-30 % by the year 2050. Utilization of coal and bio-syngas in the FT process is under development and yet to be explored. The conversion process chain from coal and biomass to liquid fuel is completely dependent on R&D which makes the process economic and competitive to current existing processes. The transportation fuels

from FT process are cleaner and able to fulfil the strict environmental norms. Before the commercialization and scale up, the process needs significant research and development. The main challenge related to the liquefaction of coal and biomass derived syngas is the lower H₂/CO ratio (~0.5-1.5). It has to be increased intrinsically to meet the stoichiometric demand of the FT reactions to achieve maximum product yield. So, the research has been done for the substantial enhancement of the combined WGS and FT activity by the formulation of a Fe-Co bimetallic catalyst system. Selection of Fe-Co bimetallic catalyst enables the system at which both FT and WGS reactions takes place simultaneously. Again there are various structural

parameters which affect the catalyst selectivity and activity. It is generally accepted that a catalyst dispersion, metal particle size has a major impact on the FT selectivity. Another important structural parameter is pore size of the catalyst which immensely affects the H₂/CO ratio at the vicinity of the catalyst site which consequently alters the rate of FT and WGS reactions and the product distribution. The design of suitable catalyst with maximum selectivity toward desired range of product (C₅-C₂₀) is required to increase the efficiency of the process. Metal (Fe, Co, Ni and Ru) supported catalyst are frequently used and have been explored by various researchers.

Selection and synthesis of catalyst support with optimum porosity and pore size favourable to deliver the maximum product of selective range are the ultimate aims of the present work. The Pore size of a catalyst play vital role in FT reactions. Altered product distribution as a function of pore size can be attributed to various factors such as pore diffusion resistance in the narrow pore and the changed texture property of catalyst due to pore size. the reason of increased methane selectivity with decreasing pore is related to the diffusion resistance and different adsorption tendency of CO and H₂ inside the pores. On the contrary, some researchers explained the reason in the terms of changed textural property such as dispersion, reducibility etc. It was observed that the characteristics of pore size had a significant effect on the product distribution.

Experimental

In the laboratory scale research, four different batches (CAT-A to CAT-D) of catalysts (10%Fe-20%Co/SiO₂ by wt.) were prepared with the different methods like the combination of co-precipitation, sol-gel and wet impregnation methods. These catalysts were characterized for their pore size distributions, phases formed and the metal dispersion. Different techniques were used for the detail characterization of catalysts (BET, BJH, TPR, TEM, and XRD etc.).

The performance of these catalysts was tested in fixed bed reactor at different reaction conditions (T- 220-280°C, P- 2 MPa, H₂/CO-1, and GHSV-1.2 SL/gcat-h). 3 g of catalyst were sieved in the range 0.5–1 mm and packed with inert silicon carbide material of same size range to avoid the formation of a hot spot in the catalyst bed. The catalyst was reduced in situ in the reactor in H₂/N₂ flow (1:4) at the temperature 500°C which is decided from temperature programmed study. Detail description and schematic of reactor set up are given elsewhere 8,9. The exit line of the reactor was connected to the online GC through which analysis of exit gas product and unconverted gas are measured. Two main detectors were used to analyze the exit gasses.

Thermal conductivity detector equipped with Carbosieve column was used to quantify unconverted CO, H₂ along with produced CO₂ and CH₄. FID detector equipped with PoropackQ column, was used to quantify gaseous hydrocarbon. Before the GCs, a hot trap (at 100°C) and a cold trap (at 0°C) were connected to the exit line of the reactor. These traps were utilized to collect the wax and liquid products. Analysis of liquid products and wax were done in GCMS equipped with DB-5 and DB-wax column.

Results and discussion

The results of the pore size variation in pore size are given in Figure-3. Variation in pore size in the catalysts was mainly due to the method of preparations. In sol-gel method (CAT-D and CAT-C) mechanism of gel preparation involves hydrolysis and condensation of TEOS precursor. Depending upon the solvent, synthesis condition and relative ratio of reactant, morphology and pore size of silica change. BET surface area of catalyst increased from 212m²/g (CAT-A) to 512 m²/g (CAT-D), however, in the case of CAT-D most of the surface area is an internal surface area which indicates the encapsulation of metal particle inside the pores (Table 1). TPR results shown in Figure 1, reveal that the reducibility of the catalyst increased with the pore size. Multiple reduction peaks indicate the occurrence of different reducible cobalt and iron oxide species. Monometallic cobalt catalyst Co₃O₄ follows the reduction path as Co₃O₄°Co⁰°Co which occurs within a temperature range of 250–450 °C. Similarly in iron based catalyst follows the trend of Fe₂O₃°Fe₃O₄°Fe⁰°Fe which occurs within temperature range of 250-480°C. In the case of bimetallic catalyst, overlapping reduction peaks were observed for iron and cobalt catalyst. The results of the present study (Figure1) reveal that, as the metal crystal size decreases, reduction temperature shifts towards higher temperature. In the case of CAT-A and CAT-B, catalyst is reducible within a temperature range of 350-500°C. However, in the other two case, due to increased metal support interaction, reduction peak shifts at 700°C. Catalyst dispersion were effectively controlled by the support texture, i.e.

dispersion increases with decreasing pore size. Scherrer equation was used to calculate the crystal size of metal oxides after calcination (Table 1). XRD analysis of the catalyst reveals the important information regarding different active phases of the catalyst. In Figure 2, the presence of Co₃O₄ and Fe₂O₃ phases are evident. However, the formation of new Fe-Co bimetallic phase was also evident in the XRD spectra. Table 1 shows the variation of crystal size of Co₃O₄ and Fe₂O₃ with the pore size. It was observed that the crystal size increases with the pore size. In CAT-D the crystal size was below identification range (~5nm) of XRD. The crystal size of the metal oxide directly affects the reducibility of the metal which eventually alters the CO conversion.

The above catalysts were tested for the FT reaction at identical reaction conditions (Temp- 220°C, P- 2 MPa, H₂/CO ratio-1 and GHSV- 1.2 SL/g-h) condition to examine the effect of pore size. Product distribution shifts towards lower hydrocarbon at lower pore size (Figure-4). Whereas, selectivity to C₅-C₂₀ increases with the pore size. Methane formation increases with decreasing pore size. % CO conversion increases and then decreases with pore size. Figure-5 showed the variation in % CO conversion and % C₅-20 selectivity with the pore size. Maximum CO conversion along with maximum % C₅-20 selectivity (56 %) was obtained for CAT-B. CO conversion highly depends on metal dispersion and extent of reduction. In the case of CAT-D due to small pores (2-4. nm) surface area was very high and most of the metal crystal resides inside the pores which decrease the reducibility of the catalyst. Formation and propagation of long chain hydrocarbon largely depend on nature of adsorption of CO. Strong adsorption of CO (bridge) which generally found on the flat crystal surface, facilitates the long chain formation and propagation. Small crystallite size consists of more edges than the flat surface which affects the adsorption pattern of CO (linear or bridge) and eventually shifts the product distribution towards lower range hydrocarbon.

The selected catalysts were tested for WGS activity which is required to tune the H₂/CO ratio inside the reactor.

WGS activity of the catalyst was examined with varying temperature (220–280°C) and the H₂/CO ratio of 1. The extent of WGS shift reaction was examined by calculating H₂/CO usage ratio which is the ratio of moles of H₂ converted per mole of CO converted^{10–12}. Figure 6 and 7 show the effect of temperature on the % CO conversion and H₂/CO usage ratio. Definition of usage ratio suggests that the lower the usage ratio the higher WGS activity. %CO conversion increases with the temperature and were 63 % and 67% for CAT-B and CAT-C respectively at 280°C. there was no significant change in WGS activity at low temperature (220°C). The decreasing value of H₂/CO usage ratio with increasing temperature reveals that the rate of WGS reaction increases with temperature, however, at 280°C, loss of carbon in the form of methane and CO₂ was high for CAT-C. In case of CAT-B the value of H₂/CO usage ratio reaches to 1.62 at 260°C where the %CO conversion was found to be 60%. Therefore, CAT-B (15 nm) was found to appropriate catalyst for the production of C5- C₂₀ hydrocarbon a 260°C.

Conclusion

Effect of catalyst pore size on the Fischer Tropsch activity of the Fe-Co bimetallic catalyst was studied under similar reaction conditions (Temp- 220°C ,P- 2 MPa , H₂/CO ratio-1.48, and GHSV- 1.2 SL/g-h). Detail catalyst characterizations reveal that the catalyst reducibility and metal support interaction changes with pore size. Variation in catalyst pore size affects the crystal size of the metal catalyst which eventually affects the CO adsorption pattern over the catalyst surface. This affects the % CO conversion and overall product distribution. CAT-B (15 nm) was found to be a suitable catalyst for maximum % CO conversion (45%) and % C5- 20 selectivity (56 %) at given conditions.

Table 1: Characterization of fresh catalysts

	CAT-A	CAT-B	CAT-C	CAT-D
BET Surface area(m ² /gm)	212.8	208	255.39	503.6
External	169.9	192.7	231.4	98.1
Internal	42.82	15.9	23.9	405.5
Pore vol (cm ³ /gm)	0.976	0.48	0.577	0.37
Av. Pore size(nm)	30	15	9.0	3.0
Pore size range(nm)	20-50	5-20	5-15	2-4
% Metal Dispersion	1.5±0.05	3.1±0.05	2.8±0.05	3.35±0.05
Av. Metal crystal size (nm) ^a				
Co3O ₄	20	14	12	5
Fe2O ₃	19	13		

a-Calculated from XRD

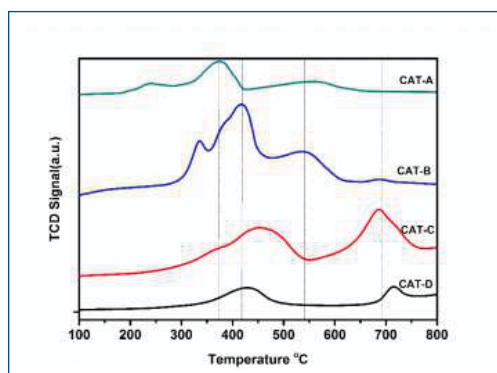


Figure 1: TPR analysis of fresh catalysts

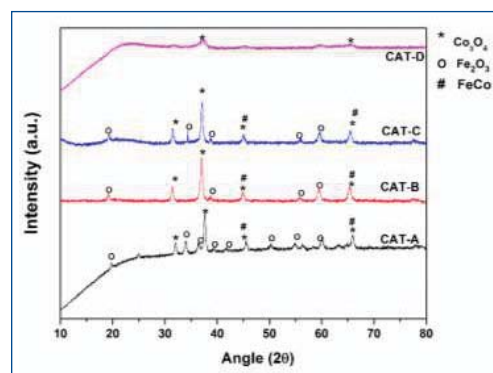


Figure 2: XRD analysis of fresh catalysts

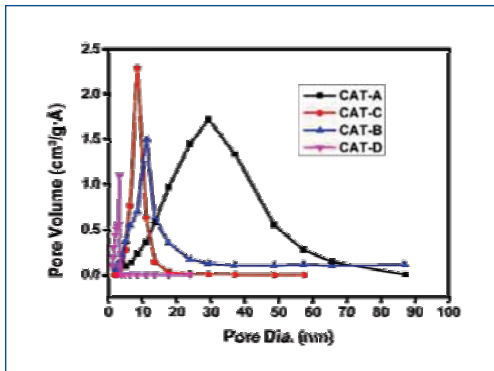


Figure 3: Pore size distribution of different catalyst

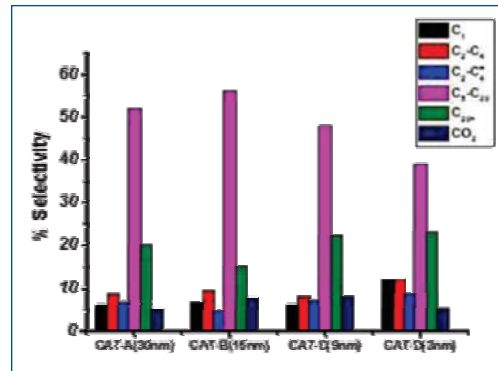


Figure 4: Effect of pore size on product distribution (P- 2 MPa, T- 220°C H₂/CO-1, and GHSV=1.2 SL/gcat-h)

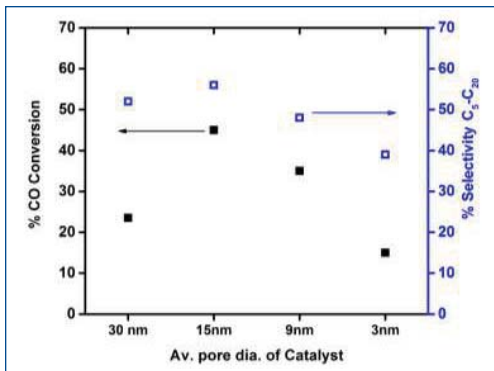


Figure 5: Effect of pore size on % CO conversion and C5+ selectivity (T- 220°C P-2MPa, H₂/CO-1, and GHSV=1.2 SL/gcat-h)

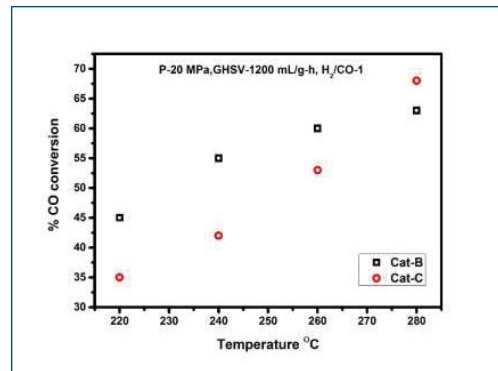


Figure 6: Effect of temperature on % CO conversion

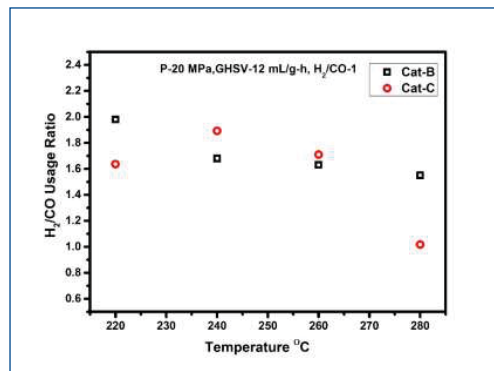


Figure 7: Effect of temperature on % CO conversion

Oil & Gas In Media



Prime Minister dedicates OPaL Plant to the Nation

Prime Minister, Narendra Modi, on 7th March 2017 dedicated ONGC Petro additions Ltd. (OPaL) to the nation. Set up at the cost of Rs.30,000 crore at Dahej Special Economic Zone (SEZ) under Petroleum, Chemical and Petrochemical Investment Region (PCPIR). OPaL, with 13% market share by 2018, will boost the consumption of polymers in India which at present is only 10kg per capita against global average of 32kg, he stated. Prime Minister also appreciated Gujarat government for the development of Dahej SEZ PCPIR which is one of the four PCPIR in the country.

Incorporated in 2006, OPaL is a joint venture of ONGC (26%), GAIL (19%) and GSFC (5%). OPaL's main Dual

Feed Cracker Unit has capacity to produce 1100 KTPA Ethylene, 400 KTPA Propylene. Associated units include Pyrolysis Gasoline Hydrogenation, Butadiene Extraction and Benzene Extraction units. The Polymer plants has 2X360 KTPA of LLDPE / HDPE swing unit, 1X340 KTPA dedicated HDPE and 1X340 KTPA of PP.

OPaL has the advantage of dynamic market. The company will be marketing a substantial part of produce in the international market. Synergy with promoters gives access to indigenous feedstock and a bright domestic market.

Complex is integrated with C2/C3 extraction unit of ONGC who has the right to extract C2+ components from



5 MMTPA rich LNG supplied by Ras Gas, Qatar to Petronet LNG at Dahej. Apart from gaseous feed, ONGC will supply naphtha from its units at Uran and Hazira through dedicated pipelines.

Dual Feed Cracker is capable of handling varying proportion of feed stocks.

Amalgamation of Oil PSUs

Finance Minister in his budget speech on February 2, 2017 in the Parliament announced the plan of the government to integrate state – run oil companies.

At present there are twelve state–run companies operating under the aegis of Ministry of Petroleum & Natural Gas in the upstream, midstream, downstream and service segments (see table). Appropriate integration

across the industry value chain is expected to enhance the professional and financial strength of the sector as a whole and more so for Oil & Gas PSUs. Consolidated structures will be able to match the performance and financial capabilities of international and local private firms.

Larger size PSUs will be able to withstand and face risks and will give better value to stakeholder.

Merged entities will be able to operate on higher economies of scale; can take higher investment decision. Media report suggests that post announcement; Oil PSUs have started working on options. Ripples to this effect are already visible. News regarding ONGC acquiring HPCL has made appearance in different channels.

PSUs under MoP&NG

	Market Capitalisation (Rs. Crores on 28.02.2017, Source: BSE)
A. Upstream	
1. Oil & Natural Gas Corporation Limited	165463
2. Oil India Limited	19681
B. Downstream	
3. Indian Oil Corporation Limited	93464
4. Bharat Petroleum Corporation Limited	48418
5. Hindustan Petroleum Corporation Limited	18211
6. Mangalore Refining & Petrochemical Limited	18902
7. Chennai Petroleum Corporation Limited	5642
8. Numaligarh Refinery Limited	-
C. Midstream	
9. Gail (India) Limited	64738
D. Service Companies / Other	
10. Engineers India Limited	5061
11. Balmer Lawrie & Company Limited	603
12. Bieco Lawrie Company Limited	-

Strategic Petroleum Reserve Program of India

Strategic Petroleum Reserve (SPR) have, by now, become synonymous with economic safeguards of a nation. They are essential to maintain national energy security in the event of energy crisis. EIA estimates global SPR at 4.1 billion barrels of oil; USA being the largest holder with capacity of 727 million barrels, equivalent to about 60 days requirement of import. SPR provide a twofold cushion to a country. Topped up at an appropriate time, its use during high price rise can help the country in absorbing wide fluctuations in the price. Second advantage is the assurance of energy supplies during disruptions due to unforeseen events.

India with rising economy growth but deficit in hydrocarbon is one of the most vulnerable country to any energy crisis and volatility with more than 80% dependence on import which is expected to increase to 90% by 2040, SPR in India will play a highly significant role in energy security.

SPR program of India is being implemented in two phases:

Facilities created under Phase – I

Location	Storage	Capacity
	MMT	Million Barrels
a) Visakhapatnam		
Compartment 1	1.03	7.55
Compartment 2	0.30	2.20 – For HPCL
Sub-Total	1.33	9.75
b) Mangalore		
2X0.75	1.50	11.00
c) Padur		
4X0.625	2.50	18.37
Total	5.33	39.12

Excluding 0.30 MMT stock of HPCL stored in Cavern at Visakhapatnam, SPR capacity of India in phase-I is 5.03 MMT (about 37.0 million barrels). Cavern at Visakhapatnam is already filled with oil from Iraq. Mangalore storage is filled to almost half with 6.0 million barrels of Iranian Crude. Indian Strategic Petroleum Reserve Ltd. (ISPRL), a Special Purpose Vehicle (SPV) wholly owned subsidiary of Oil Industry Development Board (OIDB) under MoP&NG for the construction of SPR, has invited Expression of Interest from reputed international parties for filling up Padur SPR facility.

In the meantime, an agreement between ISPRL and ADNOC (Abu Dhabi National Oil Corp.) was signed on 25th January 2017 to fill Mangalore SPR facility with 5.86 million barrels

of crude (0.81 MMT approx.). The agreement was signed in the presence of His Highness Sheikh Mohamed Bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Prime Minister Shri Narendra Modi. The agreement facilitates India to have the first right to use the stored oil in case of an emergency while ADNOC will use it for trading purposes. Crude supplies will start in last quarter of 2017. Karnataka government has waived VAT on crude oil imported for SPR from UAE.

Phase-I storage capacity can meet country's current requirement of crude for 10.5 days. Existing tankage of crude and petroleum products in India is about 14.8 MMT and 13.7 MMT respectively. This along with SPR provides 63 days coverage to the nation at current consumption rate.

Cabinet gave its approval to the Definitive Agreement with ADNOC ex-post facto.

Under the second phase of SPR, government will build two more facilities; one at Chandikhol in Odisha and Bikaner in Rajasthan. Capacity of Chandikhol storage will be 4.4 MMT (32 million barrels) and Bikaner will be (5.6 MMT (41 million barrels). Two more storage at Rajkot and Padur are planned in this phase making total planned capacity in this phase to 12.5 MMT.

Finance Minister in his budget for 2017-18 announced the exemption to the income of foreign company which books a capacity in the strategic storage from the sale of leftover stock.

Petroleum Minister leads high level delegation to USA for CERA Week 2017

With the aim to encourage active global participation in upcoming investment opportunities in India, a high level delegation led by Minister of State (I/C) for Petroleum and Natural Gas, Shri Dharmendra Pradhan had organized a promotion event for India's new Hydrocarbon Exploration and Licensing Policy (HELP) at CERA Week 2017 in Houston.

With participants who include, global energy leaders, government dignitaries, policy makers, innovators and industry professionals, Shri Pradhan addressed them the transformative and proactive policy reforms undertaken by the Government. It was also mentioned that the new policy is part of the strategy to make India a business and investor friendly destination and cut import dependence by 10 percent by 2022. With the new model, the government will not micro-manage, micro-monitor with producers and will only share revenue.

The entire sedimentary basin for investment from domestic and foreign players is open under a simplified, transparent and investor -friendly fiscal and administrative regime. The Open Acreage Licensing Policy

(OALP) will be a departure from the current licensing policy of government with identifying the oil and gas blocks and then putting them on auction. With OALP, it will provide options to a company looking for exploring

some of in production and account for 30% of the country's crude oil production and 25% of the country's gas production.

During the CERA Week event, Shri Pradhan also spoke about



hydrocarbons to select the exploration areas on its own with a ready access to huge amount of seismic data available in National Data Repository (NDR).

Several international companies like BP, Hardy Exploration, Niko Resources, Reliance, Cairn, ENI, Joshi Technologies etc. with around 236 oil and gas discoveries, so far has generated an investment of 40 billion USD. With

the success of recently concluded Discovered Small Fields Bid Round 2016 in a period of crude oil price volatility. The bid round received a total of 134 bids from 47 companies for 34 contract areas and finally, the Government has approved the award of 31 contracts areas.

Pricing Freedom for Coal Bed Methane (CBM) firms

The Cabinet Committee on Economic Affairs which was chaired by the Hon'ble Prime Minister Shri Narendra Modi, gave its approval for marketing and pricing freedom to the Coal Bed Methane (CBM) companies to sell the CBM at Arm's Length Price in the domestic market. It has been mentioned that a transparent and competitive process has to be adopted for sale of CBM with an objective to realize the best possible price of gas with no restrictive commercial practices.

In the event if the CBM companies are not able to identify a buyer, they can sell the CBM gas to its affiliate. Royalty and other dues to the Government, however, shall be payable on the basis of Petroleum Planning & Analysis Cell (PPAC) notified prices or selling prices, whichever is higher.

It is pertinent to mention that out of the 33 CBM bearing blocks awarded so far in four auction rounds gas is being produced from only four which have a combined output of 1.55 million

standard cubic metres per day and around 18 blocks have either been relinquished or are in the process as for operators it did not make economic sense to produce gas at the prevailing rates.

The policy is expected to incentivize the CBM operation in the country to boost gas production and will generate economic activities which in turn will be beneficial for creating more employment opportunities in CBM operations and related activities.

Contracts awarded under Discovered Small Field Policy bid round - 2016

The Cabinet Committee on Economic Affairs, chaired by the Prime Minister Shri Narendra Modi has given approval to award contract in 31 contract areas (23 in onshore and 8 in off shore) of Discovered Small Fields of Oil and Natural Gas Corporation (ONGC) and Oil India Limited (OIL). These areas were discovered long back but these discoveries could not be monetized due to reasons such as isolated locations, small size of reserves, high development costs, technological constraints, fiscal regime, etc.

The outcome of award of contracts under DSF is expected to have a faster development of fields and facilitate production of oil and gas which will lead to increasing energy security of the country. It is expected that with the timely implementation, in-place locked hydrocarbons volume of 40 Million Metric Tonnes (MMT) oil and 22 Billion Cubic Meters (BCM) of gas will be monetised over a period of 15 years. Since the production from these contract areas will supplement the domestic production, India would be



able reduce its spending on imported crude by about US \$525 million annually.

For early monetization of these fields, in September, 2015, Cabinet approved 69 marginal fields for offer under Discovered Small Fields Policy. Out of these, 67 Discovered Small Fields were clubbed into 46 contract areas and put on offer through online international competitive bidding. A total of 134 e-bids were received for 34 contract

areas. A total of 47 companies submitted their bid, out of which 43 are Indian companies and rest four is foreign companies. However, global oil and gas giants such as BP, ExxonMobil and Chevron, have not submitted offers in the tender for developing small fields.

These contract areas have been awarded under the new regime of Revenue Sharing Model.

Cabinet approves Policy for the Grant of Extension to the Production Sharing Contracts signed by Government of India awarding Pre-NELP Exploration Blocks

The Union cabinet chaired by the Prime Minister Shri Narendra Modi has approved a policy for grant of extension to the Production Sharing Contracts (PSC) signed by Government of India awarding Pre-NELP Exploration Blocks so as to enable and facilitate investment to extract the remaining reserves.

This policy will enable contractors to extract not only the remaining reserves but also plan to extract additional reserves by implementing new technologies. In certain fields, additional recovery of hydrocarbons can be obtained through Enhanced Oil Recovery / Improved Oil Recovery (EOR/IOR) Projects and as such the production would extend beyond the current duration of PSC. In the year 2016-17, production from these oil & gas blocks, is around 55 million barrel

of oil and 965 MMSCM of natural gas against the potential recoverable reserve to be more than 426 million barrel of oil equivalent. Therefore, with the extension in place, companies are expected to make an additional investment of more than USD 5.4 billion.

Among others, it includes oil and gas blocks in the State of Rajasthan that account for about half of the country's onland production of crude oil. Extension of these oil blocks will be major stepping stone in sustaining and enhancing onland production. The decision will be positive news for Cairn India Ltd., which operates India's largest onland block in Rajasthan. The lease period of the block was about to expire in year 2020.

The Government share of Profit Petroleum during the extended

period of contract would be 10% higher for these fields, thus, bringing additional revenues to Government. The extension of these contracts is expected to bring extra investments in the fields and would generate both direct and indirect employment. The policy aims at bringing out clear terms of extension in fair and transparent manner so that the resources can be expeditiously exploited in the interest of energy security of the country besides improving the investment climate.

The policy will give boost to accelerate and supplement indigenous production of hydrocarbon from existing blocks and act as a progressive step towards achieving the target of 10% reduction in import of crude oil by 2022.

Oil price show downtrend inspite of good compliance to voluntary production cut by oil producers

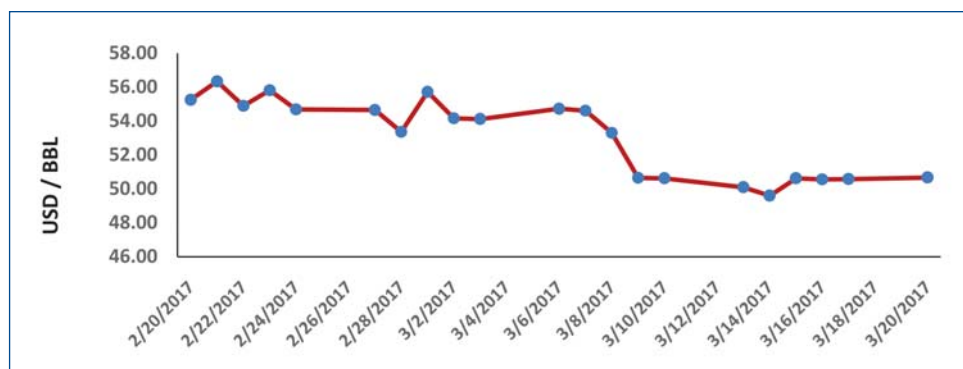
Spot price of crude crashed to sub 30\$ / bbl in February 2016 predominantly due to oversupply. Although, it recovered to above 40\$ / bbl but remained below 50\$ / bbl till November 2016. Price shot above 50 level in early December 2016 when it became almost certain that OPEC and other producers will cut production to restrict over-supply (see October-December 2016 edition of 'PetroFed', for details).

On 10th December 2016, 13 OPEC and 12 non-OPEC nations declared cut in oil production by 1.2 million barrels

and 0.6 million barrels respectively for January – June 2017 period. Crude price shot above 56\$ / bbl raising hope that price will remain around 60\$ / bbl in 2017. Price exhibited a reasonable stability during January & February 2017. It fluctuated in a close range 54-56 \$ / bbl.

With post election scenario in U.S.A., news of compliance by oil producers increased E&P activities in U.S.A. were drivers of upbeat mood in CERA week (05–09 March 2017) at Houston. However, in the mid of event, crude price crashed to 50\$ / bbl level and hovering there till date.

Some analyst attributed this to stock build up to 533.6 million barrels in U.S.A. during week ending 17th March, 2017, a rise of 4.5 million barrels (mb) against plan of 2.8 mb. Recent Short-Term Energy Outlook (STEO) of EIA also estimated US crude oil production 9.2 mb/d in 2017 and 9.7 mb/d in 2018; higher by 0.2 mb/d in total compared to previous estimates. With addition of 14 rigs in March 2017 raising total number to 631 in US, the output has risen to over 9.1 mb/d.



Brent Price (\$/Barrel)

Source : EIA

	3Q16	4Q16	January 2017	February 2017
US	479	586	683	744
Canada	122	180	302	342
Mexico	25	19	16	16
Total	626	785	1001	1102

Rig Counts (units)

Source : OPEC MOMR March 2017

IEA estimates show that oil producer's compliance with the production-cut agreement was 90% in January 2017. Saudi Arabia and Qatar compliance levels were 116% and 127% respectively. Overall production of OPEC countries was 32.06 mb/d during January 2017. Putting compliance at 91% for February 2017, IEA estimate OPEC production at about 32 mb/d and total crude output at 96.52 mb/d. Following supply estimates for January and February 2017 can be constructed .

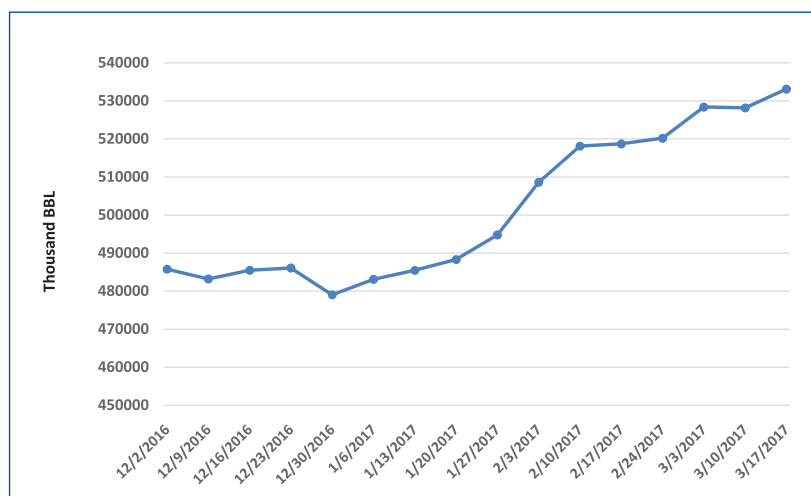
Figs. In Million Barrels / day

	4Q 16	January 2017	February 17
Non-OPEC supply	58.0	58.24	58.42
OPEC NGL (assumed)	6.1	6.10	6.10
OPEC supply	33.1	32.10	31.96
Total Supply	97.2	96.44	96.48

Rig Counts (units)

Source : OPEC MOMR March 2017

With reasonable compliance to production cut and lot of stock in transit at the beginning of 1Q17, now landing and getting counted in storage should term basis. As discussed in our last (October – December 2016) issue, impact of production adjustment will be more visible by the end of 2Q17. Crashing of price by about 6% overnight cannot be solely attributed to rising stocks and rig count of US which were showing increasing trend even when production cut was announced after Vienna meet of OPEC. It is pertinent to believe that all parties in the oil production , conventional or non-conventional , would not like to see price going steep southward.



Weekly Ending Stock of Crude Oil in U.S.

OPEC major, Saudi Arabia's energy minister Khalid al-Falih, during CERA Week stated that his country will watch the compliance of member countries to the agreement before any further consideration on extension of it beyond six months. He also said that developments at US for increase in oil production is also under watch.

A Joint Ministerial Monitoring Committee (JMMC) from OPEC and non-OPEC oil producers reviewed the status on 26th March 2017 in Kuwait. The committee expressed satisfaction with the progress on voluntary adjustment in production. In February 2017, second month of the implementation , conformity of 94% has been achieved. JMMC requested Joint Technical Committee with OPEC Secretariat to review the oil market conditions and revert to JMMC in April 2017 regarding the extension of voluntary production adjustment. JMMC will deliberate before submitting recommendation to participating countries.

R&D Conclave 2017



Federation of Indian Petroleum Industry (FIPI) erstwhile Petroleum Federation of India (PetroFed) along with industry partners organised 'R&D' Conclave during February 16th-18th, 2017 at Mussoorie, Uttarakhand. The conclave on the theme "Ideas are Here" covered topics including Innovation, Intensification, Catalysts in Refining & Petrochemicals, Upstream, Emerging Technologies, Operational efficiency improvement and panel discussion on issues related to Policy, Investments and Commercialization, etc.

In the inaugural session Dr. Anil Kakodkar, Chairman, Scientific Advisory Committee (SAC) on Hydrocarbons, MoP&NG and INAE Satish Dhawan, Chair of Engineering Eminence, BARC underlined the importance of new ideas in the research domain to secure an energy sustainable future. He also emphasized upon policy interventions for human skill management being an important pillar of research and development. The conclave covered various on-going R&D activities in the oil & gas industry (Upstream, Midstream & Downstream) as well as Alternative Energy. The event had presence of around 100 delegates participating representing the entire spectrum of Oil & Gas sector.

As many as 28 speakers from national and international organizations made presentation on various themes. With the changing energy landscape, it was opined that hydrocarbon companies should aim to become integrated energy companies. In order to achieve the same research, endeavors will be needed to go beyond traditional domains to the new and alternative energy resources which have the potential to change the future energy landscape. It was also felt that collaboration is the key in going forward as it will act as force multiplier to achieve the long term research objectives.







Gas4India Events

To develop a gas based economy in India, FIPI in partnership with CII and NGS has initiated a national campaign 'Gas4India', which was launched by Shri Dharmendra Pradhan Hon'ble Minister, MoPNG on September 6, 2016. Gas4India is a unified cross-country, multimedia, multi-event campaign to communicate the national, social, economic and ecological benefits of using natural gas as the fuel of choice to every citizen who uses, or will use in the near future, gas in any way - to cook, travel, light their homes, and power their businesses. The Gas4India campaign includes social engagement via Twitter, Facebook, YouTube, LinkedIn and its official blogsite, as well as hyper-local, offline events to directly connect with consumers through discussions, workshops and cultural events.

MGL Scooter Launch

Gas4India was present at the launch of CNG -fuelled two-wheeler in Mumbai on 1 January, 2017 by Sh. Dharmendra Pradhan, Hon'ble Minister of State (I/C) for Petroleum and Natural Gas. The presence at the venue was further supported by the campaigning on social media with the use of engaging creatives and generating visibility.



IETF 2017

Gas4India at the Green Mobility Expo during 2nd-4th February, 2017 was received well. Several visitors showed interest in the Gas4India stall, curious to learn more about the campaign and to explore possible collaborations. India Post was very impressed with the Gas4India post cards and would like to further explore possibilities of printing these post cards officially with stamps (costing .25 paise). The Gas4India Team has contacted them to seek an appointment and to discuss things further. They also want Gas4India campaign to explore advertising options on their passbooks for the rural banks.

Green Solutions Summit

Mr. Amit Wankhede from BP Exploration (Alpha) Ltd. represented Gas4India at the Green Solutions Summit on 1 January 2017 at IIT, Delhi. In this summit, different speakers explored ideas related to innovation, climate change, sustainability, investment, stakeholder engagement and so on. Mr. Wankhede provided in-depth perspective on the Gas4India Campaign. Green Solutions Summit was covered in print, radio & social media.

Vibrant Gujarat

Gas4India campaign was hosted by Hazira LNG at Vibrant Gujarat Global Summit during 10th-13th January, 2017. Over 60 % of the Hazira LNG stall was dedicated to the Gas4India campaign and the visibility, especially with LED screens and stylised visual elements. Hazira LNG curated a 'Tweet for Treat Café' which resonated deeply with our visitors, particularly the young students and a key audience for the campaign. The tweets earned over 17,289 impressions with an average of 2,470 impressions per day, during this period. The followers on Twitter were increased by 384 from 3,406 to 3,790, while the likes on the Facebook page were risen by 9 from 4,254 to 4,263.



FLAME Kurukshetra

CII co-sponsored FLAME University's annual festival titled Kurukshetra during 16th-19th February, 2017. The idea was to use this platform as a means to reach out to as many students as possible. A team of 10 Gas4India volunteers took the lead in organising several outreach programs throughout the festival. Volunteers successfully created a buzz in the campus by designing games around Gas4India Campaign.

Gas4India was able to successfully engage students of the University through these games. Distributing collateral in lieu of engaging with the games and competition proved to be very successful. Gas4India T-shirts and cloth bags attracted great attention and popularity with students. Gas4India branding was visible in different corners of the campus and students were readily using all the collateral, this proved to be enormous in terms of the visibility we received on campus.

Gas4India was powering several sports and cultural activities. i.e. the audiences were briefed on the campaign before the event began and participants had the option of working on Gas4India theme specifically. The team also instituted a prize and certificate mechanism to be distributed to all the prize winners.



Launch of Shell Technology Centre

Gas4India participated at the launch of Shell Technology Centre during 30-31 March, 2017 in Bangalore. The idea was to use this platform to spread awareness about this national campaign to more than 600 people over a two day period. Sh. Dharmendra Pradhan, Hon'ble Minister of State (I/C) for Petroleum and Natural Gas was the Chief Guest on the occasion. Gas4India stall was set up at the Gas Experience Zone (exhibition space) where the collaterals included cloth bags, brochures, post cards were distributed to the people who took part in the interactive quiz based on Natural Gas subject. Three volunteers took the lead in this campaign from Shell. They interacted with people and explained to them the importance of this campaign and usage of Natural Gas in City Gas Distribution, for Transport, as a clean fuel, for clean cities and for power. Shell videos on Power and Fertilizer sector were also displayed along with a Live Twitter wall.



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Statistics

India: Oil & Gas

Domestic Oil Production (Million MT)

		2013-14	2014-15	2015-16	April 2016-February 2017	
					Qty.	% of Total
On Shore	ONGC	6.71	6.07	5.82	5.42	33.71
	OIL	3.47	3.41	3.23	2.96	18.41
	Pvt./ JV (PSC)	9.41	9.06	8.81	7.7	47.89
	Sub Total	19.59	18.54	17.86	16.08	100
Off Shore	ONGC	15.54	16.19	16.54	14.87	88.30
	OIL	0	0	0	0	0.00
	Pvt./ JV (PSC)	2.66	2.73	2.55	1.97	11.70
	Sub Total	18.2	18.92	19.09	16.84	100.00
Total Domestic Production		37.79	37.46	36.95	32.92	100
	ONGC	22.25	22.26	22.36	20.29	61.63
	OIL	3.47	3.41	3.23	2.96	8.99
	Pvt./ JV (PSC)	12.07	11.79	11.36	9.67	29.37
Total Domestic Production		37.79	37.46	36.95	32.92	100

Source : PIB/PPAC

Oil Import - Volume and Value

	2013-14	2014-15	2015-16	April 2016- February 2017
Quantity, Million Mt	189.2	189.4	202.1	195.58
Value, INR '000 cr.	864.88	687.42	415.36	426.89
Value, USD Billion	143	112.7	64.4	63.50
Average Conversion Rate, INR per USD	60.48	61.00	64.50	67.23

Source : PPAC

Oil Import - Price USD / Barrel

	2013-14	2014-15	2015-16	April 2016- February 2017
Brent (Low Sulphur - LS- marker) (a)	107.5	85.43	47.46	48.38
Dubai (b)	104.58	83.77	45.63	46.60
Low Sulphur-High Sulphur differential (a-b)	2.92	1.66	1.83	1.79
Indian Crude Basket (ICB)	105.52	84.15	46.17	47.16
ICB High Sulphur share %	69.9	72.04	72.28	71.03
ICB Low Sulphur share %	30.1	27.96	27.72	28.97

Source: PPAC/OPEC

Refining

Refining Capacity (Million MT on 1st April 2016)

Indian Oil Corporation Ltd.	
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
Total	69.20

Chennai Petroleum Corp. Ltd.	
Chennai	10.50
Narimanam	1.00
Total	11.50

JV Refineries	
DBPC, BORL-Bina	6.00
HMEL, GGSR	9.00
JV Total	15.00

Bharat Petroleum Corp. Ltd.	
Mumbai	12.00
Kochi	9.50
Total	21.50

Hindustan Petroleum Corp. Ltd.	
Mumbai	6.50
Visakhapatnam	8.30
Total	14.80
Other PSU Refineries	
NRL, Numaligarh	3.00
MRPL	15.00
ONGC, Tatipaka	0.07
Total PSU Refineries Capacity	135.07

Private Refineries	
RIL, Jamnagar	33.00
RIL, (SEZ), Jamnagar	27.00
Essar Oil Ltd., Jamnagar	20.00
Pvt. Total	80.00

Source : PPAC/CHT

Total Refining Capacity of India 230.066* (4.62 million barrels per day)

*** Not include capacity of 6000 TMT of Cuddalore refinery of Nagarjuna.**



Crude Processing (Million MT)

PSU Refineries	2013-14	2014-15	2015-16	April 2016-February 2017
IOCL	53.13	53.59	57.19	58.91
HPCL	15.51	16.18	17.23	16.22
BPCL	22.97	23.18	24.09	23.56
CPCL	10.63	10.78	9.63	9.53
MRPL	14.65	14.68	15.6	14.52
NRL	2.61	2.78	2.52	2.45
SUB TOTAL	119.5	121.19	126.26	125.19
JV Refineries	2013-14	2014-15	2015-16	April 2016-February 2017
HMEL	9.27	7.34	10.71	9.79
BORL	5.45	6.21	6.4	5.74
SUB TOTAL	14.72	13.55	17.11	15.53
Pvt. Refineries	2013-14	2014-15	2015-16	April 2016-February 2017
ESSAR	20.2	20.49	19.11	19.16
RIL	68.03	68.04	69.44	64.11
SUB TOTAL	88.23	88.53	88.55	83.27
	2013-14	2014-15	2015-16	April 2016-February 2017
All India Crude Processing	222.45	223.27	231.92	223.99

Source : PIB Release/PPAC

Crude Capacity vs. Processing - 2016-17 April 2016-February 2017

	Capacity On 01/04/2016 Million MT	% Share	Crude Processing Million MT	% Share
PSU Ref	135.07	58.71	125.19	55.89
JV. Ref	15	6.52	15.53	6.93
Pvt. Ref	80	34.77	83.27	37.18
Total	230.07	100	223.99	100

Pol Production (Million MT)

	2013-14	2014-15	2015-16	April 2016-February 2017
From Refineries	216.44	217.08	227.9	217.57
From Fractionators	3.87	3.65	3.38	3.92
Total	220.31	220.73	231.28	221.49

Distillate Production (Million MT)

	2013-14	2014-15	2015-16	April 2016- February 2017
Light Distillates, MMT	58.81	59.54	63.60	61.18
Middle Distillates , MMT	112.85	113.41	118.31	111.56
Total Distillates, MMT	171.66	172.95	181.91	172.74
% Distillates Production on Crude Processing	77.17	77.46	78.43	77.12

International Price Ex Singapore (\$/bbl.)

	2013-14	2014-15	2015-16	April 2016- February 2017
Gasoline	114.31	95.45	61.72	57.77
Naphtha	100.22	82.22	48.54	46.89
Kero / Jet	121.23	66.62	58.17	58.10
Gas Oil (0.05% S)	121.99	99.44	57.63	58.55
Dubai crude	104.58	83.77	45.63	46.60
Indian crude basket	105.52	84.16	46.17	47.16

Cracks Spreads (\$/ bbl.)

	2013-14	2014-15	2015-16	April 2016- February 2017
Gasoline crack				
Dubai crude based	9.73	11.68	16.09	11.17
Indian crude basket	8.79	11.29	15.55	10.61
Diesel crack				
Dubai crude based	17.41	15.67	12	11.96
Indian crude basket	16.47	15.28	11.46	11.39

Source: PIB/PPAC/OPEC

Gas

Gas Production/Consumption/Import

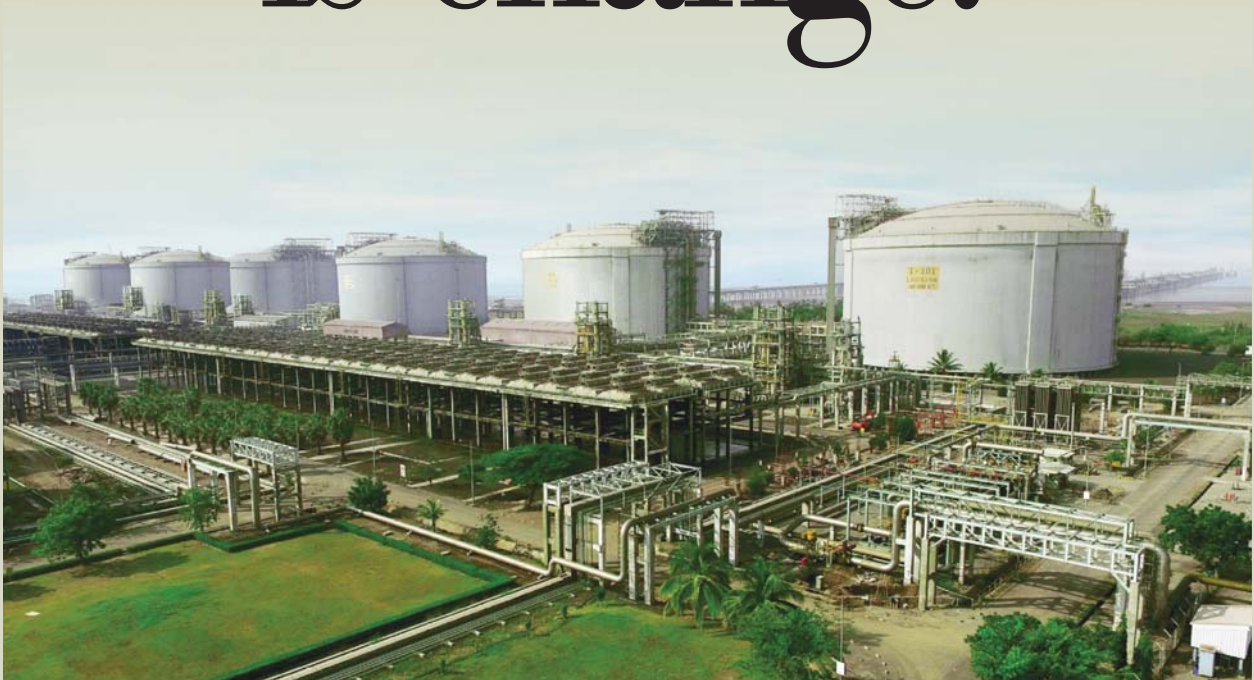
	2013-14	2014-15	2015-16	April 2016-February 2017
Net Gas Production (MMSCM)	34574	32693	31138	28179
LNG Imports (MMSCM)	17728	18536	21309	22531
Import Dependency (%)	34	36	41	44
Total Gas Consumption (MMSCM)	52302	51229	52447	50754

Domestic Gas Price (\$/mmbtu)

Period	Domestic Gas Price (GCV Basis)	Price Cap for Deepwater, High temp High Pressure Areas
November 14 - March 15	5.05	-
April-Sept 15	4.66	-
Oct 15 - March 16	3.82	-
April-Sept 16	3.06	6.61
Oct 16 - March 17	2.5	5.30

Source: PPAC

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News from Members

Petroleum Minister dedicates HPCL's new Green R&D Centre

Shri Dharmendra Pradhan, Hon'ble Minister of State (I/C) for Petroleum & Natural Gas, dedicated HPCL's new green R&D Centre in Devengunthi, Bengaluru to the nation in the presence of Sh. K.D Tripathi, Secretary, MOP&NG, senior officials of MOP&NG, Oil Industry, delegates from India & abroad and others. Hon'ble Minister also inaugurated a two-day International Conference organized by HPCL's R&D Centre on the theme "Energy Innovations: Today and Tomorrow" in the presence of dignitaries and delegates.



HPCL to use Honeywell UOP technology

Honeywell recently announced that Hindustan Petroleum Corporation Limited (HPCL) is using technologies from Honeywell UOP for the expansion and modernization of its refinery at Visakhapatnam in Andhra Pradesh on the southeast coast of India. Included in the project are licensing, basic engineering design and other associated services for a Penex™ isomerization unit, which helps make cleaner burning high-octane gasoline, and a Unicracking™ hydrocracking unit to produce cleaner burning diesel fuel.

OIL bags awards at World HRD Congress

Oil India Limited (OIL) won awards under various categories at the recently concluded World HRD Congress at Mumbai from 15th – 17th February, 2017 namely Global HR Excellence Award for Development of Welfare for Women & Children, ABP News HR Leadership Award for Learning & Development Initiative Excellence, Dream Companies to Work for Diversity Impact Award and 11th Global Employers Branding Award for Excellence in Training. In addition to the above, OIL was also ranked 20th in the listing of Best Employer Brand in India out of 470 organizations participating in the 11th Employer Branding Awards, 2017 and was also ranked 45th out of 750 participating organizations in the Dream Companies to Work for listings. The awards are in recognition of OIL's commitment and constant effort towards achieving excellence through innovative programs, showing clear and measurable business results.



HPCL awarded "Platts Global Energy Award 2016" for CSR

HPCL was awarded the prestigious "Platts Global Energy Award 2016" for Corporate Social Responsibility at a ceremony held recently at New York. The award was received by Shri Rakesh Misri, ED-Corporate, Strategy & Planning & Business Development, HPCL, and Ms. Sonal Desai ED-Finance (Refineries), HPCL. Hosted by S&P Global Platts, the leading independent provider of information and benchmark prices for the commodities and energy markets, the annual event honours organizations and individuals in the energy industry dedicated to achieving excellence.

In its citation published in the magazine 'Insight', complementing HPCL's CSR initiatives, it read, "Under new head Mukesh Kumar Surana, HPCL takes this year's top CSR prize for its robust portfolio of deep, long lasting and comprehensive programmes. HPCL's programmes target social and economic development in areas including Childcare, Education, Healthcare, Skill Development, Environment & Community Development and Sports. The company focuses on identifying gaps in the existing system and filling them, creating long-term, sustainable impact rather than create parallel systems."



HPCL participates in Standard Chartered Mumbai Marathon 2017

Engagement of HPCL employees in Standard Chartered Mumbai Marathon (SCMM) keeps getting bigger and better every time and this year's edition held on 15th January was no exception. With participation in the 2017 Marathon, HPCL has completed five years of its participation in SCMM as "Champions with Disability" to support our NGO partner ADAPT. This year's event drew enthusiastic support from over 125 HP employees– 104 participated in Champions with Disability Category (Pushing Wheel Chairs), six participated in Full Marathon and 15 in Half Marathon.

The occasion became all the more special with Shri M. K. Surana, Chairman and Managing Director, Shri P.K. Joshi, Director, HR, Shri J. Ramaswamy, Director – Finance & Shri Vinod Shenoy, Director – Refineries, taking out their precious time to support the cause by pushing the wheel chair of the ADAPT children.

Honeywell UOP scientists recognized

Honeywell UOP has recently announced that the American Institute of Chemical Engineers' (AIChE) Fuels and Petrochemical Division has recognized four of its scientists with the 2016 Industrial Research & Development Award for the development and commercialization of the UOP Advanced Methanol-to-Olefins process. The award recognizes the scientists' work on the technology that converts methanol from sources such as coal and natural gas into the olefins that are the primary components in the manufacture of plastic resins, films and fibers. This is especially critical in countries that lack domestic sources of crude oil but are rich in coal or natural gas.



OIL signs MoU with University of Houston

Oil India Limited (OIL) has recently entered into a MoU with the University of Houston, one of the leading universities on Oil & Gas in the world. The MoU was signed on 7th March 2017 in the presence of Shri Dharmendra Pradhan, Hon'ble Minister of State (I/C), Petroleum & Natural Gas, Govt. of India, at Houston, along with Dr. Anupam Ray, Consul General of India, Houston, Director General of Hydrocarbon, India, CEOs of leading Oil and Gas PSUs, and other senior officials from Ministry of Petroleum and Natural Gas, Govt. of India. The MoU was signed by Smt. Renu Khator, Chancellor & President, University of Houston and by Shri Utpal Bora, Chairman & Managing Director, Oil India Limited. Located in the energy capital of

the United States of America, home to the leading Oil & Gas operating companies and service providers, the University is a premier institute, involved in the quest of academic and translational excellence in the field of Oil & Gas through its outstanding faculty & research staff and has established well documented partnership with leading edge academia & industry subject matter experts.

Shell opens new State-of-the-Art Technology Centre

Shell opened a new major technology hub in Bangalore - a 52 acre, custom built technology centre - that can house up to 1,500 experts, who would collaboratively work on worldwide innovative energy projects. The inauguration was conducted in the presence of Chief Guest Shri. Dharmendra Pradhan, Hon'ble Minister of State (I/C) for Petroleum and Natural Gas, Govt of India, along with His Excellency Mr Alphonsus Stoelinga, Hon'ble Ambassador of Netherlands to India, Shri. R.V. Deshpande, Hon'ble Minister for Industries, Govt. of Karnataka and Shri. Krishna Byre Gowda, Hon'ble Minister for Agriculture, Govt. of Karnataka. Commenting on the opening, Shri Dharmendra Pradhan said "India has an opportunity to make a significant contribution to the world's incremental energy needs in the years ahead. Shell is developing a waste to fuel technology called IH2 at the Technology Centre in Bengaluru that takes only a few minutes to achieve what nature requires a million years to do. This IH2 technology can be one of the game changers that can make my country a net exporter of energy. 1500 young scientists of Indian origin who will work at the Shell Technology Centre Bengaluru are India's contribution to meeting the world's energy requirement". The Bangalore Shell Technology Centre is one of the three main technology hubs in Shell's global network of R&D centres, with the other two located in the Netherlands and the USA. The new centre houses a variety of technical experts, laboratories and technology demonstration units.



IndianOil celebrated its 46th R&D Foundation Day

IndianOil celebrated its 46th R&D Foundation Day on March 10, 2017. Dr. S. Christopher, Chairman, DRDO & Secretary, Department of Defence R&D, DRDO, the Chief Guest inaugurated the function and delivered the Foundation Day Address, in the presence of Shri B. Ashok, Chairman, IndianOil, Mr. Steven Gimre, Managing Director, UOP India Pvt. Ltd., the Guest of Honour, at its SERVO Auditorium in Faridabad. In line with the 'Make in India' initiative of the Government of India and coinciding with the year of Technology and Innovation being observed at IndianOil, the day also marked the launch of a new product the first in-house designed In-Line Inspection tool.



IndianOil inks POL supply agreement with Nepal Oil Corporation

A Memorandum of Understanding for supply of POL products was signed recently between Indian Oil Corporation Limited (IndianOil) and Nepal Oil Corporation (NOC) in the presence of Shri Dharmendra Pradhan, Hon'ble Minister of State (Independent Charge), Ministry of Petroleum and Natural Gas, Government of India, and Shri Deepak Bohara, Hon'ble Minister for Supplies, Government of Nepal, along with senior officials from MoP&NG, India; Ministry of Supplies of Nepal; IndianOil and NOC. The new supply agreement was inked by Shri PK Das, Executive Director I/C (Supplies), IndianOil, and Shri Gopal Bahadur Khadka, Managing Director, NOC.

Foundation Stone was laid for India's first Intelligent Digital Fuel Station

Foundation Stone was laid for India's first Intelligent Digital Fuel Station at COCO Hitec City, Hyderabad on 15th January, 2017 by Shri B Ashok, Chairman, IndianOil.

Currently, COCO, Hitec City, Hyderabad is all India Highest Selling COCO, with sales of about 2500 KL. This Intelligent Digital Fuel Station, with layered fuelling is world's first unique fuel station wherein simultaneously, liquid fuels are dispensed on the ground floor and CNG can be dispensed on the first floor of the RO on a raised ramp. The 14.5 Crore project will be carried out in 1.17 acres of land. Speaking on the occasion, Shri B Ashok said, "This Intelligent Fuel station will set Industry benchmark, revolutionize the concept of Retail Outlets in the country".



Award for Shri Sanjiv Singh Director (Refineries) IndianOil for outstanding contribution in the field of Fuel Science

Shri Sanjiv Singh, Director (Refineries), IndianOil was presented, an award 'in recognition of his outstanding contribution in the field of Fuel Science' by Dr. Harsh Vardhan, Minister of Science and Technology and Earth Sciences, Govt. of India, at Vignyan Bhawan, New Delhi.

This award places him among the luminaries in India who have passionately worked towards the advancement of fuel technology for the growth & development of the country. In particular, the distinguished jury acknowledged his contribution for implementing innovative ideas and state-of-the-art technologies in the energy sector.

New Appointments

Shri Sanjiv Singh to take over as Chairman, IndianOil from 1st June

Sh. Sanjiv Singh appointed as Chairman of the Indian Oil Corporation Ltd. (IOCL), the country's largest commercial enterprise. Sh. Singh is presently the Director (Refineries) of IOCL. Singh assumed charge of Director (Refineries) on 1st July, 2014. Before taking over as Director (Refineries), IOCL, he was positioned as Executive Director (In-Charge) at the Paradip Refinery Project in State of Odisha, a mega prestigious Rs. 34,555 crore project.



Dr. SSV Ramakumar takes over as Director (R&D) on IndianOil Board



Dr. SSV Ramakumar has taken over as Director (Research & Development) on the Board of Indian Oil Corporation Ltd. (IndianOil). Prior to this, he was Executive Director (Refining Technology) at IndianOil's R&D Centre at Faridabad. With a doctorate in Chemistry from IIT-Roorkee, Dr. Ramakumar has almost three decades of uninterrupted R&D experience in downstream hydrocarbons sector, notably in the areas of refinery process research streams, including catalyst development; simulation & modelling; and development, quality upgradation and marketing coordination of automotive lubricants.

Shri P. K. Gupta appointed as Director (HR), GAIL (India) Ltd.

Shri Prafulla Kumar Gupta is B.Tech. in Mechanical Engineering from G. B. Pant University of Agriculture & Technology, Pantnagar (UK). He has more than 33 years of rich and diverse experience in Oil & Gas Sector, particularly in Project Execution along with Operation & Maintenance of Natural Gas Pipelines, Gas Processing Units, City Gas Distribution, Natural Gas & Petrochemical Marketing and Human Resources.



Shri Bhaskar Jyoti Phukan takes over as Director (Technical), NRL

Sh. Bhaskar Jyoti Phukan has taken over as Director (Technical), Numaligarh Refinery Limited (NRL) with effect from 1 February, 2017. Before assuming the charge of Director (Technical), he held the position of GM (Operations) in NRL.

Shri A. K. Gupta appointed as Director (Commercial), NTPC

Shri Anand Kumar Gupta is a graduate in Electrical Engineering from Moti Lal Nehru National Institute of Technology, Allahabad. He has a career spanning over 36 years of outstanding contribution in the Company in various positions including those of Executive Director – in-charge of Commercial and Executive Director (Engineering).



Cairn India appoints Ms. Melody & Shri Atul as Senior Oil & Gas Advisors

Ms. Melody Meyer brings 37 years of rich experience with Chevron Corporation – one of the world's largest integrated oil companies. In her last role as President, Asia-Pacific, she was responsible for driving Chevron's E&P activities across nine countries in the region. She has extensive leadership expertise in global upstream operations, strategic business planning, major capital projects execution, capital allocation and delivering superior financial results.

A sector professional with more than 36 years of rich and varied global experience, Sh. Atul Gupta currently advises private equity firms and sits on the Boards of a number of upstream oil and gas companies including Nostrum (Kazakhstan), Seven Energy (Nigeria) and Vetra Energy (Colombia). Earlier, he was Chairman and CEO of oil and gas companies with BSG Resources – a natural resource and power company. Prior to that, Atul served as CEO of Burren Energy Plc.



FIPI Events



Lectures on 'Proactive Approach in Industrial Safety Management'



Dr. Harbans Lal Kaila, Emeritus Prof. of Psychology making the presentation on 'Behavioural Based Safety'.



Mr. Dhirendra Mishra, General Manager (HSE & SP), Hazira LNG & Port, Shell making his presentation on 'Integrated Approach to Process Safety Management for Safe Plant Operation'.

Federation of Indian Petroleum Industry (FIPI) organised a half day seminar on "Proactive Approach on Industrial Safety Management" on 25th January 2017 at India Habitat Centre, New Delhi. About 35 participants from industry members participated.

During the seminar, two talks, first on 'Behaviour Based Safety (BBS)' by Dr. H. L. Kaila, an independent practicing Psychologist on the subject and other on 'Integrated Approach to Process Safety Management (PSM)' by Sh. Dhirendra Mishra, GM (HSE & SP), Hazira LNG & Port Terminal of Shell India were delivered.

Dr. Kaila, while giving the importance of BBS made the point that imbibing safety in our behaviour has the potential to achieve near zero accident scenario in all spheres of life. To be observant about unsafe situation and taking proactive action can save precious lives and business losses. He defined nine different categories where safe behaviour must be practiced to achieve results (see presentation for details). Behaviour can be recognised, measured, and altered, he mentioned.

Sh. Mishra, through the case study of Texas Refinery Fire, highlighted various areas of technical and general management where even minor and generally ignored issues can have potential of causing accidents with high magnitudes of losses.

Implications of the Union Budget 2017 on the Oil & Gas Sector - Delhi



Mr. Rajiv Bahl, Director (Finance, Taxation & Legal), FIPI welcoming the participants.



Dr. R. K. Malhotra, Director General, FIPI delivering the opening remarks.

Continuing with the tradition of organising an annual event every year, post announcement of Union Budget, FIPI, erstwhile PetroFed conducted a workshop on post budget analysis and its impact on the Oil and Gas sector in knowledge partnership with Deloitte on February 02, 2017 at New Delhi.

At the onset Mr. Rajiv Bahl, Director (Finance, Taxation & Legal), FIPI welcomed the guests and impressed upon them as to how the implications of the budget are expected to reflect on the oil and gas sector. Dr. R.K. Malhotra, Director General, FIPI in his opening remarks while highlighting the policy decisions implicating the oil and gas sector in the latest Union budget, also stated the recommendations that were submitted by FIPI on behalf of the oil and gas industry. While expressing delight on the policy decisions with regard to LPG, it was also highlighted that clarity on inclusion of all petroleum products under the field of GST was still awaited. The integration of oil companies into a 'Major' and the far reaching impact of the same was also stressed upon.

Dr. Laveesh Bhandari, Director, Indicus Foundation gave his insight on the current state of the Indian economy. While he clearly stated that global turbulence has always had a knowing impact on the Indian economy, he clearly stated that fundamentals of Indian economy need to be strengthened. While expressing concern on the law and order situation of the country which acts as an impediment to economic development, he emphasised the need to simplify the tax laws such as GST to facilitate the steady transition from informal economy to a formal one.

Mr. Hemal Zobia, Partner, Deloitte Haskins & Sells LLP started the budget analysis session and set the context of the program. The direct tax implications were discussed by Mr. Hemal Zobia, Partner & Mr. Sujit Parakh, Partner, Deloitte Haskins & Sells LLP and the indirect tax implications were discussed by Mr. Atul Gupta, Senior Director, Deloitte Haskins & Sells LLP.

A panel discussion constituting Mr. R.K. Garg, Director (Finance), Petronet LNG; Mr. Kartikeya Dube, Director – Tax, BP; Mr. R.K. Sethi, Executive Director (CF), IOCL and Ms Gauri Jauhar, Director, Consulting & Research at IHS Markit was held and moderated by Hemal Zobia. The policy decisions stated in the Union Budget were discussed at length with the panellists deliberating on the efficiencies as well as challenges concerning the creation of a 'mammoth.' Also discussed were the recommendations submitted to the government for reduction of import duty on LNG from 5% to zero percent and how the reduction to 2.5 percent is a step in the right direction.



Mr. Laveesh Bhandari, Director, Indicus Foundation talking about 'Gauging the Indian economy'.



Panel discussion - Industry Observations on Direct and Indirect Taxes implications moderated by Mr. Hemal Zobia.

Budget Analysis - Union Budget 2017 and its impact on Oil and Gas sector - Mumbai



Ms. Kaushiki Sinha Ray, Senior Asst. Director (Economic Research), FIPI anchoring the workshop.



Mr. P. Balasubramanian, Director (Fin.) BPCL delivering the opening remarks.



Mr. Hemal Zobia, Partner, Deloitte Haskins & Sells LLP presenting Direct Tax Implications of the Union.

The Mumbai chapter of the post budget analysis program was held at Grand Salon hall, Grand Hyatt on February 03, 2017 in knowledge partnership with Deloitte. In continuance with the tradition of FIPI, erstwhile PetroFed, this workshop was conducted to analyze the impact of the Union Budget on the Oil and Gas sector.

At the onset Mr. Rajiv Bahl, Director (Finance, Taxation & Legal), FIPI welcomed the guests and impressed upon them as to how the implications of the budget are expected to reflect on the oil and gas sector. He also delved upon several critical issues like bringing all petroleum products under the fold of GST, clarity on levy of service tax on royalty on oil exploration, reduction in OID cess and the pressing need to introduce new incentives to bring in more investments in the Oil and Gas sector. Mr. P. Balasubramanian, Director (Fin.) BPCL in his opening remarks gave us an insight into the policies presented in the Budget. He especially commented on the threefold unique nature of this budget – this was the first time that the Union Budget was being held on Feb 01 instead of Feb 28, the merger of the railway budget with the Union Budget and the removal of plan and non- plan expenditure layout of the budget. The latter would provide a holistic view of plans of the government.

Mr. Debasish Mishra, Partner, Deloitte Touche Tohmatsu India LLP gave a comprehensive snapshot of what the Union Budget means for the Oil and Gas industry. Mr. Hemal Zobia, Partner, Deloitte Haskins & Sells LLP discussed the direct tax implications of the budget while the indirect tax implications were discussed by Mr. Anoop Kalavath, Sr. Director, Deloitte Haskins & Sells LLP.

A panel discussion constituting Mr. V.K. Jain, ED - Tax, HPCL, Ms. Bela Mao, Tax Director, Shell, Mr. R.G. Subramaniam, Sr. VP Tax, RIL was held and moderated by Mr. Hemal Zobia, Partner, Deloitte Haskins & Sells LLP. A very well engaged and highly interactive session on the implications of lack of inclusion of all petroleum products under the field of GST was conducted. Also discussed were the challenges and efficiencies associated with creating a "Mammoth".



Group photograph.

Workshop on “EOR – Expanding Horizons: Creating Values”

A workshop on the “EOR– Expanding Horizons: Creating Values” was organized by Federation of Indian Petroleum Industry (FIPI) to delve into the developments of EOR activities across globe, Indian case histories and its potential in India. Although, GOI has taken a number of policy initiatives to enhance E&P activities still it is important for India to focus on mature fields to expeditiously enhance production / arrest decline in production.

During the session, it was discussed that dependence on oil & gas imports has increased significantly due to declining domestic production. Examples of various countries highlighting targeted incentives for matured and producing fields to ramp up production was shared. Considering Indian reserves, a 1% increase in recovery factor will be equivalent to 05 months of oil production.

The speakers highlighted an important aspect of the need of management and technical people who are able to conceptualize, carry out research in laboratory and can take it from field pilot to commercial level in a short period. There should be partnerships of universities with industry in EOR pilot projects. As the EOR projects require long term commitments along with higher capital and operating expenditure, governments have a significant role to play at all levels by providing incentives, develop regulations and also to provide direct support.

Hon'ble Minister of State (I/C) for Petroleum & Natural Gas, Shri Dharmendra Pradhan was present during the concluding session of the workshop and addressed the participants. He announced that with the suggestions provided by the industry stakeholders today, EOR should be incentivized and Government will come out with a new progressive EOR policy.



Concluding session. (L-R) Mr. Sivakumar Pothepalli, Director RJ Oil, CAIRN; Mr. S. Rath, Director (E&P), FIPI; Shri Dharmendra Pradhan, Hon'ble Minister of State (I/C) for Petroleum & Natural Gas; Mr. T. K. Sengupta, Director (Offshore), ONGC; Dr Raj Mehta, University of Calgary, Canada.



Shri Dharmendra Pradhan, Hon'ble Minister of State (I/C) for Petroleum & Natural Gas delivering the address in concluding session.



Mr. S. Rath, Director (E&P), FIPI welcoming the participants.



Meeting in progress.



Group photograph of Inaugural Session.



Conquering Newer Horizons

With a legacy traversing three centuries from the successful commercial discovery of crude oil at Digboi in 1889 and Independent India's first oil field in Naharkatiya - all in the north eastern state of Assam - Oil India Limited was born on 18th February, 1959 to increase the pace of exploration in Northeast India.

Dogged determination of some of the finest oil & gas explorers and a committed workforce has enabled OIL to expand its pan India presence and spread its wings overseas with footprints in countries such as Libya, Gabon, Nigeria, Sudan, Yemen, Venezuela, USA, Bangladesh, Mozambique, Russia and Myanmar.

Today, as a Navratna PSU, Oil India Limited is fully committed to achieve the co-created vision of becoming "the fastest growing energy company with Global Presence" with special emphasis on carrying out its duties as a responsible corporate citizen.

Setting the right pace globally

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(भारत सरकार का उद्यम)

Oil India Limited

(A Government of India Enterprise)



Bringing together creativity and technology to create new possibilities

Every day, new innovations or new technologies are changing the way we work and live. With Innovation as one its core Corporate Values, IndianOil is embracing new technologies and adapting to change to deliver better products and services to its clients in an efficient and environment-friendly manner. As we celebrate 2017 as the year of Innovation & Technology, we renew our efforts towards building a better tomorrow.

