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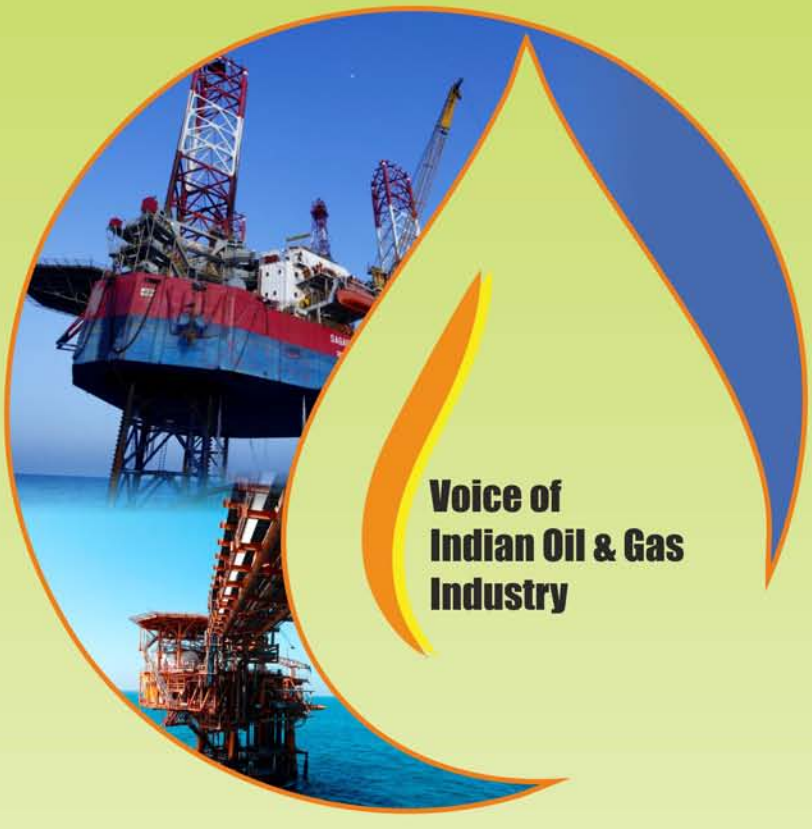
THE JOURNAL OF
FEDERATION OF INDIAN PETROLEUM INDUSTRY



Geopolitics of Oil – Has OPEC Achieved its Objectives?

January-March 2018 | Vol.17 Issue 1

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Rudyard Kipling
captured them
for his novel.
We are capturing
them again,
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"ONGC Eastern Swamp Deer Conservation Project"

a CSR Initiative by ONGC to protect this rare species
from the verge of extinction.

Eastern Swamp Deer or Barasingha (Rucervus duvaucelii ranjitsinhi), currently found in Assam is on the verge of being wiped away. This is truly sad for a wonder that once magnificently captured renowned author Rudyard Kipling's imagination in his novel "The Second Jungle Book".

ONGC stepped in to turn the tables on its possible extinction, and just at the right time.

The first phase involved carrying out baseline population estimates, study of habitat, veterinary intervention, genetic study and awareness campaign. Manas National Park was identified as the new site for its translocation - a separate viable location essential for conservation.

The translocation of 19 Swamp Deer from Kaziranga National Park to Manas was a big task. Its herculean nature drove the second phase as wildlife experts from South Africa, executed the process. By artificially creating their natural habitat inside Conical Booms, 19 Swamp Deer were then translocated. Soon the addition of 6 new fawns in the herd was a reason for celebrations.

The third phase is underway to translocate another 20 Swamp Deer to ensure the sustainability of the project.

For ONGC, it is the beginning of good things to come. Driven to preserve and save the endangered species from extinction, the entity is committed towards the true beauty of nature.

ओएनजीसी
ONGC

Oil and Natural Gas Corporation Ltd.
Regd. Office: Pandit Deendayal Upadhyaya Urja Bhawan, 5, Nelson Mandela Marg, Vasant Kunj, New Delhi-110070.
Tel: 011-26752021, 26122148, Fax: 011-26129091. www.ongcindia.com /ONGC Limited @ONGC_

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IN THIS ISSUE

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From the Desk of the

Director General

Greetings from the Federation of Indian Petroleum Industry!

We recently had the privilege of hosting the presentation of BP Energy Outlook 2018 by Mr. Spencer Dale, Group Chief Economist BP. In his presentation Mr. Dale highlighted that there will be decline in the percentage share of coal and oil in the global primary energy mix while there will be significant growth in gas and renewables. According to him the share of oil, gas, coal and non-fossil sources will each be around 25% by 2040. He added that inspite of the decline in the percentage share of oil in the energy mix; the net oil demand will continue to grow primarily driven by significant growth in India and China. Further, even the electric cars revolution is not likely to have any significant impact on the growth of liquid fuel demand up to 2040, though about 25% of car KMs may be electric driven at that time.

We were also honored to host Mr. Jagjeet Singh Bindra, the first person of Indian origin to be the President of oil MNC in USA, for an interactive session on 'Global Markets Developments'. He is presently the member of the Supervisory Board of LyondellBasell & former President of Chevron Global, USA. Mr. Bindra also indicated that the global crude demand growth will remain strong at least until 2030, primarily driven by the demand in Asia. He also said that inspite of EVs emerging in the scenario world-wide, gasoline and diesel growth is likely to be robust. He added that the projected demand growth will see India become a large net importer of oil unless we augment our refining capacity substantially.

In view of the projections made by various agencies, huge growth opportunities exist in the hydrocarbon sector in India. The projections made by various agencies suggest that the demand for conventional fuels would keep rising in the medium-term and beyond, inspite of various alternatives or emerging EV scenario. There is a huge scope to boost new renewables and alternative sources of energy but they are not likely to impact the rising demand of petroleum fuels. India's refining capacity, therefore, is likely to see a significant jump as various state refiners as well as private refiners like Reliance and Rosneft line up expansion plans, undeterred by the renewables explosion, hoping to meet future demand.

With the objective of achieving Prime Minister's vision for energy security and increased self-sufficiency, the Ministry of Petroleum & Natural Gas (MoP&NG) launched the Bid Round I under Open Acreage Licensing (OAL) Programme for international competitive bidding on January 18, 2018. This was the first time in India that 55 bidder selected blocks, each carved out by prospective bidders themselves in promising basins with an area of 59,282 Sq. Kms, were announced for bidding.

To handhold and apprise the prospective investor community about the salient features of HELP policy frame work and details about the e-bidding process, Government successfully concluded a facilitation workshop in Mumbai on February 12, 2018. The workshop was witnessed by over 150 participants including financial experts, leading professionals from the industry and technical personnel from E&P community. Besides the requisite information about OALP Bid Round – I, the DGH officials also shared the information about the fields to be offered under DSF Bid Round-II which is soon to be launched by the Government.

ONGC agreement saw the strategic sale of its 51.11% equity share-holding in HPCL at a consideration of Rs. 36,915 crore. This acquisition will make ONGC, India's first vertically integrated 'oil major' company, having presence across the entire value chain with the advantage of having enhanced capacity to bear higher risks, take higher investment decisions and neutralizing the impact of volatility of global crude oil prices.

FIPI organized the Post-Budget Analysis meetings at Delhi and Mumbai. Mr. Gokul Choudhry, Partner, Deloitte, Haskins & Sells LLP emphasized on how the oil and gas industry was one of the largest contributors to the country's ex-exchequer and highlighted the dominant position of the hydrocarbon industry in India's economy. He also suggested that there was a need to bring in fiscal stability to promote investments in this sector and to avoid litigations. Mr. Anoop Kalavath, Senior Director, Deloitte, expressed his views on the indirect tax aspects of the budget. As this was the first budget after the introduction of GST from July last year, there was not much to discuss on the indirect taxes other than Customs Duty and the procedural amendments proposed.

During the Post-Budget Analysis, a panel discussion was also held in which the Union Budget 2018-19 was discussed at length and future steps to taken up by FIPI and the Oil industry were deliberated upon. The panel discussion was primarily focused on GST and highlighted the urgent need to bring petroleum products under the fold of GST. The panel mooted on the question of bringing natural gas in the first instance under GST and felt that while this would be a welcome move, even ATF could be considered along with Natural gas as the impact would be relatively small and states could be easily persuaded for this. The panel recognized that the Ministry of Petroleum & Natural Gas is fully seized of the matter and is supporting the case of the oil industry with GST Council.

The 25th GST Council meeting gave recommendations for reduction in the GST rate of transportation of petroleum crude and petroleum products (MS, HSD, ATF) from 18% to 5% without ITC and 12% with ITC. Another recommendation was related to the reduction of GST to 12% in respect of mining or exploration services of petroleum crude and natural gas. Based on the support we are getting from the Hon'ble Minister for Petroleum & Natural Gas, Shri Dharmendra Pradhan we are hopeful that rest of our concerns related to GST will also be addressed in coming months.

FIPI is associated with the organization of the 16th International Energy Forum Ministerial Meet being organized at New Delhi from 10th-12th April, 2018. The theme of this Forum is "The Future of Global Energy Security: Transition, Technology, Trade and Investment". This event is likely to be attended by Energy ministers of various countries and Chiefs/ CEOs of the top oil companies besides participation by agencies like IEA, OPEC, WPC etc. We hope this event will provide an excellent opportunity for the Indian Hydrocarbon industry to interact with the global policy makers and industry leaders.

At FIPI we are committed to the cause of our stakeholders and are engaged in a variety of projects keeping in view the changing times for the oil and gas companies. We have planned studies on "LNG for Transportation" and "Future of Oil for Transportation in 2030 & beyond" with active participation of member companies. In this year we took a new initiative to bring out a monthly report on the Policy and Economic front wherein we highlight the key movements in the global economy and the oil industry at large. We shall continue to strive to better ourselves and work towards adding more value to our industry.

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.

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OIL & GAS

REDEFINING THE ROLE OF PUBLIC SECTOR UNDERTAKINGS IN OIL & GAS SECTOR IN THE POST 2017 ERA

Dr. D C Patra
Fellow Energy Institute, London
Chief General Manager, Planning,
Bharat Petroleum Corporation, Mumbai

INTRODUCTION

"Public sector enterprises (PSEs) are a major force in mining and in some of the capital intense manufacturing sub-sectors as metals, oil, natural gas, refining, capital goods, aerospace, etc. The performance of the PSEs varies quiet a lot across these sub-sectors. What is the role of the public sector, say a decade from now? If they are to remain, for social / political-economic / strategic reasons, then how to ensure that they remain efficient and do not became a drag on the economy? Do we have clarity on their "social role" going forward? What institutional innovations are needed to ensure that the PSEs can compete commercially, and at the same time deliver on their social role?"

This article is a reflection on the questions raised in the above paragraph, quoted from 'Background paper for a symposium on "Future of India", held at 'Indira Gandhi Institute of Development Research' Mumbai on December 8, 2017. (http://www.igidr.ac.in/seminars/igidr-cea-symposium-future-india-background-paper/)

The assessment and the changes proposed in this article are from the national perspective of development and are minimalistic in their scope. These are not to be viewed from the point of view of commercial excellence. The views expressed are scholarly and author's personal; in no way do these represent that of the organization which the author is affiliated with.

1. THE ERA DURING 1955 TO 1976

Two decades commencing from 1955 was the period when all the Oil & Gas companies were set up / nationalized (except GAIL which was formed in 1984). The primary objective then was to make available petroleum products as required in the development process of the country. Policy objective was to have secure and reliable availability of petroleum products at affordable price, across the country.

The criticalities prevailing at that time were the following:

a) Non availability of oil and technology in the country; that was the background under which Oil and Natural Gas Corporation (ONGC), Oil India Limited (OIL) and Indian Oil Corporation (IOC) were set up. ONGC was set up in 1955 and OIL in 1958;

b) Need for development of oil infrastructure like refineries, Petroleum Oil and Lubricants (POL) installations, pipelines and import facilities; which were capital intensive and required massive investment;

c) Need for transportation fuel to support defense and civil aviation requirement.

Oil and Gas Industry then enjoyed the status of economic infrastructure and the status continues till date. The national priority then was to have

State control on the commanding heights of the economy; to have import substitution and self-sufficiency.

Two significant facts merit mention here as background knowledge:

i. There was not much of prospect of oil reserves in India's territory. Multinational countries, having head office in western countries, (Europe and USA) did not provide unconditional support for exploration and production (E&P) activities. Companies from then USSR came to India's help, provided technology to ONGC and proved that there is some prospect of Oil and Gas in the sedimentary basin of India. Thus Mumbai High was discovered in 1974.

ii. The multinational Oil companies then operating in India took adversarial position at the time of war in 1962. They overpriced their products in India. That was the trigger for nationalization of marketing companies, namely Burmah Shell, ESSO and Caltex. Post nationalization, Burmah Shell became Bharat Petroleum Corporation and ESSO & Caltex became Hindustan Petroleum Corporation.

2. THE ERA DURING 1990S

Liberalization and privatization in Oil Industry began in 1990s, when the following four significant developments happened:

i. Multinational companies entered into marketing of lubricants in 1993; Lubes import was de-canalized in 1992.

ii. Private sector and joint sector refineries were allowed to come up in 1992-93. Thus came the largest grass root refinery, commissioned in 1999 at Jamnagar and came MRPL in 1996. Refining sector was de-licensed in 1998.

iii. Import by private parties were allowed for Kerosene and LPG in 1993.

iv. PSU companies were disinvested and their shares were listed in bourses.

The trigger of reform measures at that point of time was capital and investment requirement, particularly from private and FDI. The Restructuring Group (R – Group in 1996) estimated an investment of about $ 100 billion in the Petroleum & Natural Gas sector up to 2010 for ensuring the security of oil and gas supplies for various sectors of economy. Thus came New Exploration Licensing Policy (NELP) in E&P sector in 1997.

From the policy point of view, it was also envisaged to make India a refining hub and to bring about trade balance by exporting petroleum products. Both these intents materialized to benefit the country effective mid-2000s.

3. POST 2000

The period during 2000s witnessed decontrol of pricing and freeing of retail market. Administered Pricing Mechanism (APM) was dismantled in 2002. The process culminated in decontrolling petrol in 2010 and diesel in 2014.

The policy thrust in the 21st century were:

i. Market orientation leading to competition and customer satisfaction;

ii. Reforms including de-subsidization, leading to market determined pricing,

iii. De-carbonization, leading to promotion of LPG and LNG. (Petronet LNG was formed in 1998.)

Remarkable to note that despite occasional oil price shocks, emanating from global market, (first shock in 1973-74, second shock in 1978-79, then 2004-05 and in 2010-11), India has managed its external trade balance and has never resorted to demand side management (restriction in consumption) of petroleum products.

4. WHAT HAS CHANGED?

The table below provides the changes in the economic environment that have induced changes in Oil and Gas Companies 'now' from 'then' with respect to some salient particulars:

Particulars	Situation 'then'	Changes 'now"
Upstream		
Capital and investment in E&P	There was no private investment coming from the private and foreign sector for E&P, as the investment under E&P is always risky.	There has not been much change with respect to availability of private and foreign capital for upstream investment; despite New Exploration and Licensing Policy (NELP, formulated in 1997-98) and Hydrocarbon Exploration and Licensing Policy (HELP, formulated in 2017). Therefore, PSUs like ONGC, OIL and OVL will continue to play the role that they have played so far. Open acreage under HELP provides level playing field to both private and public companies.
Services in E&P	The services in E&P sector is capital and technology intensive. It is always in the hands of foreign companies.	Indian private sector companies like L&T are into it. There is no regulatory entry barrier. PSU Oil Companies are users of these services.
Refining Sector		
Refining	Refining sector is open for private investment since 1990s. Number of private and joint sector refineries have come up and are doing well.	The refineries under PSUs are fragmented in size, geography and old in technology. However, all the refineries are de-bottlenecking and up scaling themselves and going for complex operation, particularly towards petrochemicals. Refineries have consistently upgraded quality of their yields and have kept pace with national auto fuel policy, particularly, for switching over to BS IV and BS VI in compressed timeframe. The PSU refineries will continue to play the role they have been playing.
Crude Oil Procurement	IOC was canalizing agency for import of Crude Oil till 2002.	Now each Refinery is importing crude based on its own commercial consideration and optimization model. As a result, there has been lot of diversity of grade and sourcing of Crude Oil that has taken place in recent years. The same practice will continue.
Export of surplus refined products	IOC was canalizing agency for export of surplus refined products till 2002.	Now each company is exporting their products under EXIM policy. The same commercially prudent practice is likely to continue.
Marketing of Petroleum Products		
Competition	PSU Oil companies operated under oligopolistic market structure.	Now there is price de-control for all products except PDS kerosene and LPG for household use. There is healthy competition in the market between private and public sector companies and amongst PSU companies. The cartelization of PSU Oil companies, which was a feature till some years back does no more exist. Innovative product packaging, branded fuels and delivery mechanisms including use of 'internet of things' (IOT) have changed the marketing landscape of petroleum products. PSU Oil Companies no more enjoy any purchase preference in the market, except for their brand equity. The same practice of operating within market forces will continue.

Public Private Partnership	There has always been public private partnership at the delivery end of the petroleum products. The last leg of delivery, be in product positioning and retailing or in transport, private sectors are used by PSU companies under commercial agreements.	This arrangement has worked well for long time. However, PSU Oil Companies remain guided by policy and procedures framed by MOPNG for selection and appointment of dealers, distributors and transporters. That works well from the point of view of being fair, objective and social justice. However, this very procedure of being fair to all builds some cost into the operating structure.
Infrastructure build up	PSU Oil Companies have invested huge sum of money and built assets across the country.	The need for building more infrastructure exists. Therefore, PSU Oil Companies have to continue the role of infrastructure development in line with their business expansion. It goes to the credit of the professional management of PSU Oil Companies that they have maintained sound balance sheet even with high scale of investment and operated the assets well. There is scope for independent terminaling agencies in this space. There is scope for joint investment in port facilities. Policy permits these activities. There is independent regulator like PNGRB in the space of pipeline infrastructure. There is lot of scope for new pipelines to come under the PNGRB regime.
Quality and customer service	PSU Oil Companies were operating under sellers' market.	Of late, PSU Oil Companies are operating in competitive environment. They are responsive to customers' heightened expectation, particularly those customers who are on positive side of digital divide. There is scope to improve customer service standards. Market forces will compel the PSU Oil Companies to rise to the market compulsions.
New Players and Entry barriers	In the pre-2002, there was entry barrier for new players	There is hardly any entry barriers for new players to get into market. A company can market petroleum products either by way of investing Rs 2000 crores in infrastructure or through equity participation with a PSU Oil Company. Market provides room for disruptions, which may come as a threat to PSU Oil Marketing Companies.
Overseas Business Expansion	Indian PSU Oil Marketing Companies have set up marketing operation in overseas market.	Depending upon commercial potential, PSU Oil marketing companies may be more aggressive in overseas market.
R&D	PSU Oil Companies have developed sound R&D facilities in their own sphere of business.	There is much scope for this and more work can be done by PSU Oil Companies, particularly under collaboration with academia.
Interface with Academia	Each PSU Oil Companies interact with academia under HR / PR activities. Refineries regularly churn out apprentices.	This activity has scope to enlarge. Each PSU Oil Companies has its own in-house training center and leaning culture. Management of each PSU Oil Company takes a call on this.

5. EMERGING SHOCKS TO CULTURE AND STRUCTURE

Democratic polity has always maintained the policies, operating system and governance of PSU transparent and rule bound. Structures of PSUs have been designed for public scrutiny, subject to audit by public authorities and surveillance system of executive and legislative organs of the state. With RTI regime, environment of heightened political and social activism and under the glare of social media, PSU Oil Companies have become more responsive to public opinion and open to participation in public space. Mandatory CSR expenditure has created a separate line of activities for PSUs.

Under these contextual settings, managerial and cultural features like professional focus, domain expertise, commercial decisions, autonomy and corporate integrity are coming under strain and being subjected to test. Hopefully, leadership and managerial acumen will find way to maintain cultural balance, structural resilience and appropriate work culture over period of time. Management cases are to be prepared to develop stocks of sound management practices under different situations.

6. CHANGES REQUIRED IN POLICY AND OPERATING SPACE OF PSU OIL COMPANIES

a. Policy Level

- Strengthen the Board of the Oil PSUs. Autonomy with accountability, corporate governance and commercial excellence are to be the guiding buzz word in the functioning of the Boards.

b. Operating Level

- Oil Companies need to diversify into renewables; that will be step in the direction to fulfill India's commitment to United Nation's Framework Convention on Climate Change, given at Paris in 2015.
- Oil companies have to find a role in upcoming electric mobility practices.
- Oil Companies may incubate start-ups that will leapfrog their business process. That also may help to manage the disruption that may likely to arise from outside
- Be competitive in cost structure and provide affordable service to customers. This may mean working out a different revenue model and pricing methodology.
- Invest in R&D, both technical and managerial, at par with some best multinational oil companies. An area that requires focused approach is knowledge management.

FINANCE

BUDGET 2018: WHAT IT MEANS FOR THE OIL AND GAS SECTOR?



Pankaj Bagri
Partner

Shailvi Singhal
Manager

Khushboo Shah
Deputy Manager

Deloitte Haskins and Sells LLP

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 is the third largest consumer of crude oil and petroleum products globally accounting for 4.5 per cent of world oil consumption in 2015, behind US and China[i].

As per the annual report published by Ministry of Oil and Gas for FY 2016-17, the targeted crude oil production during FY 2016-17 was at 37.085 Million Metric Tonnes (MMT) as against production of 36.942 MMT in 2015-16, showing an increase of 0.39%. Further, the natural gas production (targeted) during FY 2016-17 is at 34.119 Billion Cubic Meters (BCM) which is 5.8% higher than production of 32.249 BCM in 2015-16[ii].

Rapid economic growth would in turn lead to increase in demand of oil for production and transportation. Over the last 9 months April to December 2017, petrol consumption has grown by 8.8%, High Speed Diesel by 5.7%, LPG by 8.4%, whereas Kerosene recorded a drop in sales of 30.9% over this period[iii]. However, domestic production of crude oil decreased by 0.4% leading to increase in imports by 1.6% over same period[iv].

In this context, Mr Dharmendra Pradhan, Minister of Petroleum and Natural Gas stated in his interview that India's oil demand is expected to grow at a CAGR of 3.6 per cent to 458 Million Tonnes of Oil Equivalent (MTOE) by 2040, while demand for energy will be more than double by 2040 as economy will grow to more than five times its current size[v]. Further, in his recent interview, he added that India has a strong focus on using renewable energy sources and will achieve its aim of 175 GW of renewable energy by 2022. Next 20 years, India will be depending on conventional sources of energy - fossil fuels, hydrocarbons[vi].

Given India's dependence on oil and gas, Government has taken several steps to increase domestic production of oil and gas and secure resources abroad for energy security. Some of the important initiatives undertaken to transform the oil and gas sector in India are: Complete mapping of sedimentary basins; new bidding rounds under HELP and DSF bidding rounds; increase of refining capacity; development of national gas grid and creation of an integrated oil company. The acquisition of HPCL by ONGC has been successfully completed recently.

In Budget 2018, Government has announced key policy[vii] as under to promote and strengthen oil and gas sector:

- In order to fulfil the mission to set up Strategic Crude Oil Reserves, it was announced by the Finance Minister in his last year's budget to set up caverns at 2 more locations named Chandikhole in Odisha and Bikaner in Rajasthan which will increase strategic reserve capacity to 15.33 MMT.

In this regard, additional estimated cost of Rs. 1 crores has been proposed for construction of caverns in Chandikole and Padur. Further, to augment 14 days' worth of strategic crude oil storage on import basis, estimated cost of Rs. 700 crores is proposed for filling of crude oil in Mangalore and Padur caverns towards creation of strategic petroleum reserves.

- The budget also announced construction of gas trunk pipelines of 400 km to cover gas supply including industries to Patna, Varanasi, Ranchi, Jamshedpur, Cuttack and Bhubaneswar.
- Given the success under Pradhan Mantri Ujjwala Yojana (already 3.34 crore connections provided), the target to provide 5 crore LPG connections has been increased to 8 crore LPG connections to Below Poverty Line ('BPL') families. To meet the said target, 2 Crore LPG connections to women members of rural BPL households are proposed to be provided which is aimed at replacing unclean cooking fuel with clean LPG. Continuing with Pratyaksh Hanstantrit Labh (PAHAL) and Direct Benefit Transfer in PDS Kerosene (DBTK) scheme to ensure that subsidies reach the public directly without any leakages, all beneficiaries to be linked to Aadhaar Enabled Payment System where direct transfer of subsidy would be done to consumer's account availing LPG Subsidy or kerosene consumers' subsidies.
- In all, an outlay of Rs. 22,180 crores has been provided for FY 2018-19 for various central sector schemes under Ministry of Petroleum and Natural Gas.

Interestingly, Mr Dharmendra Pradhan, Minister of Petroleum and Natural Gas in his recent interview said that "a gas exchange is planned in order to bring market-driven pricing in the energy market of India and the proposal for the same is ready to be taken to the Union Cabinet". This will help pricing of gas to be driven by the market force and uniform over all segments[viii].

TAX PROPOSALS

On the direct tax front, exemption is proposed to be extended to foreign company on income from sale of leftover stock of crude oil on termination of agreement in accordance with the terms mentioned therein and subject to such conditions as may be notified by the Central Government. Currently, income of a foreign company on account of sale of leftover stock of crude oil after the expiry of the notified agreement / arrangement is exempt from tax subject to certain conditions. However, the said exemption is not available in case of premature termination of the said agreement / arrangement.

To put long standing litigation at rest, the most awaited retrospective clarification is proposed on non-applicability of MAT under section 115JB of the Income-tax Act. 1961 ('the Act') to foreign companies engaged in the business of prospecting for or extraction or production of mineral oils on presumptive income basis.

In last year's budget, the Government had announced reduction of corporate tax rate to 25% for companies whose turnover was less than Rs. 500 million in FY 2015-16. Continuing to keep Government's promise to reduce the corporate tax rate in the phased manner, it is proposed to extent the benefit of reduced corporate tax of 25% to domestic company whose total turnover or gross receipts does not exceed Rs. 2,500 million during FY 2016-17. The proposed effective corporate tax rate for such domestic companies would be 29.12%.

Having said which, reduced corporate tax rate has been marginally compensated by increase in Education Cess. Education Cess and Secondary and Higher Education Cess of 2% and 1% respectively has been removed and a new cess 'Health and Education Cess' of 4% is proposed to be levied going forward for all tax payers.

The tax rate remains unchanged for other tax payers. Also, no relief on the long standing demand for reduction of MAT rate is announced.

Introduction of new regime of taxation of long term capital gains. Prior to 2004, LTCG was taxed on sale of listed securities and equity oriented funds and the exemption on the same was introduced from 2004 with effect from 1 October 2004. However, transactions in such long term capital assets carried out on a recognized stock exchange are liable to securities transaction tax. Consequently, the said exemption has now been proposed to be removed from 1 April 2018 on sale of listed securities and equity oriented funds. In other words, any LTCG on sale of listed equity shares or units of equity oriented fund which are subject to securities transaction tax,

with effect from 1 April 2018, would be taxable at 10% of capital gains exceeding Rs. 100,000 without indexation benefit.

Although there were mixed reactions on this proposition, the Government has taken certain measures to ensure that the existing investments are not affected and wide fluctuations in the stock markets are avoided.

Being proactive, the Government notified list of 24 FAQs clarifying the doubts raised by the stakeholders. One of the key issues clarified was that all the capital gains upto 31 January 2018 has been grandfathered. Such grandfathering would be applicable to foreign institutional investors as well. Further, clarification was provided that any LTCG arising on sale of such equity shares or units of equity oriented funds which are sold by 31 March 2018 would be exempt under section 10(38) of the Act. In order to compute LTCG, we have provided an illustrative example in various possible scenarios as under:

Particulars	Example 1	Example 2	Example 3
Actual Cost of acquisition, say January 2014	80	80	80
Fair Market Value as on 31 January 2018	100	100	100
Sale Consideration, say on 30 September 2018 (A)	120	90	60
Cost of acquisition (as per proposed amendment) (B)	100	90	80
Long-term capital gains (A) – (B) [Taxable @ 10%]	20	0	(20)

After the Government had notified Income Computation and Disclosure Standards ('ICDS') effective from FY 2016-17, there was a writ-petition filed by the Chamber of Tax Consultants seeking clarification on constitutional validity of ICDS where Delhi High Court struck down some provisions of ICDS which intend to overrule judicial precedents. In order to bring in certainty in light of the said judicial pronouncement, retrospective amendments (effective from 1 April 2017) are proposed to be made under relevant provisions of the Act to bring in line with ICDS.

In line with Base Erosion and Profit Sharing Action Plan ('BEPS') 1 and 7, definition of 'business connection' has been proposed to be widened to include 'significant economic presence' in context of digital economy and 'agency PE'. Until the tax treaties are amended through negotiation or Multilateral Agreements, companies could rely on the tax treaty to avail beneficial provisions under the tax treaty. Having said which countries with which India does not have a tax treaty (for instance, Hong Kong) may have to relook at the existing model in line with the introduction of the said provisions under the Act. Anyhow, with introduction of Multilateral Instrument ('MLI') as proposed by BEPS, existing arrangements between related parties would require fresh evaluation for determination of tax liability.

At present, deemed dividend under section 2(22)(e) of the Act is taxed in the hands of the recipient at the applicable marginal rate which has posed serious problem of the collection of tax liability and has also been the subject matter of extensive litigation. With a view to ease in collection, it was proposed to tax deemed dividend under the scope of dividend distribution tax at the rate of 30 per cent (without grossing up).

To target shell companies and its actual owners, it was proposed to expand the list of cases requiring application for PAN wherein non-individual entities which enters into a financial transaction of an amount aggregating to Rs. 250,000 or more in a financial year would be required to apply for PAN. The said requirement to obtain the PAN was also extended to managing director, director, partner, principal officer, office bearer etc., of the aforesaid entities. From the plain reading of the provisions, it seemed that a foreign company along with its KMP would be required to apply for PAN.

To limit the scope of the said section, recently, the Finance Bill, 2018 as passed by Lok Sabha restricts the scope of this provision to only resident other than individuals. Having said which, few aspects such as meaning of 'financial transactions' and whether all directors or only 1 authorized director would be required to obtain PAN need appropriate clarifications. This would be relevant for foreign directors of Indian companies.

Further, it was proposed to introduce prosecution for failure to furnish return where exception provided to a person if tax payable on total income determined on regular assessment less advance tax / TDS does not exceed three thousand rupees, shall not be applicable to companies.

To rationalize the assessment procedure, it was proposed to introduce new scheme for assessment procedure by eliminating interface between the assessing officer and assessee, optimal utilization of the resources and introduction of team-based assessment.

Having said which, reduction in MAT rate, introduction of tax holidays / exemption to Oil and gas industry to promote domestic production if oil and gas did not see place.

On indirect tax front, proposed rate vis-à-vis existing rate under excise and custom duty rate in case of motor and high speed diesel are tabulated below. However, the net impact of proposed rate to existing rate of the same remains unchanged.

Customs	**Duty rates applicable prior to 01.02.2018**				**Duty rates applicable w.e.f 02.02.2018**			
Product	**Add duty u/s 3(1) (road cess)**	**ACD (road cess)**	**SAED**	**Ed cess and Higher Edu Cess**	**Add duty u/s 3(1)**	**Road and infrastructure cess**	**SAED**	**Social welfare surcharge**
Petrol (unbranded)	6.48	6	7	3%	4.48	8	7	3%
Petrol (branded)	7.66	6	7	3%	5.66	8	7	3%
Diesel (unbranded)	8.33	6	1	3%	6.33	8	1	3%
Diesel (branded)	10.69	6	1	3%	8.69	8	1	3%

Excise	**Duty rates applicable prior to 01.02.2018 [Rs. Per litre]**				**Duty rates applicable w.e.f 02.02.2018 [Rs. Per litre]**			
Product	**BED**	**AED (road cess)**	**SAED**	**Total ED**	**BED**	**Road and infrastructure cess**	**SAED**	**Total ED**
Petrol (unbranded)	6.48	6	7	19.48	4.48	8	7	19.48
Petrol (branded)	7.66	6	7	20.66	5.66	8	7	20.66
Diesel (unbranded)	8.33	6	1	15.33	6.33	8	1	15.33
Diesel (branded)	10.69	6	1	17.69	8.69	8	1	17.69

Under excise, road and infrastructure cess on ethanol blended petrol and bio-diesel is proposed to be exempted subject to the condition that appropriate excise duties have been paid on petrol or diesel and appropriate GST has been paid on ethanol or bio-diesel used for making such blends.

To boost north-eastern states on India, road and infrastructure cess on petrol and diesel manufactured and cleared from #4 specified refineries in the North-East to be levied at Rs. 4 per litre.

In order to encourage ease of doing business in India, the Budget announced following proposals which will bring efficiency while doing business:

- The time-limit within which the authority shall pronounce the advance ruling has been reduced from existing six month to three months
- Electronic order for clearance of goods for home consumption and clearance of goods for exportation through Customs Automated System in addition to existing clearance by proper officer. This facility shall be made available based on risk evaluation through appropriate selection criteria
- New provisions have been inserted to exempt goods imported or re-imported after export for repair, further processing or manufacture from payment of whole or any part of duty of customs, leviable thereon subject to certain conditions
- To enable payment of duties, taxes, fee, interest and penalty through electronic cash ledger
- To include Speed Post, Courier and registered email as valid modes of delivery for issuing order, notice, summons etc.

In order to reduce litigation, it is proposed to insert a provision whereby a pre-notice consultation shall be held with the assesse before issuance of show cause notice for cases not involving collusion, willful mis-statement or suppression.

CLOSING REMARKS

On an overall basis the budget promotes ease of business but it doesn't do complete justice to the demands of the oil and gas sector. There was little action taken in addressing the issues of oil and gas industry. Higher imports in the oil and gas sector leading to higher fiscal deficit will always remain a concern which has to be addressed on an immediate basis and domestic production should be given a boost.

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FINANCE

KEY PROPOSALS OF THE BUDGET 2018



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January not only marks the beginning of a new calendar year of new resolutions, hopes and expectations, it also ushers in seasons of expectations for the taxpayer population from the annual union budget, which as a custom, is presented before the parliament on the first day of February.

The Indian Oil and Gas industry, still reeling under the global industry downturn, had its own set of expectations. While it is impossible to have a dream budget where all the expectations of an industry are fulfilled, it would be fair to state that the Oil and Gas industry has something to cheer about from the budget in terms of specific clarification on non-application of minimum alternate tax provisions, unlike the few previous budgets.

This article briefly discusses the key direct tax proposals of the Union Budget of 2018 from the perspective of the Oil and Gas industry.

NON-APPLICABILITY OF MINIMUM ALTERNATE TAX

Income earned by non-residents engaged in the provision of services in connection with/hiring of plant and machinery used or to be used for prospecting, extraction or production of mineral oil in India is taxed on deemed income basis under section 44BB of the Income-Tax Act (the ITA), wherein 10% of the gross receipts is deemed to be the total income subject to tax.

There was always a lingering question regarding the applicability of Minimum Alternate Tax (MAT) to the income being taxed under section 44BB of the ITA. The position generally adopted by non-resident service providers was that there was no requirement to maintain books of accounts given the deemed income taxation under section 44BB of the ITA and consequently there was no question of application of MAT. Budget 2018 has now sought to clarify that the MAT provisions do not apply to non-residents having income solely subject to tax under section 44BB of the ITA (and also other presumptive income sections, like section 44B (shipping), section 44BBA (aircrafts) and section 44BBB (turnkey projects)). This amendment is proposed to take effect retrospectively from the Assessment Year (AY) 2001-02 onwards and is very much a welcome amendment.

Having said so, it is noted that the MAT is proposed to not be applicable only when a non-resident has income solely subject to tax under section 44BB of the ITA. There may be instances of a non-resident having incidental income in the form of interest on bank deposits, interest on income-tax refunds, etc. This incidental income can deprive a non-resident from being covered under the budget proposals. Hopefully, this apparent anomaly would be addressed by suitable changes being made in the final budget proposals which would put all the doubts to rest.

EXTENSION OF EXEMPTION FROM SALE OF LEFTOVER STOCK OF CRUDE OIL

Currently, income of a foreign company from sale of leftover stock of crude oil on expiry of agreement or arrangement entered into, or approved by the Central Government, is exempt, subject to certain conditions.

It is now proposed to extend the said benefit of tax exemption to a foreign company from sale of left over stock of crude oil on termination of the agreement or arrangement subject to satisfaction of the prescribed conditions.

REDUCTION OF CORPORATE TAX RATE

It is proposed that all companies with a turnover of less than INR 2,500 MillionsMillion during the AY 2016-17, would be taxable at a reduced rate of 25% from AY 2018-19 onwards. This is indeed a beneficial amendment for large number of companies.

INCOME COMPUTATION AND DISCLOSURE STANDARDS (ICDS)

The Central Government had notified 10 Income Computation and Disclosure Standards (ICDS) under section 145(2), effective from 1 April, 2016 for the purpose of computation of income chargeable under the head 'Income from Business Income and Profession' and 'Income from Other Sources'. ICDS covers areas such as calculating profits from construction contract or contract for providing services, valuation of inventory, change in foreign exchange rates, revenue recognition, government grant, etc. The Delhi High Court in the case of Chamber of Tax Consultants vs Union of India (252 Taxman 77), had struck down certain provisions of the ICDS, which were contradictory to the provisions of the ITA/principles laid down by the Supreme Court.

The provisions of ICDS have now been specifically incorporated into the ITA with retrospective effect from 1 April, 2017 and accordingly, will apply from AY 2017-18. This amendment may require those tax payers who have not applied ICDS while filing their returns for AY 2017-18 to revise the said returns in order to comply with the provisions up to 31 March, 2018.

TAXATION OF LONG TERM CAPITAL GAIN ON SALE OF EQUITY SHARES

The exemption provided to long term capital gain (LTCG) arising from transfer of long term capital assets being equity shares of a company, a unit of equity oriented fund, or a unit of business trusts, on which security transaction tax has been paid, is now proposed to be withdrawn with effect from 1 April, 2018.

Such LTCG exceeding INR 0.1 million will now be taxed at the rate of 10%, without giving effect to inflation indexation benefit and exchange currency benefit. LTCG earned up to 31 January, 2018 is sought to be protected by providing for a stepped up cost which is computed as follows:

Stepped up cost = Higher of {Actual cost of acquisition or [Fair market value as on 31 January, 2018 or full value of consideration received or accrued, whichever is lower]}.

COMPENSATION ON TERMINATION OR MODIFICATION OF ANY TERMS OF CONTRACT OF BUSINESS

It is proposed that any compensation or payments due to or received by an assessee on termination of a contract relating to their business or on modification of any terms and conditions of such a contract, will now be taxed as business income.

This amendment is proposed to widen the scope of taxation concerning compensation.

BUSINESS CONNECTION

1) Expansion of the dependent agent scope under business connection

Under the existing provisions of section 9(1)(i) of the ITA, 'business connection' includes business activities carried on by non-residents through dependent agents. These provisions are similar to the Dependent Agent Permanent Establishment (DAPE) provisions of the tax treaties entered into by India.

The OECD, as part of the Base Erosion and Profit Shifting (BEPS) project (aimed at addressing tax avoidance), recommended certain amendments to the definition of permanent establishment ('PE') (in BEPS Action Plan 7).

The amended DAPE provisions state that an agent would include not only a person who habitually concludes contracts on behalf of a non-resident, **but also a person who habitually plays a principal role leading to the conclusion of contracts.**

The recommendations under BEPS Action Plan 7 **have now been included in Article 12 of the Multilateral Convention to Implement Tax Treaty Related Measures (MLI), to which India is also a signatory.** Consequently, these provisions will automatically modify India's bilateral tax treaties covered by the MLI, where treaty partners have also opted for Article 12. As a result, the DAPE provisions in Article 5(5) of India's tax treaties, as modified by MLI, shall become wider in scope than the current provisions in the ITA, which would further mean that the provisions in the ITA would be more beneficial for the taxpayers.

In view of the above, business connection provisions under the ITA are proposed to be amended, as mentioned below, so as to align them with the provisions of the DTAA and as modified by MLI, in order to make the provisions in the treaty effective.

2) Business Connection includes Significant Economic presence

There has been a radical transformation in the way organisations do business globally as well as in India in view of the increasing digitalisation of business operations. Tax laws did not keep pace with these rapid changes which resulted in tax leakages.

OECD, under its BEPS Action Plan 1, addressed the

tax challenges in a digital economy and discussed several options to tackle the direct tax challenges arising in digital businesses. One such option is a new nexus rule based on 'significant economic presence', which India has proposed to incorporate in section 9(1)(i) of the ITA.

It is proposed that significant economic presence in India shall also constitute 'business connection' under section 9(1)(i) of the ITA. **Further, 'significant economic presence' for this purpose, shall mean** (i) any transaction in respect of any goods, services or property carried out by a non-resident in India, including provision of download of data or software in India, if the aggregate of payments arising from such transaction or transactions during the previous year exceeds the amount **as may be prescribed;** or (ii) systematic and continuous soliciting of its business activities or engaging in interaction with such **number of users as may be prescribed,** in India through digital means.

The threshold of 'revenue' and 'users' in India will be decided after consultation with the stakeholders.

It is **further proposed** to provide that only a specific amount of income as **is attributable** to such transactions or activities shall be deemed to accrue or arise in India

However, it has also been clarified that unless corresponding modifications to PE rules are made in the tax treaties, cross border business profits will continue to be taxed as per the existing treaty rules.

PERSONS REQUIRED TO OBTAIN PAN

The proposed amendment makes it mandatory to obtain PAN for all persons, not being an individual who enters into financial transaction of an amount exceeding INR 2.5 Million in a financial year. It also mandates a managing director, director, partner, trustee, author, any person competent to act on behalf of such a person, etc. to also mandatorily obtain PAN. While the term 'financial transaction' has not been defined in the budget proposals, it appears to cover all the financial transactions in its ambit.

In addition, there is also no specific exclusion for non-residents. Thus, it may occur that even if a foreign company or other entity is merely selling goods from overseas to Indian residents or rendering services, it would be required to obtain a PAN. Moreover, every director, office bearer or agent of such non-resident company or entity will also then need to obtain a PAN. This could be a cause of concern and have far reaching effects on many non-resident entities and their officers.

NON-FILING OF RETURN BY COMPANIES

Currently, many companies do not comply with the requirement of filing return of income and escape from prosecution if their tax payable (after considering advance tax and TDS) is less than INR 0.03 Million.

The Finance Bill, 2018, in order to prevent abuse of the said provision by shell companies or by companies holding Benami properties, has proposed that if a company wilfully fails to furnish in due time the return of income, it shall be liable for prosecution, irrespective of the tax liability of the company.

While the memorandum states that the amendment is proposed to prevent abuse by shell companies or by companies holding Benami properties, the language of the amendment makes it applicable to all the companies.

E-ASSESSMENT

Currently, an assessee at their option can opt for e-assessment or manual assessment. However, to impart greater transparency and accountability, the Finance Minister has proposed to amend the act to empower the Central Government to notify schemes for mandatory e-assessments.

Thereafter, the Central Government has issued an instruction dated 12 February, 2018, clarifying certain procedural aspects of e-assessments, some of which are mentioned below.

1. The tax officer to use digital signature certificate in all communications.

2. Compliance of e-assessment to be undertaken within office hours.

3. For time barring cases, e-submission facility closes 7 days before the due date.

4. Manual proceedings can be undertaken subject to conditions (includes issue of show cause notice contemplating an adverse view).

CONCLUDING THOUGHTS

The direct tax proposals of Budget 2018 are a mixed bag for the oil and gas industry. While a specific amendment on non-applicability of MAT to non-resident oil and gas service providers is highly welcome, the amendment could be better worded for the reasons discussed earlier in this article. The proposed amendments to the definition of business connection, requirements for obtaining PAN, prosecution for non-filing of tax return, etc., have a potential to have far reaching impact on the industry.

The views expressed herein are personal.

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GAS

LNG IMPORTS FROM UNITED STATES OF AMERICA – IMPLICATIONS FOR INDIA

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ABSTRACT

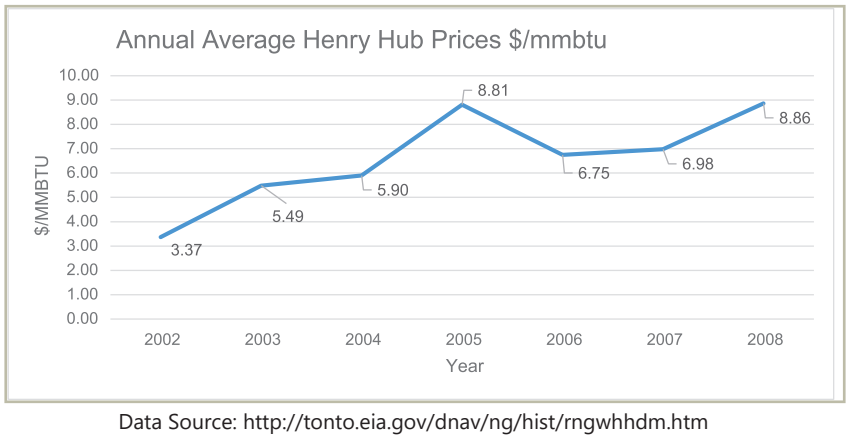
With the shale gas production increasing, USA is slated to become a major exporter of LNG. LNG Liquefaction Projects (approx. 140 MMTPA) have been approved and are in various stages of construction. USA is expected to be one of top three exporters along with Australia and Qatar once this capacity comes on stream. Countries like India were looking at importing low cost LNG(henry hub pricing had advantage over the crude oil linked pricing.) from USA as a secured supply of natural gas to decrease emissions and diversify their fuel mix.

Asian companies were biggest buyers of US LNG due to its price advantage vis- a-vis crude oil linked LNG. However, with the fall of crude prices from 2015 onwards, US LNG became uncompetitive.

This paper examines the growth of US LNG exports, the regulatory requirements and lessons learnt with sudden fall of crude prices and suggest way forward in sourcing LNG from USA.

US SHALE GAS REVOLUTION

During the period from year 2000 to year 2006, the natural gas production showed a declining trend in USA. Based on gas production estimates, it was apparent that USA will have to import gas to meet it's domestic demand. This led to a spurt in LNG Import Terminal projects in USA. The domestic gas prices also showed an uptrend indicating demand – supply gap.



Data Source: http://tonto.eia.gov/dnav/ng/hist/rngwhhdm.htm

However, the gas production estimates did not take into account a silent revolution taking place for harnessing the potential of unconventional gases mainly, the 'Shale Gas'. Development in cutting edge technology i.e. "hydraulic fracturing", innovations in drilling technologies and higher prevailing gas prices made production of shale gas commercially viable.

In fact after 2006, the domestic gas production in USA started showing a growth trajectory with shale gas being the main contributor. Shale gas production has increased from 0.39 Tcf[1] in year 2000 to 15.6 Tcf in the year 2016[2] which is approximately 60% of total natural gas production in that year.

LNG EXPORT PROJECTS

With the forecast of depleting natural gas production, several LNG import terminals were constructed to meet domestic gas demand through imports. With the reversal in the trend of natural gas production from year 2006 onwards, these import terminals remained underutilized. Many companies came under financial stress due to this reason.

With the shale gas production likely to remain higher than domestic demand, brownfield projects to convert the LNG import terminals to LNG export Terminals were envisaged. LNG Export projects currently under construction and approved and those still to start construction are as under:

APPROVED LNG EXPORT FACILITIES[3]

S. No.	Project Name	Capacity Bcfd	Capacity MMTPA*
APPROVED - UNDER CONSTRUCTION			
	Cameron LNG Train 1-3	2.10	15.96
	Freeport LNG	2.14	16.26
	Dominion Cove Point LNG	0.82	6.23
	Corpus Christi	2.14	16.26
	Sabine Pass Train 5 & 6	1.40	10.64
	Sabine Pass Train 1-4	2.80	21.28
	Southern LNG	0.35	2.66
	Sub-Total	**11.75**	**89.30**
APPROVED - NOT UNDER CONSTRUCTION			
	Lake Charles	2.20	16.72
	Magnolia LNG	1.08	8.21
	Cameron LNG Train 4 & 5	1.41	10.72
	Golden Pass	2.10	15.96
	Sub-Total	**6.79**	**51.60**
	Grand Total	**18.54**	**140.90**

*Conversion factor[4] 1 bcf/d = 7.59974192 MMTPA of LNG

Currently there is only one operational liquefied natural gas (LNG) export terminal, Cheniere Energy in the United States, operating since early 2016. The terminal is exporting LNG at its Sabine Pass facility with 3 trains and a capacity of about 2 billion cubic feet per day. It's total capacity is expected to be 3.5 billion cubic feet per day when 5 trains get completed. Cheniere is in the process of getting contracts and financing for a sixth train.

Five additional LNG projects are under construction with a total capacity of about 7.5 billion cubic feet per day, expected to be online in 2018 and 2019. The construction of four more projects with a capacity of almost 7 billion cubic feet per day is yet to start, although approved. The Energy Information Administration expects that LNG exports are likely to exceed 3 billion cubic feet per day in 2018 and over 12 billion cubic feet per day by 2035, thus making USA as one of the top three LNG exporters in the world.

APPROVAL PROCESS FOR LNG EXPORTS

Natural Gas Industry in USA is regulated through Natural Gas Act, 1938 (NGA). Section 1(b) of the NGA defines the areas where it is applicable. Said Section 1(b) reads as follows:

*....."The provisions of this Act shall apply to the transportation of natural gas in interstate commerce, to the sale in interstate commerce of natural gas for resale for ultimate public consumption for domestic, commercial, industrial, or any other use, and to natural gas companies engaged in such transportation or sale, and to the **importation or exportation of natural gas in foreign commerce** and to persons engaged in such importation or exportation, but shall not apply to any other transportation or sale of natural gas or to the local distribution of natural gas or to the facilities used for such distribution or to the production or gathering of natural gas".....*

The imports and exports of natural gas are further addressed in Section 3 of NGA. Section 3 (a) places restriction on the export of natural gas. Excerpts from Section 3(a) are as under:

*".....no person shall **export** any natural gas from the United States to a foreign country or **import** any natural gas from a foreign country without first having secured an **order** of the Commission **authorizing** it to do so. The Commission shall issue such order upon application, unless, after opportunity for hearing, it finds that the proposed exportation or importation will not be **consistent with the public interest.** The Commission may by its order grant such application,*

in whole or in part, with such modification and upon such terms and conditions as the Commission may find necessary or appropriate, and may from time to time, after opportunity for hearing, and for good cause shown, make such supplemental order in the premises as it may find necessary or appropriate ....."

It may be noted that one of the criteria for approval is that the imports and exports are consistent with **"Public Interest".** Section 3(b) and 3(c) of NGA dealing with import and export of natural gas provide "deemed to be consistent with public interest" status to import from/ export to countries having a "Free Trade Agreement (FTA)" with United States of America. The import and export authorizations to FTA countries therefore are fast tracked and on automatic route. The export/ import to non-FTA countries therefore requires a much more detailed scrutiny by Department of Energy (DOE), which is the designated authority for this purpose.

Section 3(e)(1) of the NGA deals with approvals related to LNG terminals and reads as follows:

..."The Commission shall have the exclusive authority to approve or deny an application for the siting, construction, expansion, or operation of an LNG terminal. Except as specifically provided in this Act, nothing in this Act is intended to affect otherwise applicable law related to any Federal agency's authorities or responsibilities related to LNG terminals".....

The designated authority for this purpose is Federal Energy Regulatory Commission (FERC).

In a recent change, DOE grants export/ import authorization with respect to natural gas only after FERC approval. Currently, FERC regulates twenty four operational LNG facilities.

As indicated above, export licenses to non-FTA countries take considerably longer period and are procedure bound. Process involves application, public comment period followed by applicant's response to public comments. DOE then considers the application and grants authorization if it is not inconsistent with 'public interest'.

Though 'public interest' is not defined in the NGA, DOE has developed factors for examining it on consistent basis in every project. These factors[5] include economic impacts, international impacts, security of natural gas supply, and environmental impacts, among others.

PRICE STRUCTURE OF US LNG

Most of the LNG export projects are on tolling model. The total LNG price is summation of various cost elements viz.

a) Purchase of domestic gas

b) Transportation through pipeline to LNG Liquefaction facility

c) LNG Liquefaction tolling charge

d) Shipping charge

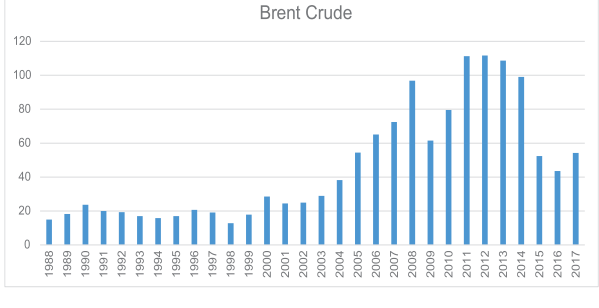
Each may be a separate agreement with different parties and therefore importer has to deal with multiple risks. There are two specific risks which Asian importers need to consider:

a) Henry Hub Price Risk : Asian markets are traditionally used to natural gas price linked to crude oil price. The fuel prices move in synch with crude prices. Henry Hub prices are entirely based on demand supply dynamics of USA. Variations in Henry Hub prices may or may not be in synch with alternative fuel prices.

b) Due to Tolling model, the LNG price has components of free market, regulated and negotiated rates. Due to this there is practically no room to negotiate prices, if market conditions warrant that.

INTEREST OF ASIAN COUNTRIES IN US LNG

Most of the Asian countries have crude linked LNG pricing in their long term contracts. The LNG price therefore varied with crude prices. Crude Oil prices started rising from 2006 onwards and showed an uptrend till early 2014 as exhibited in the following chart.



Data Source: http://www.eia.gov/dnav/pet/pet_pri_spt_s1_m.htm

LNG market during the period 2006 to 2014 was seller driven and hence the slope used for correlating LNG price to crude price in excess of 14.5% on Delivered Ex- Ship (DES) basis. There was a marked difference in gas prices in USA, Europe and Asia, with Asia being the premium market. The free market pricing in USA (Henry Hub) coupled with fixed cost of liquefaction provided the cost advantage to Asian countries vis-a- vis crude linked prices. The arbitrage available during the period 2011-2014 was the very high and therefore there was a rush to tie-up long term LNG from USA. The price differential between crude linked LNG vis-à-vis US LNG for India was as under:

	2011	2012	2013	2014
Henry Hub Prices[6] $/mmbtu	4.00	2.75	3.73	4.39
Brent Crude Prices[7] $/bbl	111.26	111.65	108.64	99.02
DES India Price Crude Linked				
14.5%* Brent crude price	16.13	16.19	15.75	14.36
DES India Price US LNG*	9.60	8.17	9.29	10.05
Price Difference	6.53	8.02	6.46	4.31

*Assumptions : LNG Price = 115%*HH Price + $3(Liq. Cost) + $2(Shipping Cost)

The price advantage along with a general presumption that crude oil prices can only go up, induced a mad rush to tie-up Long Term LNG from USA.

IMPACT OF LOW CRUDE OIL PRICES 2015-16

The euphoria however was short lived. With the falling crude prices from year 2015 onwards, the price advantage was no longer available. Rather the price formulation with a high fixed price component became a disadvantage. The depressed demand led to falling of LNG prices and the slope for DES LNG (Delivered Ex-Ship) came down to 12.5%. The price disadvantage of US LNG was as under :

	2015	**2016**	**2017**
Henry Hub Prices[8] $/mmbtu	2.63	2.52	2.99
Brent Crude Prices [9] $/bbl	52.35	43.55	54.25
DES India Price Crude Linked			
12.5%* Brent crude price	6.54	5.44	6.78
DES India Price US LNG*	8.02	7.89	8.43
Price Difference	-1.48	-2.45	-1.65

*Assumptions : LNG Price = 115%*HH Price + $3(Liq. Cost) + $2(Shipping Cost)

Thus it can be seen that LNG from USA makes sense for the Asian countries in a high crude oil price scenario and has a distinct disadvantage when crude oil prices are lower. Additionally, cost structure almost precludes any possibility of price review.

The crude linked prices, on the other hand, being bundled prices, provided a scope for renegotiation. India in particular has been able to successfully renegotiate it's long term crude linked LNG prices downwards.

PATH FORWARD FOR US LNG SOURCING BY INDIAN COMPANIES

USA is developing into a big exporter of LNG. In the next decade, it is expected to be among the top three exporters of LNG. Considering India is aiming to diversify its energy sources, India will need to import LNG from USA. However the quantity and duration of contract will depend on individual company's risk appetite. Some of identified risks and suggested mitigation approach is given hereunder:

S.No	Risk	Possible Mitigation approach
1.	Henry Hub Indexation not accepted by Indian consumers	• Portfolio approach. US LNG a percentage of total portfolio (to be determined by each company based on portfolio).
2.	Crude Oil Price volatility	• US LNG has price advantage generally when crude oil trades above $70/bbl without considering shipping cost optimization • Past indication of rising price trend indicates shorter duration contracts say around 5 years
3	Shipping Costs	• Swap quantities to optimize shipping costs

CONCLUSION:

With the shale gas production increasing, USA is slated to become big exporter of LNG. LNG Liquefaction Projects of approx. 140 MMTPA have been approved and are at various stages of construction. USA is expected to be one of top three exporters along with Australia and Qatar, once this capacity comes on stream. India therefore needs to import LNG from USA.

There is a price advantage to Indian companies in importing LNG from US during rising crude prices. During low crude prices a high fixed cost structure of US LNG leads to a price disadvantage. It is therefore necessary that Indian companies adopt a portfolio approach and decide allocation of US LNG in the portfolio based on risk appetite.

Source :

[1] https://www.eia.gov/todayinenergy/detail.php?id=811

[2] https://www.eia.gov/tools/faqs/faq.php?id=907&t=8

[3] https://www.ferc.gov/industries/gas/indus-act/lng/lng-approved.pdf

[4] Conversion factors and common units to be used for North American Cooperation on Energy Information (http://www.nrcan.gc.ca/energy/international/nacei/18057)

[5] DOE/FE ORDER NO. 3638 granting long-term, multi-contract authorization to export LNG from Corpus Christi Liquefaction Project

[6] Source http://tonto.eia.gov/dnav/ng/hist/rngwhhdm.html

[7] Source http://www.eia.gov/dnav/pet/pet_pri_spt_s1_m.html

[8] Source http://tonto.eia.gov/dnav/ng/hist/rngwhhdm.html

[9] Source http://www.eia.gov/dnav/pet/pet_pri_spt_s1_m.html

OIL

GEOPOLITICS OF OIL – HAS OPEC ACHIEVED ITS OBJECTIVES?

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DECLARATION OF CO-OPERATION

OPEC member countries, on 30th November, 2016 decided to implement a production adjustment (read 'reduction') of 1.2 million barrels per day (mb/d). The production cut aimed at 32.5 mb/d for stabilizing then oversupplied volatile oil global market. In the agreement, while Iran was allowed to increase its oil production, Nigeria and Libya were exempted. On December 10, 2016, eleven non-OPEC oil producing countries joined the movement and agreed to reduce production by 558 thousand barrels per day (say 0.6 mb/d). Together it makes the reduction in oil production by around 1.8 mb/d by 24 oil producing countries producing about 53% crude oil of the world.

Effective from January 1, 2017, the agreement was for six months extendable by another six months if market conditions compel to do so. All participating countries, OPEC and Non-OPEC decided on May 25, 2017, to extend the co-operative approach by nine months w.e.f. July 1, 2017 that is up to March 2018. Subsequently, the agreement was extended for entire period of 2018 with a review in June 2018.

Indonesia suspended its OPEC membership in November 2016 whereas Equatorial Guinea, a country who agreed to reduce production as non-OPEC country, became full member of OPEC on May 25, 2017. OPEC worked out country-wise 'reduction quota' based on October 2016 levels quoted by secondary sources, as reference baseline (except for Angola which is based on September 2016). Country-wise 'baseline' and 'agreed cut' are given in table 1 (source IEA – OMR, January 19, 2018).

Table 1
Agreed Crude Oil Production Adjustments and Levels (million barrels per day -mb/d)

OPEC

Member Country	Supply Baseline*	Agreed Cut	Desired Production level
Algeria	1.09	-0.05	1.04
Angola	1.75	-0.08	1.67
Ecuador	0.55	-0.03	0.52
Equatorial Guinea	0.14	-0.01	0.13
Gabon	0.20	-0.01	0.19
Iran	3.71	0.09	3.80
Iraq	4.56	-0.21	4.35
Kuwait	2.84	-0.13	2.71
Qatar	0.65	-0.03	0.62
Saudi Arabia	10.54	-0.49	10.05
UAE	3.01	-0.14	2.87
Venezuela	2.07	-0.10	1.97
Total OPEC	**31.11**	**-1.18**	**29.92**

**Reference base to crude oil production adjustment is October 2016 levels, except Angola for which September 2016 is used, and the numbers are from Secondary Sources, which do not represent a quota for each Member Country.*

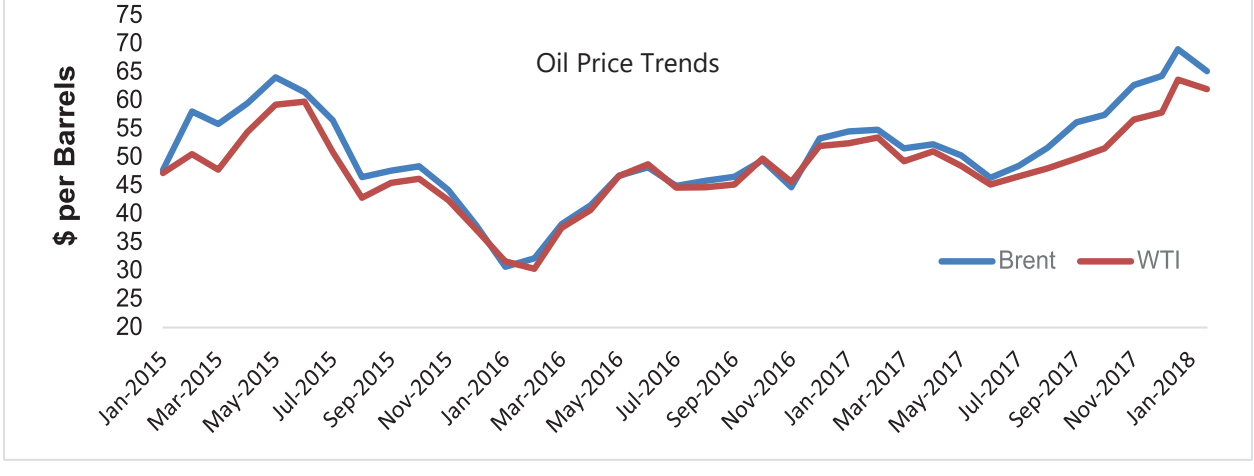
Non-OPEC

Member Country	Supply Baseline	Agreed Cut	Desired Production Level
Azerbaijan	0.81	-0.04	0.77
Kazakhstan	1.805	-0.02	1.785
Mexico	2.40	-0.10	2.30
Oman	1.02	-0.05	0.97
Russia	11.60	-0.30	11.30
Others**	1.22	-0.05	1.17
Total Non-OPEC	**18.86**	**-0.55**	**18.295**

*** Others include Bahrain, Brunei, Malaysia, Sudan and South Sudan*

PRODUCTION ADJUSTMENT VS OIL PRICE TRENDS

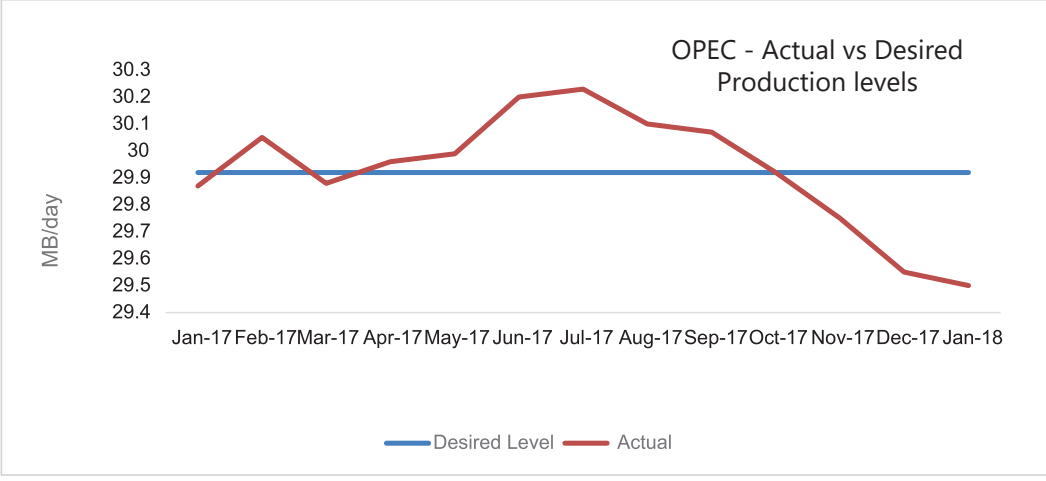
As mentioned above, production adjustment Decision of major oil producing countries to cut the production by about 1.8 mb/d from January 1, 2017 primarily is the outcome of falling cure oil prices. Oil markets globally witnessed downtrends from Q2 - 2015 onward to reach the bottom by the end Q1 - 2016. During this period, monthly average of crude price of Brent touched the lowest average of $30.7 per barrel in January 2016 from its peek at $ 64.08 per barrel in May 2015. Subsequently, markets witnessed range bound trends with Brent price ranging between $45-$49 per barrel till the end of November 2016 after which markets shifted to higher range of $50-55 per barrel till August 2017.



It further moved up and touched average $ 69.08 per barrel in January 2018. The upward reversal in the trend from end 2016 is clearly due to agreement between OPEC and Non-OPEC oil producing countries in December 2016 to cut down their production by cumulative of about 1.8 mb/d from January 1, 2017.

COMPLIANCE WITH RESPECT TO TARGETS

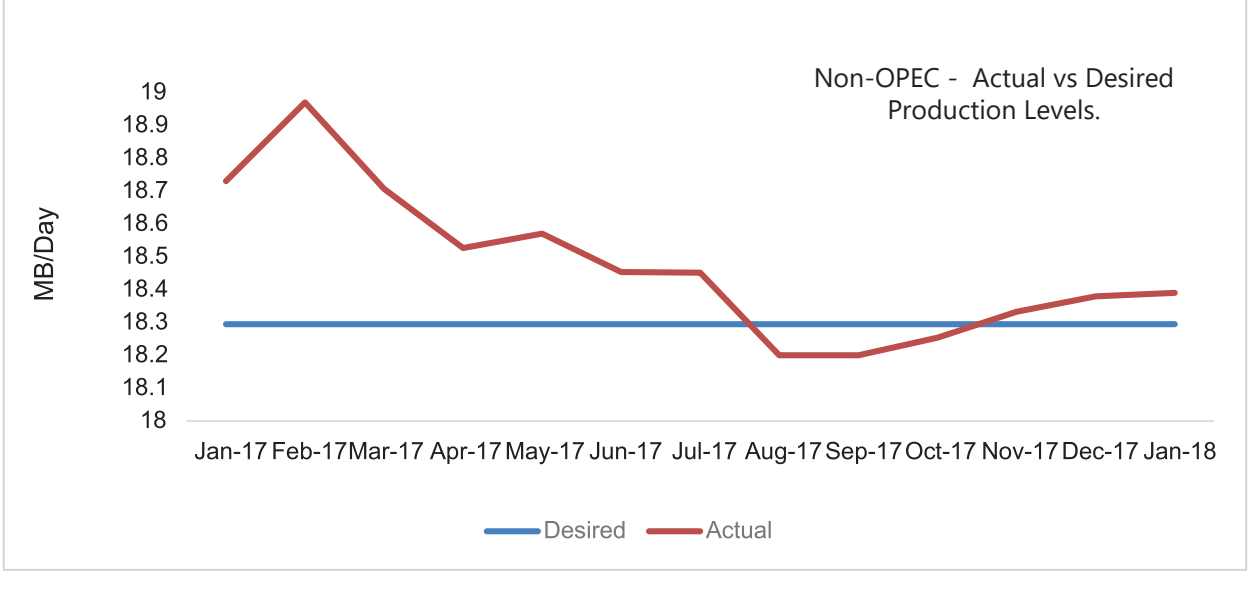
Actual production in 2017 by the OPEC countries (excluding NGL) was 29.99 mb/d against the target of 29.92 mb/d, higher by 0.07 mb/d (0.2%) then the target. This compliance level, considered to be reasonable, could be achieved primarily because of more strict production adjustment from October 2017 onwards. Month-wise production figure from OPEC countries clearly indicates that actual production compared to the desired production level was higher till September 2017 after which production cuts were sharp and compliance rates improved beyond 100% resulting in "Close to compliance" to production level at the end of year 2017.



Saudi Arabia took maximum share of the production adjustment even beyond set compliance level. Venezuela, although produced crude as per the target 1.97 mb/d, the reduction may not be attributed to the spirit of compliance towards adjustment as the country is facing multiple issues on economic front as well as political sanctions by US resulting in drastic reduction in their crude output.

Production level of Venezuella in January 2018 also remained at 1.6 mb/d, the lowest level average since January 1, 2017. Libya and Nigeria, exempted from production adjustment, increased their reduction continuously during 2017. Oil output of Nigeria during January 2018 was 1.82 mb/d and the same for Libya was 1.0 mb/d.

Non-OPEC countries who agreed to join the production adjustment agreement with OPEC countries continued to supply crude higher than their cumulative production level 18.295 mb/d till July 2017. The compliance rate marginally improved between July - October 2017 after which higher than the target supplies were resumed again. On an average, these Non-OPEC countries maintained cumulative average of 18.37 mb/d against the desired production level of 18.295 mb/d during 2017.



US supplies in 2017 continued to increase with rise in crude price. US crude supplies were 12.67 mb/d in first quarter of 2017 went high up 13.85 mb/d in fourth quarter and remained of 13.87 level in January 2018.

OIL DEMAND - SUPPLY BALANCE

The demand during 2017 also remained higher by 1.6 mb/d compared to 96.2 mb/d during 2016. The total demand supply balance is given below in Table -2 (Source IEA, OMR February 13, 2018).

Table 2

Oil demand Supply Balance (mb/d)

	2014	2015	2016	2017
A. Demand	93.1	95.0	96.2	97.8
B. Supply				
OPEC Oil	30.7	31.8	32.8	32.3
NGL	6.40	6.60	6.80	6.90
Total OPEC	37.1	38.4	39.6	39.2
Non - OPEC	56.6	58.1	57.4	58.2
Total Supply	**93.6**	**96.5**	**97.0**	**97.4**

DISCUSSION

With rise in demand and adjustment in production, it is evident that during 2017 oil market shifted from 'over supply' to 'balanced' mode. In spite of higher supplies from some of OPEC members as well as US, it is quite apparent that non-conventional oil production plays the important role in balancing the market. The impact of production adjustment by OPEC countries may face lower compliance if oil producing countries like Nigeria and Libya continue to increase their output. The status of the crude output from Venezuela need to be watched. The country is trying to work out various options to improve production. If successful, production adjustment compliance level will face higher arresting trends.

IEA forecast oil demand in 2018 at 99.2 mb/d. Considering OPEC production at 29.99 mb/d and 7.0 mb/day NGL, total supply may remain at 98.7 mb/d level. Rising demand trend coupled with decreasing scope in stock variations in 2018, increase in production by some oil producing nations which suffered low production and thus low revenue in 2017, may become the choice strategy for their own economic reasons. US production close to 13.9 mb/d is likely to remain at the current price range.

In the meantime, market is balancing its price equilibrium in the range of 62 - 67 $ per barrel (Brent ICE). Demand – Supply forecast for 2018 with balancing forces developed during 2017, specially towards end, this price range is likely to continue in 2018.

(Views and analysis presented in this document is solely of the author. Any one using this for any purpose may do so at own risks and responsibility)

PETROCHEMICALS

A COMPARATIVE STUDY ON NAPHTHA VS GAS VS MIXED FEEDSTOCK FOR PETROCHEMICAL PRODUCTION IN INDIAN CONTEXT

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1. INTRODUCTION: PREVAILING GLOBAL SCENARIO

Last decade, with development of shale in US & recent plummeting of oil & gas prices, a lot of dynamics in petrochem market has been witnessed. Where in 2012-14, ethane based crackers in US were making attractive premiums over its Naphtha counterpart in Asia and Europe, post mid 2014 due to falling crude oil prices, the situation seemed to have changed, the premium for production of chemicals from gas feedstock shrinked significantly relative to naphtha. With falling crude oil prices, the gap between Ethane and other feedstock prices has significantly narrowed, giving the crackers that use heavier feedstock outside US slightly competitive edge as they yield other valuable by-products.

Ethylene cash curve for crackers using Ethane-Propane mix feedstock is less than those only using Ethane gas feedstock. This has gradually made LPG the most preferred feedstock for US crackers. **The Cracker margins for US based ethanes are just slighter higher than Asian Naphtha crackers.** However with crude flirting around less than 40 USD/bbl, Asian Naphtha crackers may even look as competitive as US Ethane cracker w.r.t. margins.

Last couple of years, experts & analysts have attempted to compare the economics of various regions in the world w.r.t. the advantageously available feedstocks. **However, not much work w.r.t. Indian context has been done. EIL, in 2016, carried out a comparative study for olefins/ polymer production from standalone cracker w.r.t. different feedstocks, i.e. 100% Naphtha, Mix feed (60:40: Naphtha: C2 Gas), 100% Gas (C2) feed, and find out the cost of production w.r.t. Indian context.**

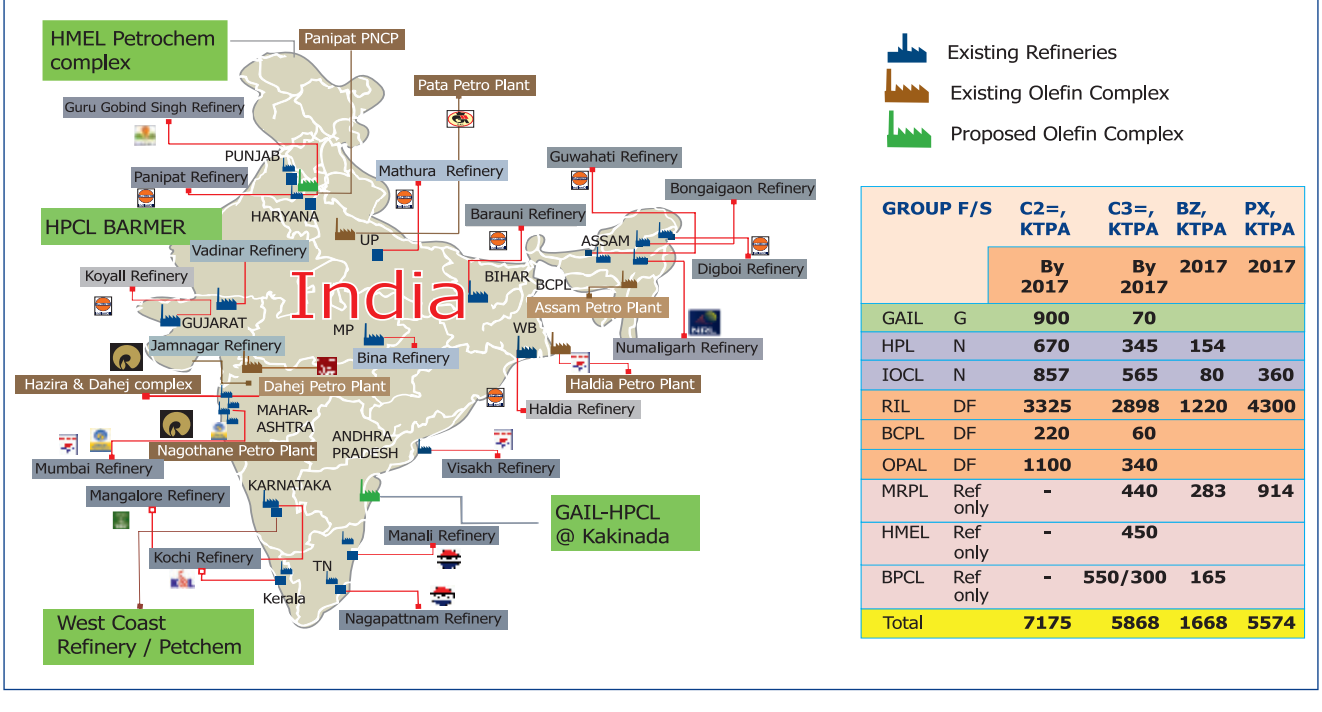
As per the findings of the in-house studies carried out by EIL, it emerges that for integrated refinery-cum-petrochemical complexes, LPG cracking offers potential opportunity for higher value addition. As of now, LPG produced in domestic refineries falls short of domestic demand & the shortfall is met through imports. Given the shortfall in domestic LPG availability, the option of Propane / Butane import can be be looked into as an alternative for feeding to the olefin crackers. However, this study has been kept limited to Naphtha, ethane and Naphtha- Ethane mix feedstock only.

2. EXISTING & ANNOUNCED PETROCHEMICAL COMPLEXES: PETROCHEM SUPPLY& GAP

Currently, the domestic ethylene capacity is over 7.0 MMTPA with 10 operating crackers. A list of existing units, their capacity & feedstock is presented in Table-1 below.

Table-1: Existing Crackers & Feedstocks				
Complex	**Ethylene, KTPA**	**Feedstock**	**Products**	**Remarks**
RIL-Baroda	195	Naphtha	Downstream PE, PP,PVC,ACN and MEG	From RIL-Jamnagar
RIL- MGCC, Nagothane	400	Gas(C2/C3) fractions	PE, PP and MEG	Natural Gas from ONGC (BH). C3 imported or from RIL-JN
RIL-Gandhar	440	Gas(C2/C3) fractions	PE, PVC and MEG	NG by ONGC (Gandhar on-shore and South Bassein)
RIL- Hazira	910	Naphtha, NGL	PE, PP, PVC, PTA, MEG, BD, PDEB, MTBE	Jamnagar Refinery/Imported
HPL, Haldia	670	Naphtha	PE (HDPE, LLDPE), PP, BD, BZ, PGH	IOC Haldia Refinery/ Imported
IOCL-Panipat	857	Naphtha	HDPE, LLDPE/HDPE, MEG, PP, HC4, BD, BZ,SBR	IOC Refinery (Panipat/Mathura)
GAIL, Auraiya	900	Gas cracker	HDPE, LLDPE, HPG, LPG	Natural Gas produced ONGC (South Bassein)
OPAL, Dahej	1100	Naphtha,C2/ C3/C4	HDPE, LLDPE/HDPE), PP, Hy. Pygas, , BD,BZ	Under implementation
BCPL, Lepetkata	220	Naphtha, C2/C3	HDPE, LLDPE, PP, Py.Gas	Started in Jan'16.
RIL Jamnagar*	1400	Gas Cracker	LLDPE, LDPE, MEG, PP(from Refinery)	Off gases from RIL Jamnagar

Fig-1 : Location of Major Petrochemical Complexes



GROUP F/S		C2=, KTPA	C3=, KTPA	BZ, KTPA	PX, KTPA
		By 2017	By 2017	2017	2017
GAIL	G	900	70		
HPL	N	670	345	154	
IOCL	N	857	565	80	360
RIL	DF	3325	2898	1220	4300
BCPL	DF	220	60		
OPAL	DF	1100	340		
MRPL	Ref only	-	440	283	914
HMEL	Ref only	-	450		
BPCL	Ref only	-	550/300	165	
Total		7175	5868	1668	5574

2.1 Burgeoning Gap- 2020/2035 : Opportunity Available

The current import of major petrochemical products in the year 2016-17 is presented in Table-2 below. Asmay be noted, the total import of petrochemicals in the country was more than 12 MMTPA resulting in foreign exchange outgo of more than Rs 84,500 crores.

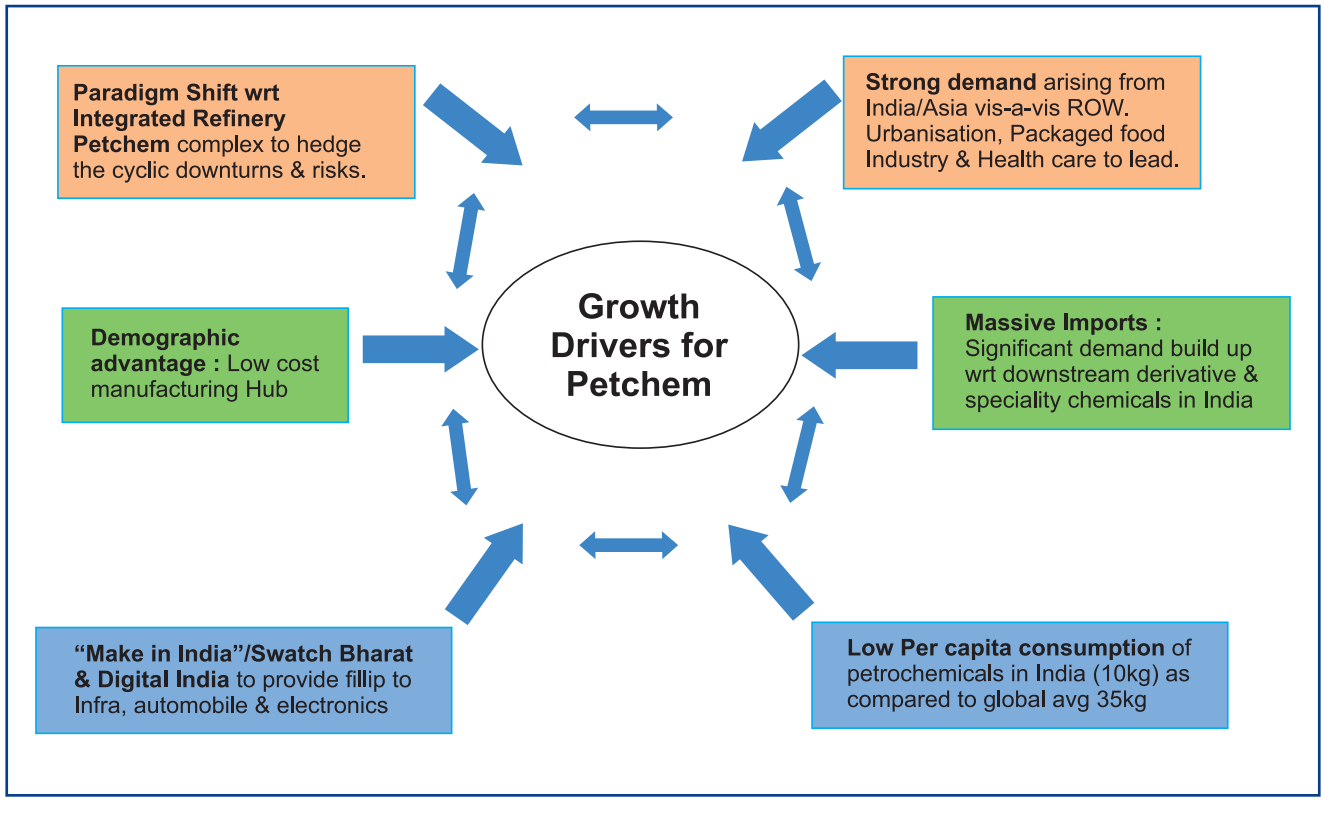
Table-2 : Import of Major Petrochemicals (2016-2017)

S.No	Product name	Quantity	Value
		'000 Tons	Rs Lakh
1	Acrylonitrile	139.71	1081,92
2	MEG	1235.39	6048,38
3	PTA	412.47	1784,54
4	LDPE	391.50	3301,25
5	HDPE	100.46	8,24
6	Polystyrene	44.37	542,25
7	PP (Incl. Co-polymer)	781.19	6118,82
8	PVC+PVC Compound	1761.88	10616,93
9	LLDPE	469.08	3813,87
10	SBR	149.56	1554,36
11	PBR	84.91	930,64
12	EVA	144.60	1416,86
13	Butyl Rubber	1009.84	1369,10
14	LAB	228.09	1776,75
15	ABS Resin	102.69	1142,01
16	Nylon-6	158.81	2337,11
17	Polyester Chips	118.00	689,60
18	Paraxylene	1195.52	6670,02
19	EDC	503.99	863,04
20	VCM	344.42	1773,68
21	Polycarbonate	138.37	2041,95
22	PO	23.06	216,99
23	PG	51.34	399,56
24	Styrene	729.63	5575,71
25	VAM	162.00	871,59
26	Polyol	175.77	2253,87
27	Others	1454.60	19338,35
	TOTAL	**12111.25**	**84537,39**

Source: **Ministry of Chemicals and Fertilisers**

The petrochemicals demand in the country is likely to increase at a fast pace owing to the improving living standards & growth in the middle class. The prime drivers responsible for growth in domestic demand of petrochemicals & derivatives are shown in Fig-2 below.

Figure-2: Growth Drivers



A comparison of the forecast demand numbers of the major petrochemical products vis-a-vis supply is presented in Table-3 below.

Table-3: Burgeoning Gap in Petrochemicals in India

S.No	Petrochemical	Name plate Capacity#	Demand , KTPA		Gap Available	
			2025	2030	2025	2030
1	PP	5815	10048	13701	4233	7886
2	Phenol	282	608	710	326	428
3	Acetone	182	247	268	65	86
4	LLDPE	2275	4154	5853	1879	3578
5	HDPE	2735	4155	5466	1420	2731
6	LDPE	615	1291	1652	676	1037
7	PVC	1550	5147	6573	3597	5023
8	MEG	1919	3249	3969	1330	2050

Table-3: Burgeoning Gap in Petrochemicals in India						
S.No	Petrochemical	Name plate Capacity#	Demand , KTPA		Gap Available	
			2025	2030	2025	2030
9	PX	5565	5333	6378	(-232)	813
10	PTA	7180	7910	9620	730	2440
11	Butadiene	532	411	568	(-121)	36
12	Styrene	0	899	1082	899	1082
13	BA	180	326	413	146	233
14	EPR	30	69	90	39	60
15	SAP	0	55	71	55	71
	C2=	**7489**	**14169**	**18679**	**6679**	**11190**
	C3=	**6221**	**10816**	**14690**	**4595**	**8468**

Source: **IOCL-3rd party Analysis**

Name plate Capacity given in the table above does not take into account the following projects, mentioned in Table-4, which are under construction / implementation stage :

Thus, based on above products only, C2= and C3= Gap available would be 11190 KTPA and 8468 KTPA respectively by 2030. Following announced projects shall narrow this gap significantly

Table 4: Announced New Petrochemical Complexes				
Petchem Complex	C2=, KTPA	C3=, KTPA	BZ, KTPA	PX, KTPA
HMEL Petchem	1200	500	100	
HPCL, BARMER	800	1000	90	
GAIL-HPCL KAKINADA	1000	400		
WEST COAST	7500	4500	Note-1	Note-1
Total	**10500**	**6400**	**1464**	**3600**

Source: EIL In-house Analysis

Note-1: No Benzene and PX for sale anticipated in West Coast project. Benzene shall be consumed captively in Phenol & Styrene plants while PX shall be consumed in making PTA

It can clearly be seen that, based on above derivatives only, the petrochemical deficit gap would be narrowed to a large extent, i.e. a gap of 700 KTPA and 2070 KTPA in C2= and C3= respectively would exist 2030 if the announced projects see the light of the day. Worth mentioning that so far India has been a refinery hub which exports refining products. **In future, post achieving self sufficiency towards the petrochemical deficit, India may like export Petrochemicals also, thus creating opportunities for future investments in petrochemical complexes** apart from the ones mentioned in table-4. The analysis being carried out would be a useful documents for the owners and the policy makers in making the decision for deciding the feedstock for the same.

3. PROCESS & FEEDSTOCK OPTIONS FOR CHEMICAL & PETROCHEMICAL GENERATION

- **Steam Cracking**
  - ✓ Produces olefins and some aromatics.
  - ✓ Processing feedstock including ethane, LPG, naphtha and Gas oil from Crude/ NGL (inc. Condensates)

- **Fluidized Catalytic Cracking**
  - ✓ Produces C3= & lot of C2= in off gases

- **Catalytic Reforming**
  - ✓ Produces Aromatics

- **Alternate Feedstock Options**
  - ✓ Coke/ Coal Gasification: Syn-gas to Chemicals
  - ✓ On-Purpose Olefin technologies like PDH/ BDH
  - ✓ Underground Coal Gasification
  - ✓ From Natural Gas via Methanol: Methanol to olefins(MTO)
  - ✓ Coal Bed Methane

The major factors governing the choice of feedstock in petrochemical plants:

- Availability: assured continuous availiability
- Cost of Feedstock
- Product slate/ configuration type
- Downstream requirement including Aromatics.

3.1 Existing predominant Cracker feedstock across the globe:

- America : Predominantly Gas based
- Middle East : Gas based
- Europe : Naphtha / Gasoil / LPG Based
- NEA : Naphtha Based
- SEA : Mix of Gas based and Naphtha Based
- Latin America : Mix of Gas based and Naphtha Based

Global Cracker Feedstock Consumption (2014),
Source: Indian Petrochem 2015

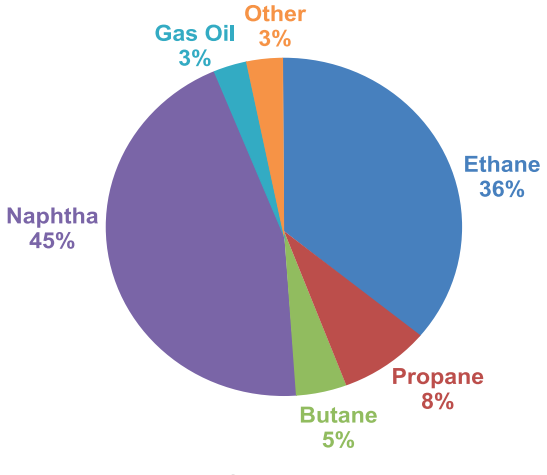


Figure 3 : Global Feedstock Pattern

As is evident from above, two predominant feedstocks for cracker are Naphtha and Ethane with a flexibility to crack other swing stream such as LPG, Gasoil etc. Across the globe either they are used on standalone basis or mixed feed.

Naphtha

- The most common feedstock for crackers
- Produces a broad range of products
- For each ton of ethylene produced, 3.3 tons of naphtha has to be cracked
- Substantial by-products

Ethane

- Regions with surplus, low priced ethane are attractive for steam cracking
- For each ton of ethylene produced, 1.25 tons of ethane has to be cracked
- Minimal by-products (apart from fuel)

TABLE – 5: Feedstock & Logistic cost

Physical State	Feedstocks	Petrochemicals	Transportation Costs
Gas	Ethane, LPG	Olefins	High
Liquid	Naptha, Gasoil	Aromatics/ olefins	Low/ High
Solid	Coal, coke	PLastics	Medium

Cost competitiveness is key to petrochemical success. For a country like India, which lacks a feedstock advantage wrt conventional feedstocks for petrochemical industry, i.e oil & gas, logistic cost plays a vital role, thus Integrated complexes are at advantage than a standalone complex.

3.2 Naphtha & Gas Availability in India & Projected Requirement:

3.2.1 Naphtha

- ❑ Naphtha Production: 17861 / 19946 MT (FY 2015-16/ 2016-17)
- ❑ Consumption in Petrochem Industry: 10350 / 10312 MT(FY 2015-16/ 2016-17)
- ❑ Naphtha Surplus/ Export: 7116 / 8727 MT (FY 2015-16/ 2016-17)

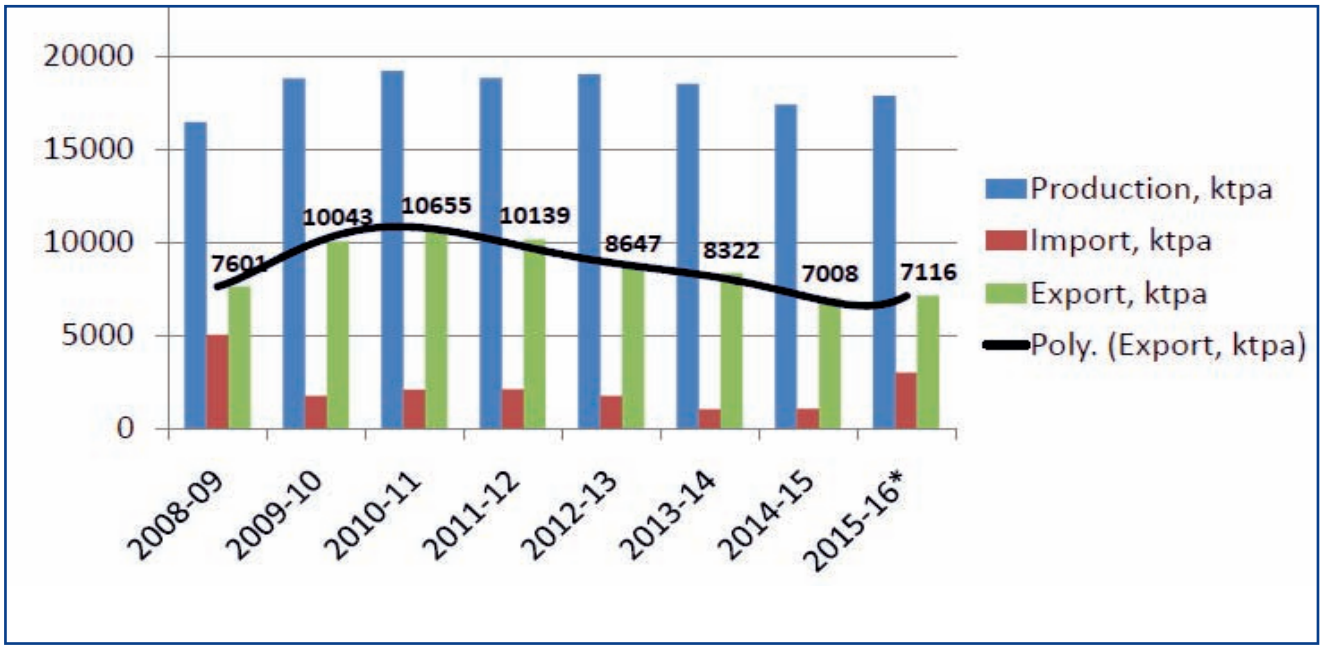


Figure-4: Naphtha Scenario-2015-16, Source: PPAC, MOP&NG

Naphtha produced in various refineries is depicted below:

Refinery	Naphtha Produced KTPA (2016-17)
IOC, Guwahati	15
IOC, Barauni	266
IOC, Koyali	547
IOC, Haldia	503
IOC, Mathura	407
IOC, Digboi	-
IOC, Panipat	1617
IOCL,Bongaigoan, Assam	177
IOCL, Paradip, Odisha	542
BPCL, Mumbai	822
BPCL, Kochi	583
HPCL, Mumbai	406
HPCL, Vishakhapatnam	223
CPCL(MRL), Manali	513
CPCL(MRL), Narimanam	206
NRL, Numaligarh	15
MRPL, Mangalore	1584
ONGC, Tatipaka	27
RPL, Jamnagar	6210
RPL,SEZ	2991
EOL, Vadinar	1012
BORL,Bina	34
HMEL,Bathinda	89
Total Refinery	**18786**
Fractionators	**1160**
Grand Total	**19946**

Source: P&NG Statistics, MOP&NG-GOI

As mentioned above the nation exported Naphtha amounting to 8727 KTPA, which was scattered naphtha. **For setting up world scale crackers, it's imperative that this naphtha is pooled effectively,** however, the price of domestic pooled naphtha should be competitive to the imported naphtha, which inturn helps petrochemical owners to remain competitive. In the coming years, a sharp decline in Naphtha generation as a product is expected from the refineries due to upcoming integrated petrochem projects.

As mentioned above, 8727 KTPA naphtha is already being exported through 2-3 major terminals/ ports, which means this naphtha is already pooled at these ports. One may like to exploit the opportunity by setting up port based worldscale liquid feedstock crackers. The feedstock can be be complemented by import naphtha feedstock also, if required.

3.2.2 Gas Scenario:

- Off take of natural gas(incl. imported gas) for petrochemical sector was 3733 million SCM in 2015-16
- India, being a gas deficient nation, new plants would have to rely on imported gas only.
- In last 5 years, a lot of Indian firms have made big investment in US shale industry for gas feedstock

India, being a gas deficient nation, has set up sectoral priorities for utilization of this so called low priced "APM" gas. Existing cracker units may have access to low cost gas, however, unfortunately the refiners & petrochemical owners setting up new plant would not have access to this low priced domestic gas, and would have to rely on imported gas only. It means gas pricing to petrochemical facility owners would be linked to imported LNG/ ethane only. India is the 4th largest importer of LNG.

In last 5 years, with an objective of feedstock security & profit making, a lot of Indian firms have made big investment in US shale industry. Interestingly the investments made by some of the Indian players in US shale is having ~ 16-17% of C2 & C3, which seems to be a perfect feed for Petrochem complex post C1 and heavier separation. For the purpose of transporting liquefied ethane to India in a safe and cost efficient manner, the firms have ordered state-of-the-art VLECs(RIL has ordered 6, while GAIL has plans for 6 VLEC).

3.2.3 Propane as potential feedstock – imported as well as on-purpose

Apart from Naphtha and ethane, Propane is another attractive feedstock which is widely traded. Benefit of Propane as a feedstock vis-à-vis Ethane is in terms of better yield of by products which are premium products, and also the ease of transportation due to less cryogenic temperature, around - 45 deg C against – 100 for ethane. LPG being a domestic fuel in India, until now C3 from refineries was mostly routed to LPG pool, the deficit was in domestic LPG consumption was made up by import. India imports around 9 MMTPA of LPG. However, Propane finds a much better value-add when it is cracked or converted to petrochemical than being routed as LPG.

Nowadays, when getting more competitive in terms of cost of production is the mantra to survive & sustain, the trend of routing propane solely to LPG pool is now changing upcoming petrochemical complexes are being envisaged with Propane as one of the feedstock, both domestic & imported. Importing low cost propane, wrt domestic price of LPG, is also being looked into by owners for setting up petrochemical complexes either through cracker of on-purpose projects like PDH. EIL, by virtue of being involved in most of the project study feasibility reports, have been suggesting to crack both domestic propane in integrated projects and also importing same for petrochemical production.

3.2.4 Projected Naphtha & Gas Requirement

Based on the deficit expected inspit of the new proposed investments, as shown in table-4, the following quantity of Naphtha and other feedstock would be required to fulfill the demand supply gap of petrochemicals:

Table-6: Estimated Feedstock required to meet Petrochem Deficit in Future

Building Block Gap	Quantity	Feedstock Options , KTPA			
	KTPA	Naphtha Only	Naphtha +Ethane	Naphtha + Propane	Ethane + Propane for PDH
Ethylene	3200/6800	18900 C2: 550	Nap: 17650	Nap: 9450 C3: 8100	C2: 6570, C3: 3675
Propylene	1450/3000				

4. COMPARATIVE CASE STUDY

As mentioned earlier, a comparative study was carried out at EIL for the standalone petrochemical complex having following feedstocks:

- 100% Naphtha Feed
- Mixed feed (60:40:: Naphtha: Ethane w.r.t. Ethylene make)
- 100% Ethane Feed

The objective of study were as following:

- To establish the economic viability of the standalone cracker project w.r.t. different feedstock
- To find out the Cost of Production w.r.t. Ethylene production w.r.t. different feedstock
- To find out the comparative break even feedstock price through the sensitivity analysis.

Following assumptions were considered as the basis of study:

- All the cases shall have same Ethylene make of ~1 mmtpa(1030 KTPA to be exact)
- Same Ethylene derivative have been considered, i.e. HDPE/LLDPE, HDPE, MEG
- For 100% Ethane feed case, all the propylene make has been considered for sale, as the quantity is too small for putting up any derivative.
- Benzene shall be consumed to generate Phenol
- All the utilities shall be produced captively.
- The fuel for the complex shall be as follows:
  a. For cracker unit in all the cases, the fuel shall be fuel gas generated & the deficit, if any, shall be made up by routing H2 to fuel gas pool.
  b. The balance fuel requirement of the complex for CPP etc. shall be satisfied by:
     i. Naphtha for 100% Naphtha case, after consuming all PFO and C9-200 product generated in the cracker unit.
     ii. Ethane for 100% Ethane & mixed feedstock case, after consuming all PFO and C9-200 product generated in the cracker unit
- The hydrogen generated in the complex, post satisfying the cracker unit fuel requirement shall be considered for sale.
- The PYgas make has been considered for the sale
- Cost of the feedstock is at the complex battery limit, taking into account all the logistics/ transportation cost

4.1 Product Slate:

The product slate w.r.t. different feed is as follows:

Table-7: Product Slate

	Case-1	Case-2	Case-3
	Naptha Feed	Mix Feed	Ethane Feed
Net Hydrogen for sale	21	41	43
Ethylene (Intermediate stream only)	1030	1029	1032
HDPE/LLDPE	450	450	450
HDPE	270	270	270
MEG	456	455	460
EVA/ LDPE	nil	nil	nil
Propylene (C3=)	nil	nil	44
Polypropylene	588	366	0
PHENOL	181	108	0
Acetone	111	67	0
Butadiene	169	111	Recycled back after C4H to cracker
Hydrogenated Pygasoline	293	184	25
Styrene			
Benzene (Consumed captively for Phenol)	0	0	0
C9-200 Kero/Diesel Cut)	Consumed in CPP		0
Py. Gas oil	Consumed in CPP		0

Note:

1. Typical C5-160 Naphtha has been considered. C5-90 Naphtha may also be compared later in second case study.
2. Typical Ethane feed composition having min. 98 mole% Ethane has been considered.
3. Cracker unit fuel requirements satisfied by internally generated FG and H2. C9-200 & Py Gas oil generated in Case-1/2 shall be routed to CPP
4. H2 post satisfying cracker fuel requirement is considered for sale.
5. The intermediate streams produced are not shown
6. *(2x 300) chains. For CAPEX estimation all the process unit capacities have been rationalized

For proper financial analysis for each case, the utility requirement & offsite storages have been calculated & accounted for.

4.2 Project Economics: IRR & COP at various Naphtha & Gas price

The Investment in the Project has been evolved considering the basis mentioned earlier. Following additional points have been considered:

a) The hydrogen generated in the complex, post satisfying the cracker unit fuel requirement shall be considered for sale.

b) The PYgas make has been considered for the sale

c) Cost of the feedstock is at the complex battery limit, taking into account all the logistics/ transportation cost.

The following are excluded from estimation:

a) Land cost

b) Railway siding.

c) Cost towards LNG pipeline for supplying LNG till refinery battery limit.

The following product prices(2014-16 price basis) have been considered to evolve the economics of the proposition:

Table-8: Feedstock & Product Prices Considered for Base Case

S.N.	Description	Prices (Rs./Ton)	Remark
1	Naphtha	32,597	Varied as per table-9 for sensitivity analysis
2	Ethane	US$ 11 / MMBTU	Varied as per table-9 for sensitivity analysis
3	Hydrogen	135,000	
4	Ethylene		
5	Propylene	60,000	
6	Butadiene	66,675	
7	HPG	51,626	
8	LLDPE/ HDPE	79,375	
9	HDPE	80,962	
10	Poly Propylene	80,000	
11	Phenol	109,000	
12	Acetone	73,000	
13	MEG	61,841	
14	Styrene	92,075	
15	Benzene	47,625	

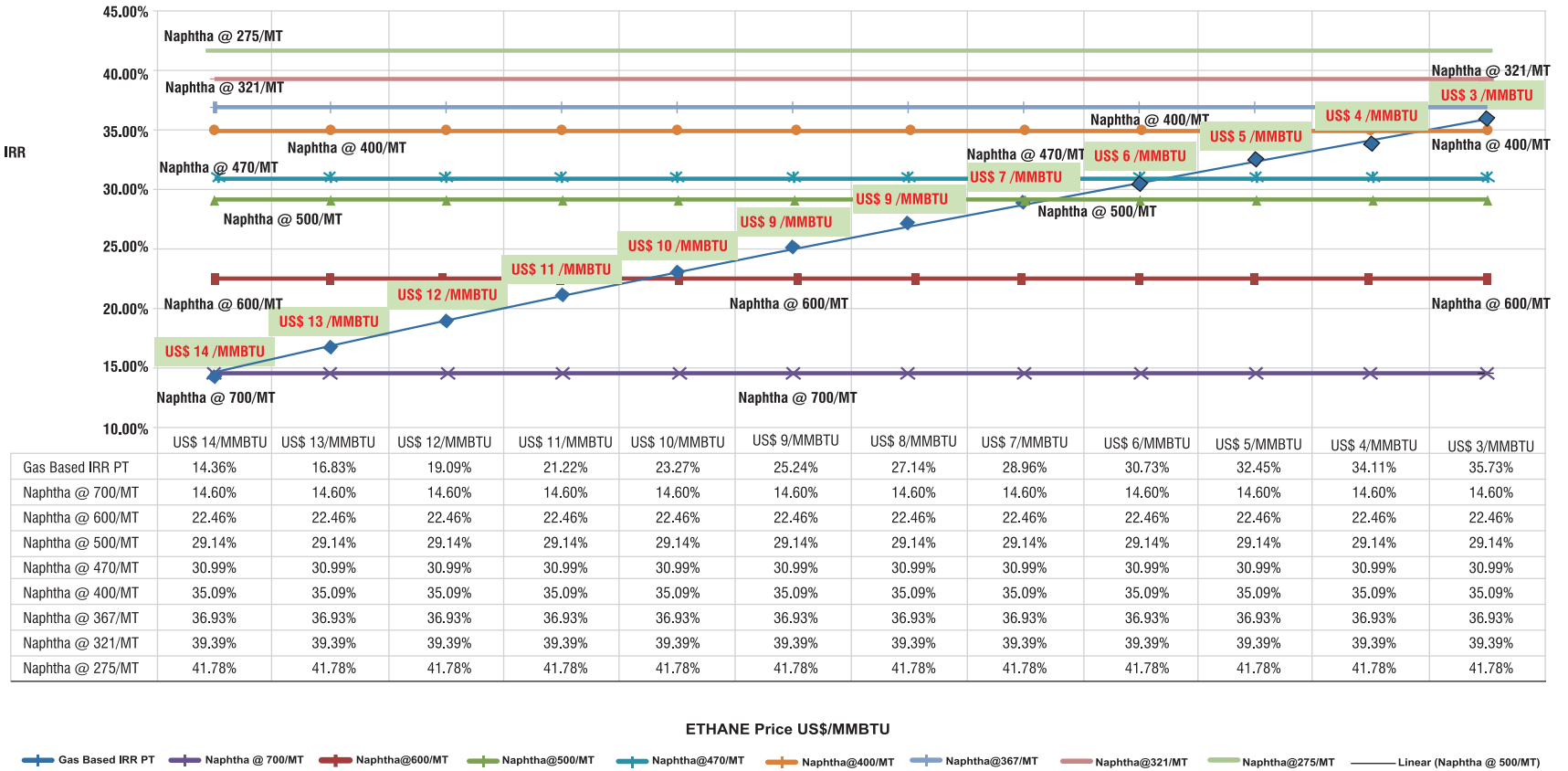
As discussed earlier, gas pricing for a petrochemical facility owners would be linked to imported gas only. Be it a spot transaction of gas or a long-term contract with ME/ US/Australia, the Indian consumer **may expect the complex B/L imported gas price** in the range of **$8-10 /Mmbtu (Liquefaction +Transportation + Regasification + inland transportation + Tax).**

It is a well-known fact that price of Naphtha has a direct linkage to crude price. Though Naphtha price for each refiner varies & the Refinery transfer prices (RTP) are not available in open domain, however, the published data of traded Naphtha price from PPAC, MOPNG and open published sources is as follows:

Table-9 : Naphtha Price Variation((Actual Data, PPAC- MOP&NG)				
Timeline	**Indian crude Basket price, $/bbl ($/ton)**	**Naphtha Price $/ ton**	**Naphtha Price INR/ton**	**Gas price, $/mmbtu**
2013-14	105.52 (773.5)	881.3	53318.65	LNG spot price was 17-18 USD/ mmbtu. Long term contract price was 11-12 MMBTU + 2-3 USD/ mmbtu extra for inland logistic
2014-15	84.16 (617)	717.44	43871.456	
2015-16 (April- Oct)	55.8 (409)	472	30349.6	Spot LNG price ~ 7-8 USD/mmbtu. Add 2-3 USD/mmbtu for logistic
2015-16 (April- Jan)	49 (359.2)	436	28353	
Future case Scenarios for Sensitivity analysis (in-house EIL Prediction)				
Sensitivity Cases	Crude Price $/bbl ($/ton)	Naphtha $/ton	Price INR/ton	Gas Price
Case 1	45 (330)	~ 412	27213	Against each case a variable gas price of 11/10/8/7/6/5/4 USD/ mmbtu to be taken
Case 2	40 (293.2)	~ 367	24189	
Case 3	35 (257)	~321	21165	
		~370	24420	
Case 4	30(220)	~275	18142	
		~320	21120	

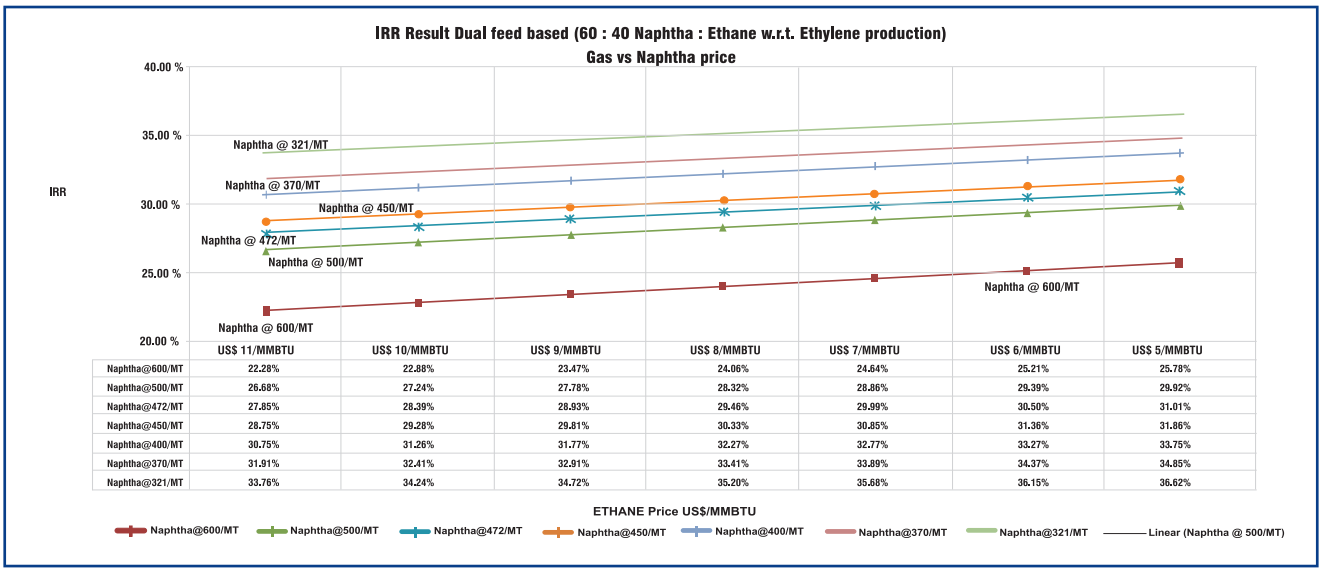
IRR for different Gas & Naphtha Feed price is depicted in Figure-5 and 6 below:

Figure-5: IRR for 100 % Naphtha & 100% Ethane feed at varying feed price



	US$ 14/MMBTU	US$ 13/MMBTU	US$ 12/MMBTU	US$ 11/MMBTU	US$ 10/MMBTU	US$ 9/MMBTU	US$ 8/MMBTU	US$ 7/MMBTU	US$ 6/MMBTU	US$ 5/MMBTU	US$ 4/MMBTU	US$ 3/MMBTU
Gas Based IRR PT	14.36%	16.83%	19.09%	21.22%	23.27%	25.24%	27.14%	28.96%	30.73%	32.45%	34.11%	35.73%
Naphtha @ 700/MT	14.60%	14.60%	14.60%	14.60%	14.60%	14.60%	14.60%	14.60%	14.60%	14.60%	14.60%	14.60%
Naphtha @ 600/MT	22.46%	22.46%	22.46%	22.46%	22.46%	22.46%	22.46%	22.46%	22.46%	22.46%	22.46%	22.46%
Naphtha @ 500/MT	29.14%	29.14%	29.14%	29.14%	29.14%	29.14%	29.14%	29.14%	29.14%	29.14%	29.14%	29.14%
Naphtha @ 470/MT	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%	30.99%
Naphtha @ 400/MT	35.09%	35.09%	35.09%	35.09%	35.09%	35.09%	35.09%	35.09%	35.09%	35.09%	35.09%	35.09%
Naphtha @ 367/MT	36.93%	36.93%	36.93%	36.93%	36.93%	36.93%	36.93%	36.93%	36.93%	36.93%	36.93%	36.93%
Naphtha @ 321/MT	39.39%	39.39%	39.39%	39.39%	39.39%	39.39%	39.39%	39.39%	39.39%	39.39%	39.39%	39.39%
Naphtha @ 275/MT	41.78%	41.78%	41.78%	41.78%	41.78%	41.78%	41.78%	41.78%	41.78%	41.78%	41.78%	41.78%

Figure-6: IRR for 100 % Naphtha & 100% Ethane feed at varying feed price



	US$ 11/MMBTU	US$ 10/MMBTU	US$ 9/MMBTU	US$ 8/MMBTU	US$ 7/MMBTU	US$ 6/MMBTU	US$ 5/MMBTU
Naphtha@600/MT	22.28%	22.88%	23.47%	24.06%	24.64%	25.21%	25.78%
Naphtha@500/MT	26.68%	27.24%	27.78%	28.32%	28.86%	29.39%	29.92%
Naphtha@472/MT	27.85%	28.39%	28.93%	29.46%	29.99%	30.50%	31.01%
Naphtha@450/MT	28.75%	29.28%	29.81%	30.33%	30.85%	31.36%	31.86%
Naphtha@400/MT	30.75%	31.26%	31.77%	32.27%	32.77%	33.27%	33.75%
Naphtha@370/MT	31.91%	32.41%	32.91%	33.41%	33.89%	34.37%	34.85%
Naphtha@321/MT	33.76%	34.24%	34.72%	35.20%	35.68%	36.15%	36.62%

Cost of Production for Ethylene

We have also attempted to find the cost of production of Ethylene for the following cases as tabulated:

a. Naphtha @320 USD/ton, Gas @ 8 USD/MMBTU comes as following

- to be around 502 $/ton for 100% Naphtha Feed Case
- to be around 1001 $/ton for 100% Gas Feed Case
- to be around 712 $/ton for Mixed Feed Case

It can be seen that Naphtha as a feedstock is very sompetitive at this price, and owner would gain good premium by selling at the market trading price.

b. Naphtha @700 USD/ton, Gas @ 12 USD/MMBTU comes as following:

- to be around 1252 $/ton for 100% Naphtha Feed Case
- to be around 855 $/ton for 100% Gas Feed Case
- to be around 1104 $/ton for Mixed Feed Case

It can be seen that Naphtha as a feedstock, at this price vis-à-vis, gas and mixed feedstock isn't attractive. Naphtha plant owners at this price would be the price setters which would be determining the market price of C2=. Hence, owners using other feedstock would be making premium on their product.

Naphtha	US$/MT	700		
Gas	US$ / MMBTU	12	1 USD	Rs 62

COST OF PRODUCTION OF ETHYLENE - COMPARISON

Sr.no	Description	3rd Year 100% capacity	3rd Year 100% capacity	3rd Year 100% capacity
I	Variabel Cost	Naphtha Feed Based	Gas Feed Based	Dual Feed Based
1	Raw Material Cost	128,515	42,459	94,303
2	Fuel requirement - additional	5,236	5,006	5,210
3	Power Cost	Internal Gen	Internal Gen	Internal Gen
4	Other Utilities & Offsite	1,603	1,567	1,591
5	Cat/Chem Cost	667	665	667
6	Manpower	765	763	765
7	O&M	1,167	824	1,194
	Total Variable Cost (1 to 7)	137,952	51,284	103,731
8	Interest - Long Term	8,028	5,687	8,232
9	Interest - Long Term	874	872	875
10	Depreciation Cost	5,742	4,037	5,903
11	Other Cost (Ammoritization)	167	93	135
12	Insurance Cost	565	400	579
13	Selling Expense	380	47	256
	Total Fixed Cost (7 to 10)	15,756	11,136	15,980
14	By-Product Cost	- 76,077	- 9,434	- 51,238
	Cost of Production (Rs. / MT)	77,632	52,986	68,472
	Cost of Production (US/ MT)	1,252	855	1,104

5. CONCLUSION

As discussed earlier, the major factorsgoverning the choice of feedstock in petrochemical plants:

1. Availability: assured continuous availability
2. Cost of Feedstock
3. Product slate/ configuration type

Given the availability of feedstock & finalized configuration, the impact of feedstock has clearly been shown by the Comparative case study above. From the results above, refer the IRR graph & COP in section 8.11, one may clearly infer the feedstock price at which Naphtha wins over Gas and vice-versa.

The graphs clearly show why the existing gas crackers were enjoying a healthy margin vis-à-vis Naphtha ones when crude price was high earlier.

For upcoming units, Ethane rate of less than 5 USD/ MMBTU can only be envisaged at US/ ME, in Indian context, we believe, imported Ethane would never be available at a price less than 8-10 USD/ MMBTU depending upon the in-land distance from the terminal

The study is also in line with the global comparative carried out by the analysts w.r.t. US Ethane cracker/ ME crackers and NE Asia crackers where we see which have better margins due to respective advantageous feedstock. Availability of cheaper feedstock makes them competitive, i.e.:

- America : Predominantly Gas based
- Middle East : Gas based
- Europe : Naphtha / Gasoil / LPG Based
- NEA : Naphtha Based
- SEA : Mix of Gas based and Naphtha Based
- Latin America : Mix of Gas based and Naphtha Based

Given the present scenario, crude flirting around 30 USD/bbl, Naphtha cracker seems a clear winner.

Further considering the non-availability of domestic gas for gas cracker, as discussed above, the Naphtha crackers are going to remain competitive as long as Naphtha is below 600 USD/MT (crude ~ 60 USD/bbl) as the availability of Ethane at complex battery limit at less than 10 USD/MMBTU would be a challenge. Further, as global gas price has linkage to crude, oil price moving up is bound to make gas price go up. Graph shows us even at a price of 700 USD/MT, Naphtha is competitive until we get a gas less than 14 USD/MMBTU.

Worth mentioning that study is independent of any location. The graph plotted for I**RR versus the Naphtha/ gas/ mixed feedstock price@ Complex Battery limit,** clearly shows the viable option **at given battery limit feedstock price**. Also the Naphtha available with each refiner, we can strategically pool in naphtha from the near-by refinery & set up a petrochemical complex. Also, as mentioned earlier, gas need to be integrated to refineries, which in **return shall displace the liquid fuel from HGUs and CPPs, the displaced naphtha should then be utilized as petrochemical (Olefin & Aromatic) feedstock.** Past couple of years, various suo-motu case studies has been carried out by EIL in this regard which have been passed on to respective clients / MOP&NG

In next few years, we do not foresee a reason for crude price to touch the previous high, until something exceptional happens, so a setting up a standalone gas cracker complex doesn't seems a viable option. **Further, taking into account the emerging threat due to disruptive technologies, refiners would be under pressure due to anticipated dip in the demand from transportation sector which may lead to a fall in price of naphtha. This situation may make naphtha crackers even more advantageous in time to come.** As of now, even accounting the **crude price rise to 70-75 USD/bbl in near future, we suggest going for a mixed feed cracker would be the best option.** It would allow the owner to hedge the risk & also give flexibility of altering the feedstock w.r.t. market scenario.

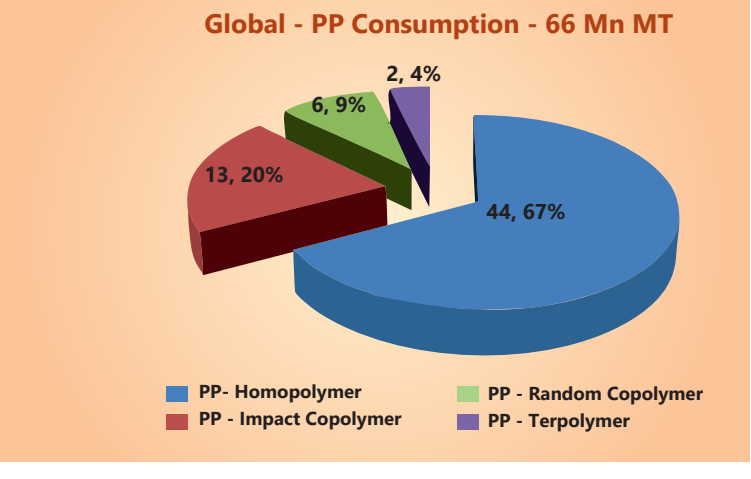
PETROCHEMICALS

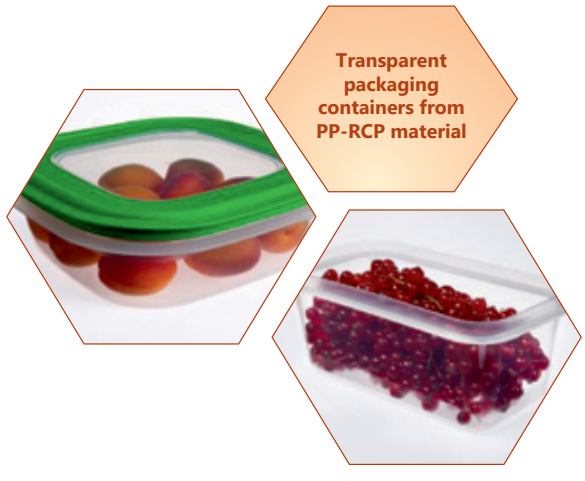
POLYPROPYLENE RANDOM COPOLYMER – MARKET OUTLOOK & EMERGING TRENDS

Prabhu N. Chakrawal
Manager – PADC
Product Application & Development Center (PADC)
BD- Petrochemicals
Indian Oil Corporation Ltd., Panipat

POLYPROPYLENE RANDOM COPOLYMER MARKET OUTLOOK:

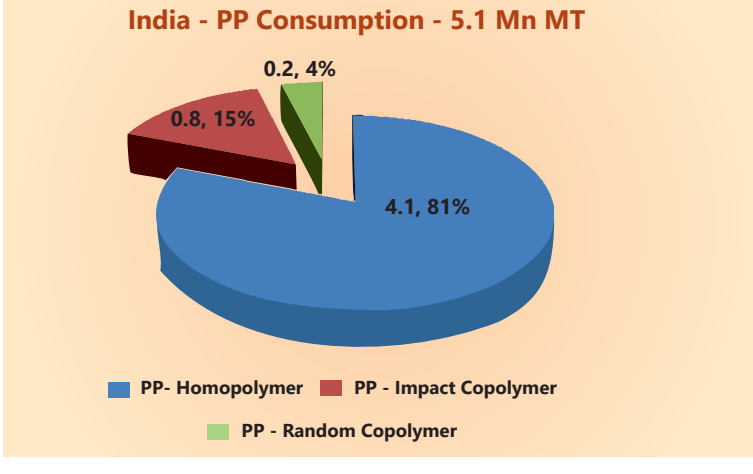
Polypropylene Random Copolymer (PP-RCP) is used in a host of applications across sectors such as FMCG Packaging, harma packaging, Appliances & Housewares due to its versatility, ease of processing, cost efficiency and value added properties such as transparency, gloss, light weight and decent heat resistance.



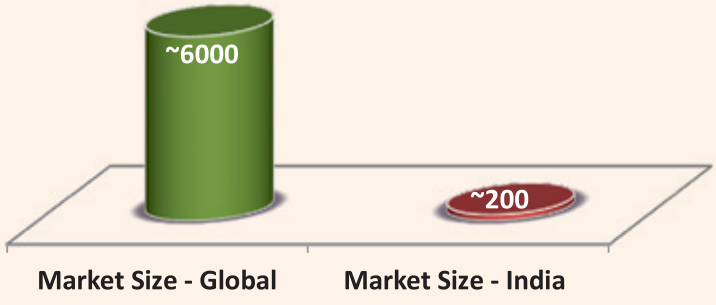
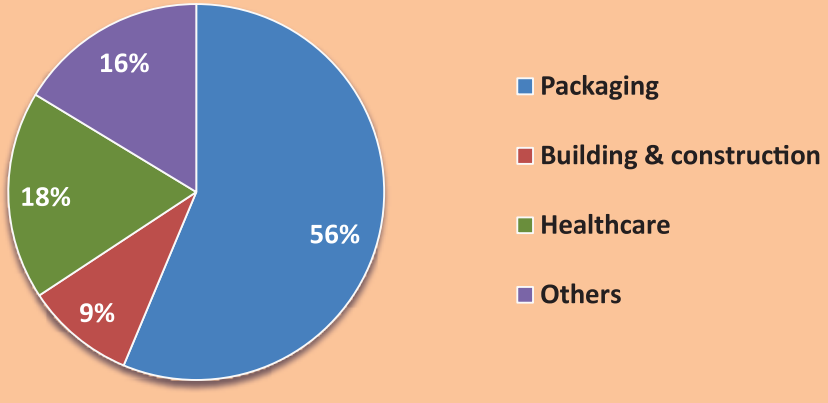
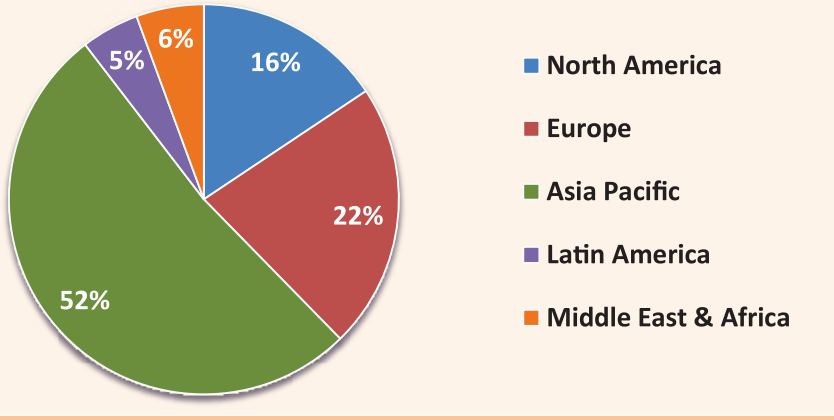
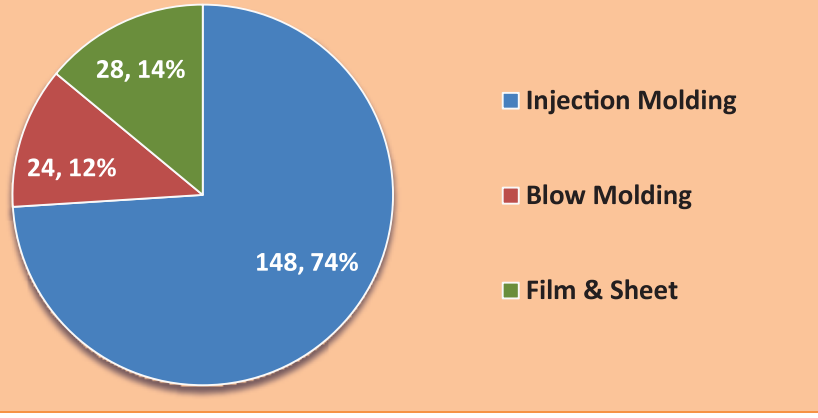


The global polypropylene random copolymer market share for packaging held the largest chunk, occupying more than half of the overall industry and market share for packaging is forecast to witness highest gains by 2024.

Asia Pacific mainly led by China, India and Japan polypropylene random copolymer market size dominating the global demand and is forecast to experience highest gains at over 5.5% over the projected period 2016 -2024.



Polypropylene Random Copolymer Industry Synopsis

Industry Factor	Description
Market size (KT)	
Global End-user trends	
Regional trends	
Sector wise consumption – India (KTA)	

Source: ICIS, Global Market Insights & Industry Reports

GROWTH DRIVERS & EMERGING TRENDS:

Robust growth in the packaging industry across the globe is analyzed to be the prime factor contributing the overall polypropylene random copolymer market size by 2024. This trend is analyzed to fuel the global polypropylene random copolymer market share by 2024.

Polypropylene random copolymer market size is chiefly driven by increasing product applications across food storage containers mainly due to its good impact resistance, good optical and flexibility characteristics. In addition, the product offers value added properties such as gloss, transparency, light weight and decent heat resistance. It also helps in retaining food's organoleptic properties.

Trends	Sub-Trends	Market Demand
Growing Population Rising per capita income	Increasing working population & Increasing number of dual income families	Processed packed food
Increasing number of super market	Drifting focus of manufacturers towards esthetic packaging	Value added properties such as gloss & superior clarity in the packaging container
Creative Sales and Marketing	People would love to buy a tantalizing and scrumptious eatable if it's packaging is mouth watering.	See-through packaging along with added durability by enhancing shell life of packed food

Main Segments	Packaging Industry
Growth Markets	China, India Emerging Markets
Growth Segments	Food packaging Beverages packaging Pharma packaging

Clear packaging gives products an aura of being natural & fresh

NEW APPLICATIONS DEVELOPMENT WITH IOCL PROPEL PP-RCP GRADES:

PP-RCP finds widespread applications across packaging due to its cost efficiency, good barrier, clarity and high durability characteristics. These properties help in effectively preserving the products along with providing protection against moisture.

IndianOil's department Product Application & Development Center (PADC), BD-Petrochemicals has taken up various initiatives for new application developments with IndianOil's High performance Polypropylene Random Copolymer grades (PP2120MC & PP2020EC) by way of extending technical supports to the interested OEM's & customers.

Recently, following new application developments was strived using IOCL PROPEL PP-RCP Grades:

1. **Packaging of bio fertilizer in transparent container**

Grade Used: PROPEL 2120MC

There was a demand of transparent pails for packaging of Bio-Fertilizer from a renowned fertiliser manufacturing company.

Key Properties Requirements: Excellent clarity as well high drop impact strength in container.

Only PP-RCP could not meet above required properties hence an in-house material formulation was developed using our grade PP-RCP 2120MC alongwith high performance impact modifier.

Key benefits of transparent container as per PADC formulation:

- Customer can see the packed product
- Good Aesthetics
- Container passed in drop test performance

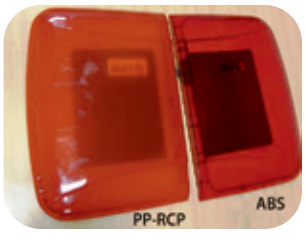
2. Replacement of transparent ABS with PP-RCP for washing machine top cover

Grade Used: PROPEL 2120MC

Key Properties Requirements: Surface printability, scratch resistance & good clarity.

Advantage of RCP-PP lid over ABS lid:

- ~20 % weight reduction with PP-RCP lid.
- No in-transit breakage in PP-RCP lid, as material is having a balance of impact & stiffness properties.



- Advantage of cost benefit with PP-RCP over ABS material.

3. Replacement of glass bottle with transparent PP-RCP IBM bottle

Grade Used: PROPEL PP 2020EC

It is a significant cost effective application development with transparent Random Co-polymer Polypropylene (RCP-PP) grade 2020EC for pharmaceutical packaging.

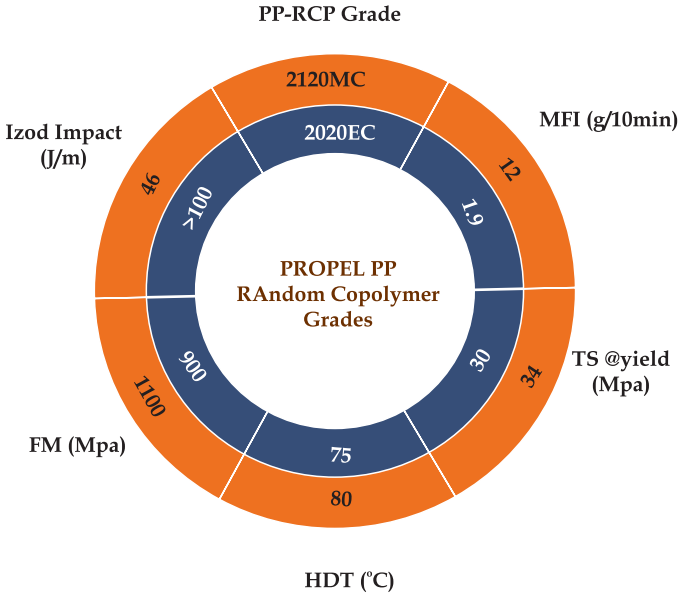
450 ml bottle for syrup packaging

Key Properties Requirements: Very good moisture barrier, light barrier & good clarity alongwith added product stability by retaining shell life of packed medicine.

Advantage of RCP-PP bottle over Glass bottle:

- 50 - 60% weight reduction with PP bottle over glass bottle.
- Cost saving with PP bottle due to no in-transit breakages in PP bottle.
- Due to weight reduction transportation cost is more economical with PP bottle.
- Advantage of cost benefit with PP bottle over glass bottle.

Bottle for solid tablet packaging



IndianOil's PP Random Copolymer (RCP) Grades:

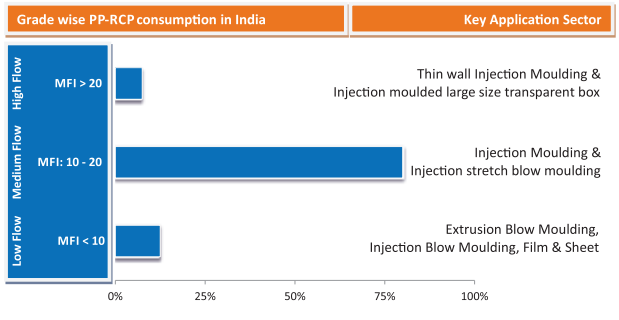
PROPEL PP- RCP grades 2120MC & 2020EC are produced from renowned Spheripol Technology of Lyondell Bassel, Italy.

These grades are coupled with benefits such as reduced processing temperatures, lower cooling time (thus energy saving to processors), better optical and balanced physical properties.

Key benefits of PROPEL PP-RCP grades:

- Lower processing temperatur(approximately 30-35°C).
- Reduced specific energy consumption.
- Improved surface aesthetic & better gloss e
- Lower Yellowness Index.

An outline of grade wise PP-RCP consumption in India:



India's No.1
Commercial Enterprise
Highest
Highest sales turnover among corporates in India

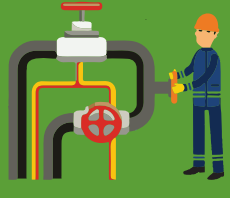
IndianOil

Tops
Tops Indian Corporates in the prestigious *Fortune* 'Global 500' listing of the world's largest companies

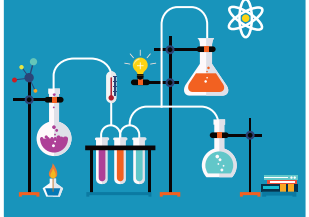
Biggest
Owns the biggest network of fuel stations in the country

Largest
Owns the largest combined refining capacity in the country

Widest
Owns the widest network of crude oil and petro-product pipelines



Most Advanced
Owns the most advanced R&D Centre in the downstream sector



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33,125 IndianOilPeople
to meet the energy demands in India and beyond

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IndianOil
The Energy of India

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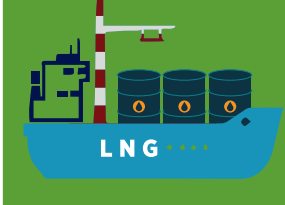
www.iocl.com

Key Player
in petrochemicals and gas marketing

Most Profitable
India's most profitable public sector enterprise for the year 2016-17



Leader
Bagged the prestigious Platts Global Energy Award-2017 for Industry Leadership - Downstream

Best
Emerged as 'Best PSU Company to work For' in India

OIL & GAS IN MEDIA

PROJECT COMMENCEMENT OF BARMER REFINERY INAUGURATED BY HON'BLE PRIME MINISTER SHRI NARENDRA MODI ON 16 JANUARY, 2018

Hon'ble Prime Minister Shri Narendra Modi, on January 16, 2018, inaugurated the project commencement of Barmer Refinery at Pachpadra, Rajasthan. With a commissioning schedule of 2022, the Prime Minister dedicated it to the countries freedom fighters on India's 75th Independence day.

With 9 million tonnes per annum capacity, Barmer Refinery will be built at the estimated cost of Rs. 43129 crore. Internal Rate of Return (IRR) of the project is 12.2%. Hindustan Petroleum Corporation Ltd. (HPCL) will have 74% equity share of the project, the Rajasthan Government will have the total 26% share. The Rajasthan Govt. will provide interest free loan of Rs. 1123 crore per annum for 15 years from the date of commissioning to be refunded in the next 15 years from 16th year onward. The refinery will be designed to produce BS VI products.

According to the statement of MOP&NG, with the objective of meeting the target mechanical completion of four years, execution of pre projects activities have already started.

The refinery project will benefit the region by providing direct and indirect employment and development of infrastructure and social facilities like education and health services etc. The region will have the overall economic developments due to ancillary support industry as well as service industry in the area.

Hon'ble Prime Minister, Shri Narendra Modi marks the commencement of work of Rajasthan Refinery, in Barmer, Rajasthan on January 16, 2018

Shri Dharmendra Pradhan, Hon'ble Minister of Petroleum & Natural Gas and Minister of Skill Development and Entrepreneurship announced a plan by the Government own companies to jointly set up a distillation plant in collaboration with Rajasthan Government to provide drinkable water for the people of the region.

Hon'ble Prime Minister, Shri Narendra Modi visiting an exhibition in Barmer Refinery, in Rajasthan on January 16, 2018. The Union Minister for Petroleum & Natural Gas and Skill Development & Entrepreneurship, Shri Dharmendra Pradhan and the Chief Minister of Rajasthan, Smt. Vasundhara Raje are also seen

"INDIAN REFINING INDUSTRY WILL EMERGE STRONGER IN THE YEARS TO COME", SHRI DHARMENDRA PRADHAN AT THE INAUGURAL MEET OF 22ND REFINING & PETROCHEMICALS IN BHUBANESWAR

Centre of High Technology (CHT), a technical arm of MOP&NG organized 22nd edition of Refining & Petrochemicals Technology Meet at Bhubaneswar, during January 13-15, 2018 . The theme of the Meet is "Emerging Trends in Downstream Hydrocarbon Sector."

Chief executives of oil & gas companies, heads of refineries and global/Indian consultancy organisations, besides almost 1000 delegates from India and abroad participated in this vital annual Meet. IndianOil was the co-host of the meet.

Shri Dharmendra Pradhan, Hon'ble Minister of Petroleum & Natural Gas and Skill Development & Entrepreneurship, inaugurated the conference. Speaking on the occasion, Shri Pradhan expressed strong optimism about the Indian Refining industry going from strength to strength and achieving global excellence standards in the years to come, despite new and disruptive technologies on the horizon. He called upon the public and private sector oil and gas companies in the country to add at least 200 million tonnes of refining capacity n the next two decades in order to maintain India's Leadership position as the hub of Asian refining and product export. Integrated refinery – petrochemical complexes should be the future for deriving maximum benefits for the industry, he added. The Minister emphasized that innovation and R&D are essential to achieve sustainable growth and providing clean and affordable energy.

Shri K.D. Tripathi, Secretary, Ministry of Petroleum & Natural Gas, Govt. of India said that the petrochemicals sector in India was poised for a quantum jump in keeping with the rapid economic growth of the country and that there existed tremendous opportunities for India to emerge as the demand Centre of energy. Low carbon, sustainable and affordable energy will be the demand for the future, he added.

H.E. Mr. Kenji Hiramatsu, Ambassador of Japan, in his Special Address expressed his happiness at the strong ties between India and Japan and offered technological support to Indian industries. He expressed confidence that steered by the top leadership of the two countries, the bilateral ties between India and Japan will be taken forward in the field of energy cooperation as well, especially in the field of LNG.

EU-INDIA CONFERENCE ON ADVANCED BIOFUELS

The EU-India conference on advanced biofuels jointly organised by the European Commission's Directorate-General for Energy and Ministry of Petroleum and Natural Gas, Govt. of India from 6th to 8th March 2018 at New Delhi. The aim of the two-day Conference was to facilitate the market deployment of advanced biofuels to enable commercialization of Advanced Biofuel Projects by improving the dialogues between the research community and technology developers of European Union and India.

Shri Dharmendra Pradhan, Hon'ble Minister of Petroleum & Natural Gas and Skill Development & Entrepreneurship Inaugurated the conference.

Hon'ble Minister of Petroleum & Natural Gas and Skill Development & Entrepreneurship, Shri Dharmendra Pradhan delivering the inaugural address, at the EU - India Conference on Advanced Biofuels, in New Delhi on March 07, 2018. The Secretary, Ministry of Petroleum and Natural Gas, Shri K.D. Tripathi and other dignitaries are also seen.

Hon'ble Minister emphasized the importance of research to promote the use of biofuels. He mentioned that while there are challenges in promoting advanced biofuels but it also offers business opportunities worth one lakh crores in the 'waste to wealth' sector. He emphasizes the need for synergies to enable industrialization of biofuels so that there are economies of scale. Shri Pradhan said while India is among the less polluting countries decarbonizing the energy sector is important and several steps are being taken in this direction by the Ministry of Petroleum and Natural Gas, Govt. of India.

In the future, biofuels would be the cost-effective, pollution-free import substitute to polluting fossil fuels for India. While first generation biofuels are made from sugars via molasses and vegetable oils, advanced biofuels are made from lignocellulosic biomass or woody crops, agricultural residues and municipal waste. Elaborating on this he said we are committed to reaching the target of 10 percent blending of ethanol in petrol by the year 2022.He also said 12 bio-refineries are being set up in the country by the Oil PSUs to enhance the ethanol production capacity.

Minister pointed out that Budget 2018-19 presented last month had announced incentives for "waste-to-wealth" conversion projects, including Gobar Dhan scheme focused on producing bio-CNG.

Delegates, Scientists and Energy Experts from 15 countries attended the conference which include technology providers, Transport specialists, researchers, academicians, biofuel associations and other stake holders.

ADNOC TO FILL MANGALORE CRUDE STORAGE OF ISPRL

On 10th February, 2018 during the visit of Prime Minister Shri Narendra Modi to Abu Dhabi an agreement between Indian Strategic Petroleum Reserves Ltd. (ISPRL) and Abu Dhabi National Oil Company (ADNOC) to share 5.86 million barrels of Abu Dhabi crude which the underground storage cavern of ISPRL at Mangalore was signed.

The pact was signed by CEO & MD, ISPRL and Director Marketing, Sales and Trading, ADNOC in the presence of Prime Minister, Shri Narendra Modi and H.H. Sheikh Mohamed Bin Zayed, President of UAE.

Under the agreement ADNOC will supply 0.81 MMT (5.86 Million Barrel) of crude oil for strategic oil reserves of India at Mangalore facility. Beginning of April 2018, three Very Large Crude Carrier (VLCC) will bring crude to this location.

ADNOC will invest about 400 million dollars for the purpose of crude storage. Period of the storage will be three years with automatic extension of 2+2 years. Earlier to this effect, a definitive Oil Storage and Management Agreement was signed on 1st January, 2017 at New Delhi during the State Visit of H.H Sheikh Mohamed Bin Zayed to India as Chief Guest at India's Republic Day celebrations.

India will have the right over 65% of this crude for countries strategic storage purpose. ADNOC will retain right over 35% which the company can use for commercial purpose, i.e. trading or selling to refiners wherever it wants. ADNOC will be paid for the oil if India were to draw from the reserves.

While the crude from Abu Dhabi will fill only one compartment out of the two, the other compartment has been filled with crude oil through funds made available by the Government of India.

Indian Strategic Petroleum Reserves (ISPRL), a special purpose vehicle created by the government, has built around 39 million barrels (5.33 million tonnes) of strategic crude oil storage at three locations – Padur and Mangalore on the western coast and Visakhapatnam on the eastern coast. Oil stored in the underground rock caverns at the three locations are to be used in an emergency and can meet the country's needs for 10 days.

While the Visakhapatnam storage of ISPRL has a capacity of 1.33 million tonnes (9.77 million barrels of crude oil. Padur can stock 2.5 million tonnes (18.37 million barrels). The Visakhapatnam facility can meet two-and-half days oil need of the country while Mangalore with 11.0 million tonnes (1.5 million barrels) can meet 2.8 days requirement. Padur can store 4.7 days requirement.

The oil storage facility will help boost India's energy security, as well as enable ADNOC to efficiently and competitively meet market demand in India and across the fast-developing southeast Asia economies.

ADNOC hired the Mangalore storage just as it ended a contract to store 6 million barrels of crude oil at Korea National Oil Corporation's Yeosu facility in the country's southwest coast.

FIPI EVENTS

ENERGY THINK TANK MEETING

Federation of Indian Petroleum Industry (FIPI) organized lectures on 05 January, 2018, at FIPI office in New Delhi, where presentations were made to the Energy Think Tank (ETT) members by FIPI officials on 'Energy outlook' and 'Electric Vehicles – Future Scenario & its impact on the Refining Industry'. An executive from Indian Oil Corporation Limited, R&D also gave overview of 'Hydrogen & Fuel Cells'.

Shri T. N. R. Rao, former secretary, MoP&NG and chairman of ETT presiding over the meet

The presentation on Energy Outlook covered the profile of incremental global energy consumption which will be fuelled by China and India due to increasing energy appetite of their middle class & higher urbanization rate. The presentation highlighted

that in next 15 years the growth of oil & coal demand will remain low with a significant increase in demand of natural gas and low carbon energy. During the presentation it was also highlighted that with low cost of solar PV technology and most countries moving towards less dependency on fossil fuels, solar PV capacity will see a significant growth. The presentation also covered India perspective of the energy outlook. As per World Energy Outlook, the percent share of natural gas will remain significantly less than 15% by 2040. Aggressive measures are required to accelerate the growth of natural gas in India. It was also highlighted that with an ever increasing demand in the petrochemical sector, the investments plan for expansion of refineries in India do not run risks.

Aspect of electric vehicle in India was also touched upon and it is believed that electric vehicle will receive a significant thrust in regions where air pollution poses a challenge. It was also highlighted that with the possible plan of increase in electric vehicles in India, the market share of CNG transport vehicles may get impacted. Therefore, investments in CGDs have to be well thought of since around 47% of market share in city gas distribution network is from CNG vehicles.

Ms. Kaushiki Sinha Ray, Senior Asst. Director (Economic Research) and Sh. Praveen Kumar Rai, Deputy Director (EP&P), FIPI making the presentation on 'Electric Vehicles & Future transportation scenario'

During the presentations, member had opportunity to raise their queries, seek clarification and also express their views on the future energy outlook and disruptions happening in the oil and gas industry.

Mr. Sachin Chugh, IOCL R&D giving the overview on 'Hydrogen & Fuel Cells'

FIPI HOSTS IEF DELEGATION

The International Energy Forum (IEF) provides the world's largest neutral platform for open and inclusive energy dialogue among and between the 72 IEF member governments and a multitude of IOC-NOC industry stakeholders. The IEF also facilitates dialogue among international organizations to help enhance policy cooperation and strengthen the governance of energy markets globally. At the forefront of this effort is the trilateral programme of work established between the IEF and the International Energy Agency (IEA) and the Organization of Petroleum Exporting Countries (OPEC).

Mr. Sunjay Sudhir, JS(IC), MoP&NG briefing the IEF Delegation about preparedness for the event

In 2018, the 16th IEF Ministerial Meeting will be hosted by India under the theme: "The Future of Global Energy Security: Transition, Technology, Market Stability and Inclusive Growth."

Energy ministers from 60 countries, 15 chief of international organizations including IEA and OPEC and 30 CEOs from top companies will brainstorm on global energy security and transition to renewables at the biennial International Energy Forum (IEF) Ministerial Meet scheduled in April 2018. The theme is centered such that it concerns everyone including oil producing and consuming countries; developing, least developed or developed countries.

The structure of the program would essentially encompass four plenary sessions, four roundtables with bilateral meetings, B-B meetings and media interaction happening in parallel.

On January 22, 2018 FIPI hosted IEF delegation on their pre visit to India at the FIPI office. This meeting comprised of Dr. Sun Xiansheng, IEF Secretary General, Mr. Christof Van Agt, Senior Energy Analyst, Mrs. Lina Murad, Government and International Relations Officer, Mr. Sunjay Sudhir, JS(IC), Dr. Prafulla Chandra Sharma, DS(IC), Dr. R.K. Malhotra, DG, FIPI, Mr. Rajiv Bahl, Director (Finance, Taxation & Legal), FIPI and other senior officials of the Oil and gas industry involved in the event. This meeting was focused on understanding and attempting to resolve possible challenges that may arise in the course of planning and execution of the event.

Dr. Sun Xiansheng, IEF Secretary General held industry meetings at the FIPI office on January 23, 2018 with senior representatives of the Oil and gas companies such as Cairns, ONGC, OIL, IOCL, BPCL, HPCL and others. The intention of these meetings was to discuss the engagement of Indian oil and gas companies with IEF and the global dialogue in this sector.

Dr. R. K. Malhotra, Director General, FIPI with IEF Delegation and Senior Industry Leaders

FIPI shall be playing an active role in organizing this historic event i.e '16th IEF Ministerial Meeting' being hosted by Government of India in New Delhi during April 10-12, 2018.

BUDGET ANALYSIS - UNION BUDGET 2018 AND ITS IMPACT ON OIL AND GAS SECTOR - MUMBAI

Federation of Indian Petroleum Industry (FIPI) organized the Budget Analysis workshop on February 05 2018 at Salon Pompadour, Sofitel BKC, Mumbai in association with knowledge partner, Deloitte.

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

At the onset Mr. Rajiv Bahl, Director (Finance, Taxation & Legal), FIPI welcomed the guests and expressed his views on the Union Budget 2018-19. In his address Mr. Bahl highlighted the pressing need for radical fiscal reforms as the oil industry was passing through a critical phase with higher challenges in committing large investments. He also stressed on the urgent need to bring the core petroleum products under the fold of GST as the industry was burdened with additional costs due to locking up of input credits.

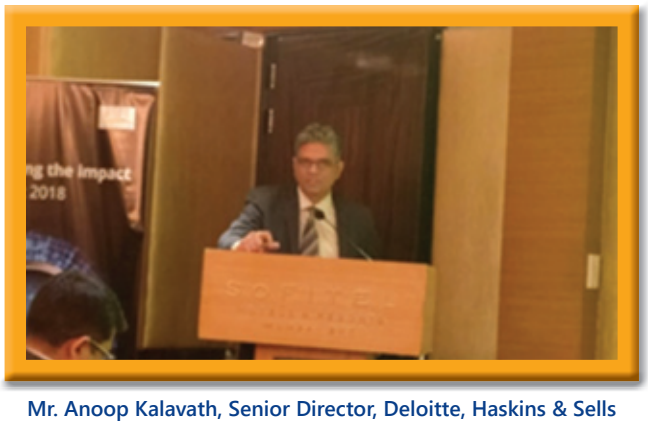
Ms. Kaushiki Sinha Ray, Senior Asst. Director (Economic Research), FIPI anchoring the workshop

Mr. Hemal Zobalia, Partner Deloitte, commenced with the Budget Analysis session and invited Mr. Dilip Lakhani, Senior Advisor, Deloitte highlight to present the key takeaways from the budget. While Mr. Hemal Zobalia, Partner Deloitte discussed on the direct tax aspects of the budget and provided clarification to the latest developments in this arena, Mr. Anoop Kalavath, Senior Director, Deloitte, expressed his views on the indirect tax aspects of the budget. As this was the first budget after the introduction of GST from July 2017, there was not much to discuss on the indirect taxes other than Customs Duty and the procedural amendments proposed.

Mr. Hemal Zobalia, Partner Deloitte, Haskins & Sells LLP delivering the presentation on Direct Tax Implications

Mr. Dilip Lakhani, Senior Advisor, Deloitte Haskins & Sells LLP expressing his views on budget

A panel discussion constituting Mr. Anup Vikal, CFO, Essar, Mr. N.V.N. Ramsai, Executive Director (Finance), IOCL, Mr. V. K. Jain, Executive Director - Tax, HPCL and Mr. Deepak S Garg, Senior Vice President, Indirect Tax, RIL was held and moderated by Ms. Bela Sheth Mao, Senior Director, Deloitte. The panelists expressed their views on the budget and what they envisaged would be the way forward for the Indian Oil and gas industry. While discussing GST, the panel felt that advocacy efforts need to be focused towards states as they are the ones who would collectively decide on the timing of inclusion of petroleum products under GST in the GST Council meeting. The panel also felt specific issues arising out of the Union Budget 2018 need to be taken up with the Govt for suitable clarifications and if felt necessary a post budget memorandum be submitted to the Govt.



Mr. Anoop Kalavath, Senior Director, Deloitte, Haskins & Sells LLP delivering the presentation on Indirect Tax Implications

This was followed by open house in which the panelists responded to the questions from audience.

Mr. Rajiv Bahl, Director (Finance, Taxation & Legal), FIPI thanked all participants for their expert comments and for making the session a productive one.

BUDGET ANALYSIS - UNION BUDGET 2018 AND ITS IMPACT ON OIL AND GAS SECTOR - DELHI

Federation of Indian Petroleum Industry (FIPI) organized the Budget Analysis workshop on February 06, 2018 at Hotel Shangri-La, New Delhi in association with knowledge partner, Deloitte.

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

At the onset Mr. Rajiv Bahl, Director (Finance, Taxation & Legal), FIPI welcomed the guests and expressed his views on the Union Budget 2018-19. In his address Mr. Bahl highlighted the urgent need for fiscal incentives to give the much needed investment thrust to the oil and gas sector in India. He emphasized that the industry was passing through a critical phase with higher challenges in committing large investments and stressed that Govt should come forward to provide a conducive fiscal regime which will go a long way in promoting investments in this sector. He also highlighted the pressing need to bring the petroleum products under the fold of GST as the industry was burdened with additional costs due to locking up of input credits.

Mr. Hemal Zobalia, Partner, Deloitte, Haskins & Sells LLP delivering the presentation on Direct Tax Implications

Mr. Hemal Zobalia, Partner Deloitte, commenced with the Budget Analysis session and invited Mr. Gokul Choudhry, Partner, Deloitte, Haskins & Sells LLP to express his views on the policy side of the Budget. Mr. Gokul Choudhry emphasized on how the oil and gas industry was one of the largest contributors to

Mr. Gokul Choudhry, Partner, Deloitte, Haskins & Sells LLP expressing his views on the Budget

the country's ex-exchequer and highlighted the dominant position of the hydrocarbon industry in India's economy. He also suggested that there was a need to bring in fiscal stability to promote investments in this sector and to avoid litigations.

Mr. Anoop Kalavath, Senior Director, Deloitte, Haskins & Sells LLP delivering the presentation on Indirect Tax Implications

While Mr. Hemal Zobalia, Partner Deloitte discussed on the direct tax aspects of the budget and provided clarification to the latest developments in this arena, Mr. Anoop Kalavath, Senior Director, Deloitte, expressed his views on the indirect tax aspects of the budget. As this was the first budget after the introduction of GST from July last year, there was not much to discuss on the indirect taxes other than Customs Duty and the procedural amendments proposed.

A panel discussion constituting Shri A.K. Sharma, Director (Finance), IOCL, Shri R.K. Garg, former Director (Finance), Petronet LNG, Shri Kartikeya Dube, Tax Director, BP and Shri Navin Jain, Head (Taxation), CAIRN was held and moderated by Mr. Debasish Mishra, Partner, Deloitte. The Union Budget 2018-19 was discussed at length and future steps to taken up by FIPI and the Oil Industry were deliberated upon. The panel discussion was primarily focused on GST and highlighted the urgent need to bring petroleum products under the fold of GST. The panel mooted on the question of bringing natural gas in the first instance under GST and felt that while this would

Panel Discussion on 'Implications of the Budget on Oil and Gas Industry with focus on GST' moderated by Mr. Debasish Mishra, Partner, Deloitte. (L-R) Shri R.K. Garg, former Director (Finance), Petronet LNG; Shri A.K. Sharma, Director (Finance), IOCL; Shri Kartikeya Dube, Tax Director, BP and Shri Navin Jain, Head (Taxation), CAIRN.

be a welcome move, even ATF could be considered alongwith Natural gas as the impact would be relatively small and states could be easily persuaded for this. The panel also felt that Ministry of Petroleum & Natural Gas who is fully seized of the matter and is supporting the case of the oil industry should be persuaded to take up the case of the industry with GST Council.

Dr. R.K. Malhotra, Director General, FIPI, in his concluding remarks stated that FIPI has put in great deal of efforts in taking up the case of the industry with regard to GST with the Govt at various levels and has succeeded in bringing the Ministry of Petroleum as well as Ministry of Finance fully on board as both the ministries were supporting the case of industry for inclusion of petroleum products under the fold of GST and were trying to convince the states to do this at the soonest. He also mentioned that senior

industry leaders have also met individual states and desired that this was the need of the hour and assured full support from FIPI in this regard. He thanked all the industry participants and expressed his gratitude in making the event a productive and successful one.

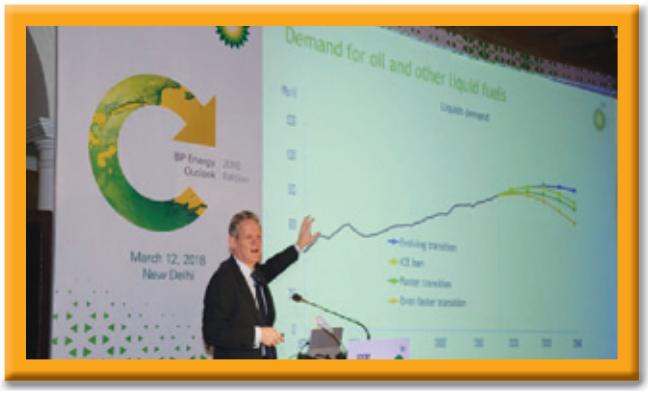
BP'S ENERGY OUTLOOK - 2018 EDITION

The BP Energy Outlook – 2018 Edition was presented on March 12, 2018 at Longchamp, Hotel Taj Mahal, New Delhi. This event was jointly organized by Federation of Indian Petroleum Industry and BP. The evening commenced with Dr. R.K. Malhotra welcoming the august gathering and stressing on the importance and relevance of the BP Energy Outlook and the pristine position it holds as a beacon of guidance for the energy sector and especially the oil and gas sector.

Dr. R. K. Malhotra, Director General, FIPI welcoming the participants

Mr. Spencer Dale, Group Chief Economist BP in his presentation of BP Energy Outlook – 2018 edition stated as to how in the light of uncertain energy transition, the energy outlook presents and analyses future energy trends and factors that could affect all of us. He explained as to how the outlook presents and analyses future energy trends and factors that could affect all of us and shows how rising prosperity drives an increase in global energy demand and how that demand will be met over the coming decades through a diverse range of supplies including oil, gas, coal and renewables.

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



Mr. Spencer Dale, Group Chief Economist, BP p.l.c. delivering the presentation on 2018 edition of BP's Energy Outlook 2040

With special emphasis on India, Mr. Dale explained as to how over 80% of the expansion in world output is driven by emerging economies, with China and India accounting for over half of that expansion. Presently petro-based fuels meet about 95% of the requirement of transportation fuels and the demand has been steadily rising. Today, the domestic crude oil is able to meet only about 20% of the demand, while rest is met through imports. In this scenario, India is bound to look out for alternative sources of energy for increasing its self-sufficiency. Looking at the future and the projections made by BP energy outlook 2018, for India it is expected that the demand will grow by 165% by 2040, nearly three times the overall non-OECD growth of 61%, and will also outpace each of the BRIC countries: China (+41%), Brazil (+60%), and Russia (+6%). India's share of global demand will rise to 11% in 2040 from 5% in 2016, accounting for the second largest share of the BRIC countries.

Mr. Sashi Mukundan, Regional President and Head of Country, India, BP Group delivering the vote of thanks

The presentation by Mr. Dale was followed by an engaging question and answer round, post which Mr. Sashi Mukundan Regional President and Head of Country, India, BP Group presented the vote of thanks and expressed his gratitude to Mr. Dale for the invigorating session as well as FIPI for having contributed towards making this event a success.

GLOBAL MARKETS DEVELOPMENTS – INTERACTIVE SESSION WITH MR. JAGJEET SINGH BINDRA

Dr. R. K. Malhotra, Director General, FIPI welcoming the participants

Hon'ble Minister of Petroleum & Natural Gas Shri Dharmendra Pradhan along with Shri Jagjeet Singh Bindra

FIPI had invited Mr. Jagjeet Singh Bindra, Member of the Supervisory Board of LyondellBasell & Former President of Chevron Global, USA for an interactive session on 'Global Markets Developments' on 15th March 2018 at REGAL, The Lalit Hotel, New Delhi.

Mr. Jagjeet Singh Bindra, Member of the Supervisory Board of LyondellBasell & Former President of Chevron Global, USA delivery the presentation on 'Global Markets Developments'.

The event was attended by many CEOs from the Indian oil and Gas companies and was also graced by the Hon'ble Minister of Petroleum and Natural Gas Shri Dharmendra Pradhan and important functionaries in the Government.

Mr. Bindra gave an insightful presentation on the latest developments in the global oil and gas markets covering the entire spectrum of the oil and gas business. He stated as to how synchronized global activity was boosting near term prospects for most countries and how Chinese GDP growth is trending lower as drivers of growth transition. Economic growth in India will further fuel demand for oil and will eclipse China's demand. According to Mr. Bindra Europe and North America are expected to lead the EV market and even though India also aspires to sell Electric vehicles by 2030, it will double its demand for petroleum products. With India's GDP growth set to lead in Asia Pacific, crude oil demand in India is to remain significant which is increasing even more due to increasing demand from consumer goods and automobile demand. Lower prices have spurred greater demand in the US and elsewhere and rapid growth in China is absorbing fresh LNG supply.

On Petrochemicals, Mr. Bindra stated that India's deficit of petrochemicals including olefins, aromatics and polymers is growing from 3.2 MMT in 2016 to 5.4 MMT 2020. India is adding capacity for Polyethylene production, but will import 25 pc of domestic demand.

He stated that consumption of LPG is surging across the globe, especially in the Asia-Pacific region owing to the huge population base and thrust from Govt initiatives.

The interactive session engaged the audience in to an interesting debate on various issues surrounding the industry and made the event a highly successful one.

Mr. N. K. Bansal, Director (Oil, Refining & Marketing), FIPI making a point

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NEW APPOINTMENTS

J.C. NAKRA
Chairman & Managing Director
Engineers India Ltd.

Mr. J.C. Nakra takes over as the Chairman & Managing Director of Engineers India Ltd. In a career spanning over 36 years, Mr. Nakra has worked in a wide array of domains including Projects, Construction & Marketing. He joined EIL in 1983 in Construction Division (Offshore). Subsequently, he served in various capacities in Marketing and Project Divisions. Mr. Nakra has steered the Marketing initiatives of EIL for business development in India and abroad and has also led Project teams for implementation of major projects.

A Mechanical Engineering Graduate from Punjab Engineering College, Chandigarh, Mr. Nakra also possesses a Post-Graduate Diploma in Management Studies from Jamnalal Bajaj Institute of Management Studies, Mumbai.

SUBHASH KUMAR
Director (Finance)
Oil and Natural Gas Corporation Ltd

Mr. Subhash Kumar has taken charge as Director (Finance), ONGC on 31 January 2018.

Mr Kumar is Fellow Member of ICMAI and also Associate Member of ICSI. He is an alumni of Panjab University, Chandigarh, where he obtained his Bachelors degree and Masters degree in Commerce with Gold Medal.

Mr Kumar joined ONGC in 1985 as Finance & Accounts Officer (F&AO). He worked as Head Business Development, Finance & Budget and also as Head Treasury Planning & Portfolio Management Group at ONGC Videsh. Mr Kumar joined back ONGC as Chief Commercial & Head Treasury in July, 2016 where he played a key role in evaluation, negotiation, and concluding outstanding issues pertaining to the organization.

RAJESH KAKKAR
Director (Offshore)
Oil and Natural Gas Corporation Ltd

Mr Rajesh Kakkar has taken over charge of Director (Offshore) of Oil and Natural Gas Corporation (ONGC). As Director (Offshore), he will look after oil and gas production from ONGC's offshore fields that contribute 70% and 78% of ONGC's domestic crude oil and gas production respectively.

Mr Kakkar holds a Bachelors degree in Mechanical Engineering with Honors from Ravi Shankar University, Raipur. He completed Global Managers' program at IIM, Kolkata and Leadership Development Program at IIM, Bangaluru. He was recognized as the "Young Executive of the Year" in 1991 and also received Chairman's award in 1992 for "Consistent Performance in Offshore Production Operations".

Mr Kakkar has more than three and a half decades of experience in the various aspects of operations and management in both offshore and onshore fields.

NEW APPOINTMENTS

B.V. RAMA GOPAL
Director (Refineries)
Indian Oil Corporation Ltd.

Mr. B V Rama Gopal has taken over as Director (Refineries) of Indian Oil Corporation Ltd. (IndianOil) with effect from February 12, 2018. Earlier, he was Executive Director (In-Charge) of the Company's Panipat Refinery & Petrochemicals Complex. Armed with a degree in Chemical Engineering from the Osmania University, Hyderabad, Mr. Rama Gopal has over three decades of rich experience in the oil & gas sector.

Mr Rama Gopal joined IndianOil in 1982 as a Graduate Engineer Trainee, and has since worked at various refinery locations, including Haldia, Vadodara, Mathura and Panipat. His experience spans several specialised areas of the oil & gas sector like Operations, Technical Services, Production, Planning & Coordination and Project Implementation.

RANJAN KUMAR MOHAPATRA
Director (HR)
Indian Oil Corporation Ltd.

Mr. Ranjan Kumar Mohapatra has taken over as Director (Human Resources) of Indian Oil Corporation (IndianOil) with effect from 19.2.2018. Earlier, he was IndianOil's Executive Director in charge of West Bengal State Office.

A Mechanical Engineering graduate from BITS, Pilani, with a Post-Graduate Diploma in Management from Xavier Institute of Management, Bhubaneswar, Mr. Mohapatra joined IndianOil in 1987. He has more than three decades of experience in all the domains of petroleum marketing management.

Mr. Mohapatra was also one of the chief architects of the auto fuel quality programme implementation PAN India.

K. PADMAKAR
Director (HR)
Bharat Petroleum Corporation Ltd.

Mr. K. Padmakar is a graduate in Agriculture & postgraduate in Personnel Management & Industrial Relations from TISS. He is also a Facilitator in Human Lab processes from ISISD / Aastha Foundation and is a Certified SAP-HR Professional.

With nearly 34 years of experience in BPCL, he had the opportunity to deliver sound value propositions for all stakeholders, ranging from strategy to execution, involving various aspects of Human Resource Management such as Talent Management, Industrial Relations, Learning & Development, Change Management, Compensation Benefits, Service Law, Discipline Management etc.

He has joined the Board of Bharat Petroleum Corporation Limited, as Director (HR) from 1st February 2018.

NEW APPOINTMENTS

S.K. BARUA
Managing Director
Numaligarh Refinery Ltd.

Mr. S K Barua has taken over as Managing Director of Numaligarh Refinery Ltd. (NRL) with effect from 31st January 2018.

With over 33 years of rich and varied experience in the Indian Oil and Gas Industry, he was serving as the Director (Finance) in NRL prior to being appointed as the Managing Director. He joined NRL in 1993, the year that the company was established. Over the last 24 years in NRL, he has garnered vast experience of setting up a grass root mega project starting from its conceptualization, implementation, commissioning and operations thereafter.

Mr. Barua started his career in Indian Oil Corporation (Assam Oil Division) in 1985. Subsequently in the year 1987, he joined the Refinery and Petrochemical Division of Government of Assam to identify & develop new oil and gas projects in the state, more particularly to implement the Assam Accord Refinery, thereafter named Numaligarh Refinery Limited. He was also a key team member in conceptualization of the prestigious Assam Gas Cracker project.

S.N. PANDEY
Managing Director
Chennai Petroleum Corporation Ltd.

Mr. S.N. Pandey, has assumed charge as Managing Director, Chennai Petroleum Corporation Limited with effect from 01.02.2018. He is a B. Tech - Chemical from IIT – Kanpur – 1983 and MBA from University of Ljubljana, (Slovenia) – 1998.

He has more than 33 years of experience in Oil industry. Prior to joining CPCL, Mr. Pandey was Executive Director (Optimisation), Indian Oil Corporation Limited, responsible for the planning of supply chain including economics of infrastructure.

G. ARAVINDAN
Director (Operations)
Chennai Petroleum Corporation Ltd.

Mr. G. Aravindan is the Director (Operations) of Chennai Petroleum Corporation Limited (CPCL) since January 2018.

Mr. Aravindan is a B.Tech graduate from Madras Institute of Technology and possesses a Masters Degree in Business Administration. He has been with CPCL for more than 33 years and has held various positions in the fields of Projects, Corporate Planning, Maintenance, Services, etc., prior to joining the Board of Directors.

He has successfully piloted the CPCL Team in the concept to commissioning of the prestigious 5.8 MGD Sea Water Desalination Plant at Kattupalli along with the associated cross-country pipeline at a cost of Rs.240 crore. This project was the "First of its kind in the Indian Petroleum Sector" and won accolades from both Central and State Governments for its novelty.

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STATISTICS

INDIA: OIL & GAS

DOMESTIC OIL PRODUCTION (MILLION MT)

		2013-14	2014-15	2015-16	2016-17	April-December 2017	
							% of Total
On Shore	ONGC	6.71	6.07	5.82	5.93	4.52	34.32
	OIL	3.47	3.41	3.23	3.26	2.55	19.36
	Pvt./ JV (PSC)	9.41	9.06	8.81	8.40	6.10	46.32
	Sub Total	**19.59**	**18.54**	**17.86**	**17.59**	**13.17**	100
Off Shore	ONGC	15.54	16.19	16.54	16.28	12.32	89.60
	OIL	0	0	0	0	0	0.00
	Pvt./ JV (PSC)	2.66	2.73	2.55	2.14	1.43	10.40
	Sub Total	**18.2**	**18.92**	**19.09**	**18.42**	**13.75**	100.00
Total Domestic Production		37.79	37.46	36.95	36.01	26.92	100
	ONGC	22.25	22.26	22.36	22.21	16.84	62.56
	OIL	3.47	3.41	3.23	3.26	2.55	9.47
	Pvt./ JV (PSC)	12.07	11.79	11.36	10.54	7.53	27.97
Total Domestic Production		**37.79**	**37.46**	**36.95**	**36.01**	**26.92**	100

Source : PIB/PPAC

REFINING

REFINING CAPACITY (MILLION MT ON JANUARY 2018)

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	11.30
JV Total	**17.30**

Bharat Petroleum Corp. Ltd.	
Mumbai	12.00
Kochi	15.50
Total	**27.50**

Hindustan Petroleum Corp. Ltd.	
Mumbai	7.50
Visakhapattnam	8.30
Total	15.80
Other PSU Refineries	
NRL, Numaligarh	3.00
MRPL	15.00
ONGC, Tatipaka	0.10
Total PSU Refineries Capacity	**142.10**

Private Refineries	
RIL, (DTA) Jamnagar	33.00
RIL , (SEZ), Jamnagar	35.20
Essar Oil Ltd. , Jamnagar	20.00
Pvt. Total	**88.20**

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

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

CRUDE PROCESSING (MILLION MT)

PSU Refineries	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
IOCL	53.13	53.59	57.19	65.19	51.85
HPCL	15.51	16.18	17.23	17.85	13.65
BPCL	22.97	23.18	24.09	25.36	20.44
CPCL	10.63	10.78	9.63	10.25	7.98
MRPL	14.65	14.68	15.6	15.97	11.95
NRL	2.61	2.78	2.52	2.69	2.14
SUB TOTAL	**119.5**	**121.19**	**126.26**	**137.31**	**108.01**

JV Refineries	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
HMEL	9.27	7.34	10.71	10.52	5.90
BORL	5.45	6.21	6.4	6.36	5.04
SUB TOTAL	**14.72**	**13.55**	**17.11**	**16.88**	**10.94**

Pvt. Refineries	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
ESSAR	20.2	20.49	19.11	20.92	15.54
RIL	68.03	68.04	69.44	70.17	53.42
SUB TOTAL	**88.23**	**88.53**	**88.55**	**91.09**	**68.96**

	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
All India Crude Processing	**222.45**	**223.27**	**231.92**	**245.28**	**187.91**

Source : PIB Release/PPAC

CRUDE CAPACITY VS. PROCESSING

	Capacity 0n 01/04/2017 Million MT	% Share	Crude Processing Million MT April-Dec 17	% Share
PSU Ref	142.10	57.39	108.01	57.48
JV. Ref	17.30	6.99	10.94	5.82
Pvt. Ref	88.20	35.62	68.96	36.70
Total	**247.60**	**100.00**	**187.91**	**100**

POL PRODUCTION (Million MT)

	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
From Refineries	216.44	217.08	227.9	238.96	185.51
From Fractionators	3.87	3.65	3.38	4.29	3.43
Total	**220.31**	**220.73**	**231.28**	**243.25**	**188.94**

DISTILLATE PRODUCTION (Million MT)

	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
Light Distillates, MMT	58.81	59.54	63.60	67.53	52.25
Middle Distillates , MMT	112.85	113.41	118.31	122.54	94.71
Total Distillates, MMT	171.66	172.95	181.91	190.07	146.96
% Distillates Production on Crude Processing	**77.17**	**77.46**	**78.43**	**77.46**	**78.21**

Source: PIB/PPAC/OPEC

PETROLEUM PRICING
OIL IMPORT - VOLUME AND VALUE

	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
Quantity, Million Mt	189.2	189.4	202.1	181.15	164.33
Value, INR '000 cr.	864.88	687.42	415.36	431.62	398.05
Value, USD Billion	143	112.7	64.4	66.70	61.77
Average conversion Rate, INR per USD (Calculated)	60.48	61.00	64.50	64.71	64.44

OIL IMPORT - PRICE USD / BARREL

	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
Brent (Low Sulphur - LS- marker) (a)	107.5	85.43	47.46	48.65	54.42
Dubai (b)	104.58	83.77	45.63	46.98	53.17
Low sulphur-High sulphur differential (a-b)	2.92	1.66	1.83	1.67	1.24
Indian Crude Basket (ICB)	105.52	84.15	46.17	47.16	53.56
ICB High Sulphur share %	69.9	72.04	72.28	71.03	72.38
ICB Low Sulphur share %	30.1	27.96	27.72	28.97	27.62

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

	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
Gasoline	114.31	95.45	61.72	58.11	65.43
Naphtha	100.22	82.22	48.54	47.22	53.93
Kero / Jet	121.23	66.62	58.17	58.42	65.61
Gas Oil (0.05% S)	121.99	99.44	57.63	58.93	66.62
Dubai crude	104.58	83.77	45.63	46.98	53.17
Indian crude basket	105.52	84.16	46.17	0	0

CRACKS SPREADS ($/ BBL.)

	2013-14	2014-15	2015-16	2016-17	April-Dec 2017
Gasoline crack					
Dubai crude based	9.73	11.68	16.09	11.13	12.26
Indian crude basket	8.79	11.29	15.55	58.11	65.43
Diesel crack					
Dubai crude based	17.41	15.67	12.00	11.95	13.45
Indian crude basket	16.47	15.28	11.46	58.93	66.62

DOMESTIC GAS PRICE ($/MMBTU)

Period	Domestic Gas Price (GCV Basis)	Price Cap for Deepwater, High temp Hingh Pressure Areas	April-Dec 2017
November 14 - March 15	5.05	-	164.33
April 15 - September 15	4.66	-	398.05
October 15 - March 16	3.82	-	61.77
April 16 - September 16	3.06	6.61	64.44
October 16 - March 17	2.50	5.30	
April 17- September 17	2.48	5.56	
October 17 - March 18	2.89	6.30	

Source: PIB/PPAC/OPEC

GAS PRODUCTION

Qty in MMSCM

	2015-16	2016-17	April-Dec 2017
ONGC	21177	22088	17651
Oil India	2838	2937	2197
Private/ Joint Ventures	8235	6872	4839
Total	**32250**	**31897**	**24687**

		2015-16	2016-17	April-Dec 2017
Onshore	Natural Gas	8845	9294	7446
	CBM	393	565	541
	Sub Total	**9237**	**9858**	**7987**

Offshore		23012	22038	16700
	Sub Total	**23012**	**22038**	**16700**

	2015-16	2016-17	April-Dec 2017
Total	**32249**	**31897**	**24688**
(-) Flare loss	1120	1049	680
Net Production	31129	30848	24008

	2015-16	2016-17	April-Dec 2017
Net Production	31129	30848	24008
Own Consumption	5822	5856	4353
Availabilty	25307	24992	19655

AVAILABILTY FOR SALE

	2015-16	2016-17	April-Dec 2017
ONGC	16076	17060	13999
Oil India	2314	2412	1811
Private/ Joint Ventures	6917	5520	3845
Total	**25307**	**24992**	**19655**

CONSUMPTION (EXCLUDING OWN CONSUMPTION)

	2015-16	2016-17	April-Dec 2017
Total Consumption	46695	49678	39044
Availabilty for sale	25307	24992	19655
LNG Import	21388	24686	19389

GAS - IMPORT DEPENDENCY

	2015-16	2016-17	April-Dec 2017
Net Gas Production	31138	30848	24008
LNG Imports	21309	24686	19389
Import Dependency (%)	41	44	45
Total Gas Consumption*	**52447**	**55534**	**43397**

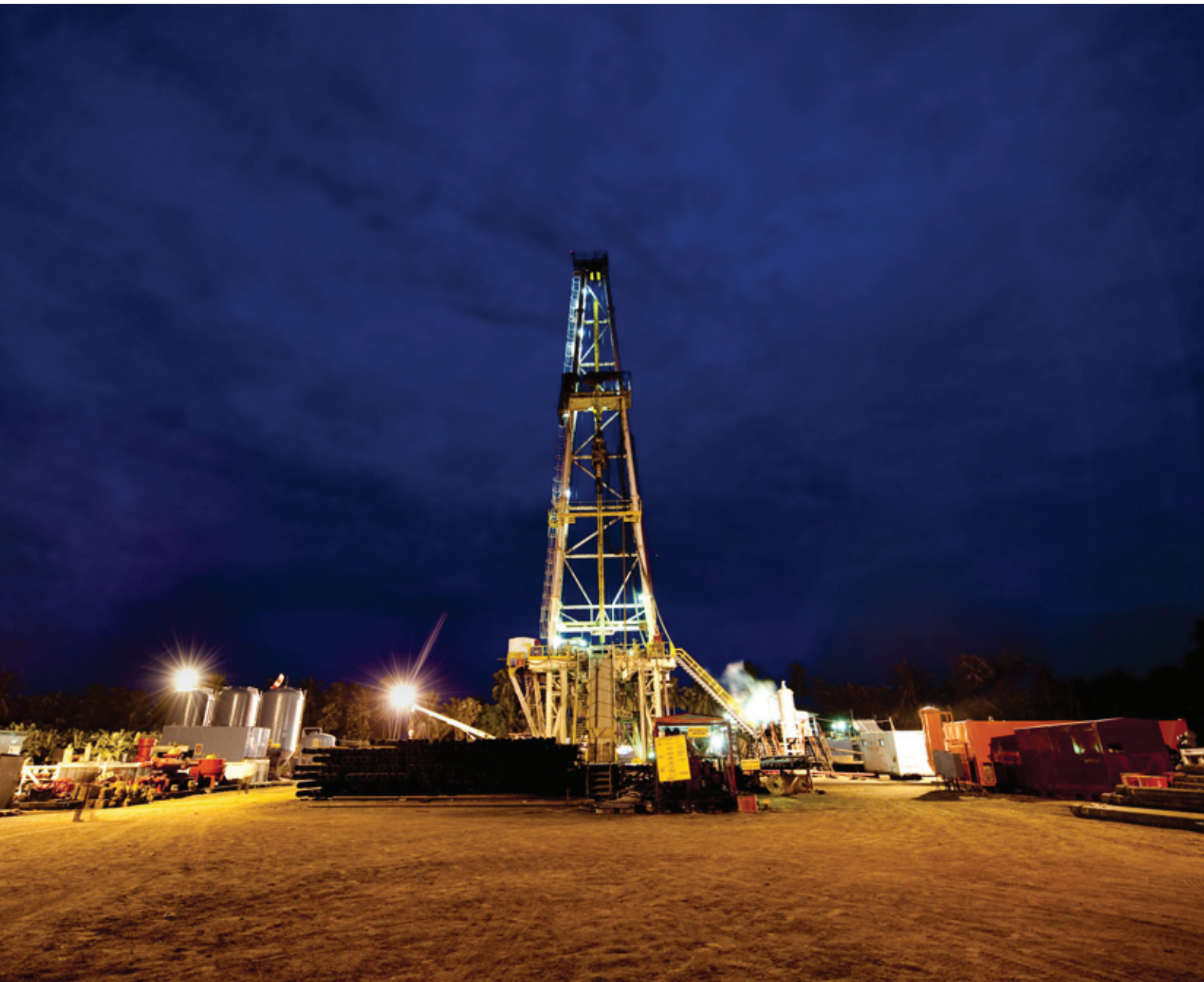
* Includes Own Consumption

Source:PIB/PPAC

SECTOR WISE DEMAND AND COMSUMPTION OF NATURAL GAS

Qty in MMSCM

		2016-17	2017-18									
			April	May	June	July	August	September	October	November	December	Total
Fertilizer	**Domestic Gas**	**6007**	554	615	614	611	600	550	572	571	555	**5242**
	R-LNG	**5695**	584	519	542	626	646	629	695	674	731	**5646**
Power	**Domestic Gas**	**6787**	697	837	799	824	741	739	858	826	784	**7105**
	R-LNG	**1964**	204	188	182	210	233	341	348	224	193	**2123**
City Gas	**Domestic Gas**	**3176**	371	372	355	394	389	385	392	391	408	**3456**
	R-LNG	**2253**	301	321	304	336	340	296	316	326	338	**2878**
Refinery Petro-chemical Others	**Domestic Gas**	**3021**	397	398	416	433	436	497	406	226	388	**3597**
	R-LNG	9277	912	999	897	1012	1009	1141	1154	924	1161	**9209**



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- International Credit Ratings- Moody's "Baa2" (stable) {higher than sovereign rating} and Fitch Rating "BBB-" (Stable) {equivalent to sovereign rating}.

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