

## Exploration & Production of Crude Oil: Drilling for the Black Gold

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### Overview

*Crude oil is a mixture of various hydrocarbon compounds and other materials. Crude Oil usually contains about 84% carbon; 14% hydrogen; 1% to 3% sulphur; and nitrogen, oxygen, heavy metals, and salts that total less than 1%.*

*Crude oil, produced goes through extensive processing before it can be commercially utilized. The production involves primary recovery (through reservoir pressure) and secondary recovery (artificial lift).*

*Exploration and production (E&P) is known as the upstream segment of the oil and gas industry.*

*The resource owners and operators of E&Ps work with a variety of contractors such as engineering procurement and construction (EPC) contractors, as well as with joint-venture partners and oil field service companies, and as E&P operators produce oil and gas, they also build infrastructure and collect massive amounts of analytical data.*

*Various kinds of drilling rigs and production platforms are employed depending upon location and geological conditions of hydrocarbon field to facilitate exploration and production activities.*

*ONGC (nomination) has the largest share of 72% crude oil reserves with OIL India (nomination) and product sharing contract (PSC) fields having 13% and 15% respectively.*

*Crude Oil consumption constitutes around 29% of India's energy mix. Coal still remains the most consumed fuel mineral in India, followed by crude oil. Crude petroleum has a 2.41% weight in WPI.*

*The government allows 100% Foreign Direct Investment (FDI) in upstream & private sector refining projects.*

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### Production Scenario in India

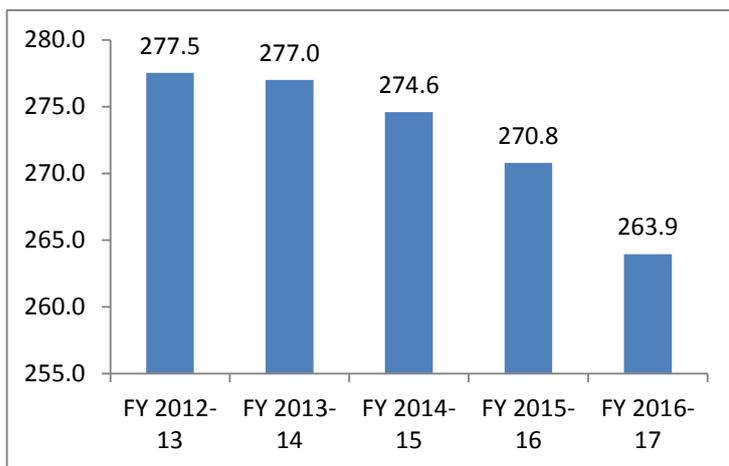
India ranks 24<sup>th</sup> in Oil production globally and produces 15% of the crude oil consumed domestically. Exploration is carried forth by NOCs (National Oil Companies); ONGC and Oil India through a nomination regime and private companies are allowed to enter into exploration through JV with NOCs (Reliance Industries, Cairn India, Essar Oil, Gujarat State Petroleum Corporation, Jubilant Oil and Gas, Focus Energy, and Naftogaz). This was applicable under the Pre-NELP regime. Subsequently, 100% foreign participation in exploration was allowed in the New Exploration and Licensing Policy (NELP)\* regime.

Currently from March 2016, Hydrocarbon Exploration and Licencing Policy (HELP) is being followed which is monitored by the Directorate General of Hydrocarbon (DGH). DGH also monitors and analyses the production performance, validating the productions of producing fields/ blocks and then supplies the production data to the Petroleum Planning and Analysis Cell (PPAC) and Ministry of Petroleum and Natural Gas (MOPNG).

HELP is a new fiscal model based on Revenue Sharing Contract. This is an **upgraded version as compared to the previous New Exploration Licensing Policy (NELP) and Production Sharing Contract (PSC)**. Under the HELP regime, the Government will not be concerned with the cost incurred and will receive a share of the gross revenue from the sale of oil and gas.

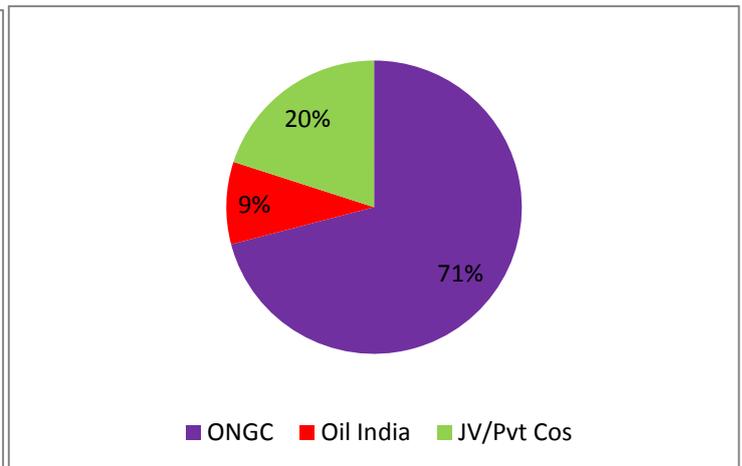
\*NELP regime explanation to be found in the annexure.

**Chart 1: Domestic Production of Crude Oil (in Million Barrels)**



Source: Office of the Economic Advisor\*

**Chart 2: Bifurcation of Domestic Production for FY17**



Source: ONGC, Oil India

\*Office of the Economic Advisor provides data in terms of thousand tonnes. We convert the data into barrels for a better understanding as worldwide crude oil is measured in terms of barrels.

Fall in production can be attributed to the lack of efficient production and drilling from matured oil fields and also due to the low performance of Production Sharing Contract fields. Production has fallen at a compounded annual growth rate of 1.2% from FY 2012-13 onwards till FY 2016-17.

On a y-o-y basis production has decreased by 2.5% i.e. the production of FY 2015-16 was 270.8 million barrels and the production in FY 2016-17 was 263.9 million barrels. The inability to bring fresh big reserves into production had kept production stagnant over the years.

ONGC is the largest domestic producer of crude oil in the country. During FY 2016-17 ONGC produced 187.1 million barrels, (71% of the domestic production), Oil India produced 24 million barrels and the balance 52.8 million barrels were produced by JV/private companies. Exploration is carried on onshore and offshore fields. Many upstream oil companies are also make biddings to acquire a portion of the oil fields in other countries eg ONGC Videsh an international arm of ONGC has acquired stakes in oil fields located in Russia, UAE, Vietnam, Azerbaijan, Myanmar, Brazil, Colombia, Venezuela and Sudan.

The government is trying to enhance production from the existing fields by adopting Improved Oil Recovery (IOR)/Enhanced Oil Recovery (EOR) measures. Enhanced recovery process involves injection of fluids in oil and gas fields to boost yield.

**Table 1: Crude Oil production scenario in FY 2017-18 (in Million Barrels)**

	FY 2016-17 (April- Dec)	FY 2017-18 (April-Dec)	% Change
ONGC	121.9	123.5	1.3%
Oil India	17.8	18.7	4.9%
PSC fields	58.5	55.2	-5.6%
Total	198.2	197.4	-0.4%

Source: PIB\*

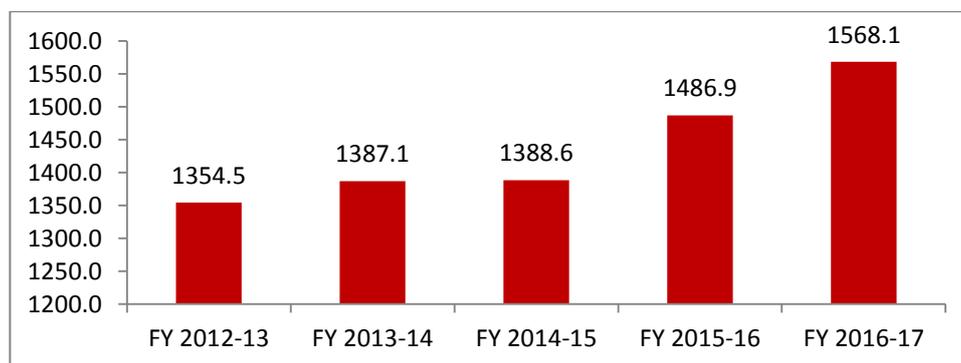
\*PIB provides data in terms of thousand tonnes. We convert the data into barrels for a better understanding as worldwide crude oil is measured in terms of barrels.

Crude oil production has declined due to poor performance of fields under the production sharing contract. Since the past few months production of crude oil from the fields belonging to ONGC and Oil India seemed to have picked up where as production of oil from private upstream companies has declined (these are the fields under the Product Sharing Contract).

### Import of Crude Oil

India imports 80-85% of its crude oil requirements. Currently India imports crude oil from Saudi Arabia, Iran, Iraq, Nigeria, Venezuela, UAE, Angola, Kuwait, Malaysia, Angola, Mexico, Qatar and Brunei. **India is the 3<sup>rd</sup> largest importer of crude oil and imports almost 4.3 million barrels per day (bpd).**

**Chart 3: Crude Oil Imports (in Million Barrels)**



Source: PPAC\*

\*PPAC provides data in terms of thousand tonnes. We convert the data into barrels for a better understanding as worldwide crude oil is measured in terms of barrels.

Imports of crude oil have risen at a CAGR of 3% from FY 2012-13 onwards to FY 2016-17. There has been a 5.5% increase in terms of imports on a y-o-y basis (Imports were 1486.9 million barrels in FY 2015-16 and 1568.1 million barrels in FY 2016-17). The value of imports has also increased by 9.7% from it being \$63,972 million in FY 2015-16 to \$70,196 million FY 2016-17.

**Table 2: Crude Oil imports scenario in FY 2017-18 (in Million Barrels)**

	FY 2016-17(Apr-Dec)	FY 2017-18(Apr-Dec)	% Change
Crude Oil Imports	1,186	1,205	1.6%

Source: PPAC

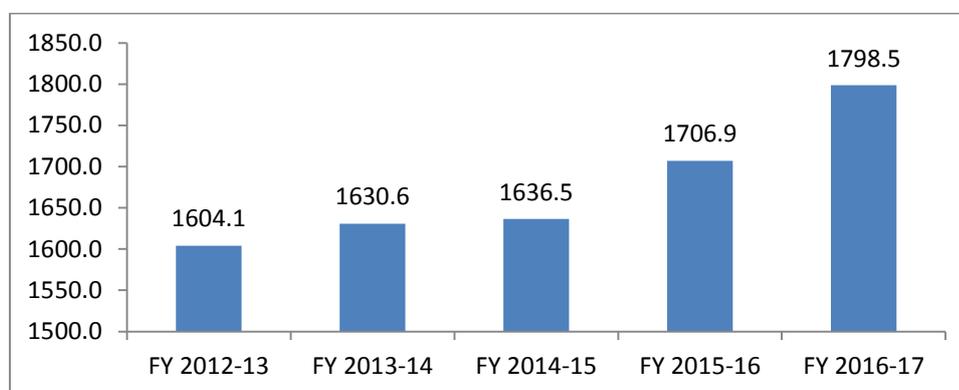
Imports of crude oil rose by 1.6% during the FY 2017-18 April-December period as compared with the corresponding period in the previous fiscal year. Value-wise, oil imports during April-December, 2017-18 were valued at \$61,775 million which was 22% higher than the oil imports of \$50,622 million in the corresponding period last year. Imports of crude oil have been rising over the years as domestic production fails to meet the increase in energy needs to the country.

Crude oil imports from OPEC countries have reduced to 82.6% of total imports vis-à-vis it to the share formerly being 87.4% during the current financial year. There has been an increase in imports from non-OPEC countries like US, Canada, Russia, Kazakhstan and Sudan.

### Consumption of Crude Oil

Crude oil is processed and refined and is used for the manufacture of petroleum products. **India consumes almost 4.9 million barrels per day.** India ranks number 3 when it comes to crude oil consumption.

**Chart 4: Consumption of Crude Oil in terms of refinery crude processed in the domestic markets (in Million Barrels)**

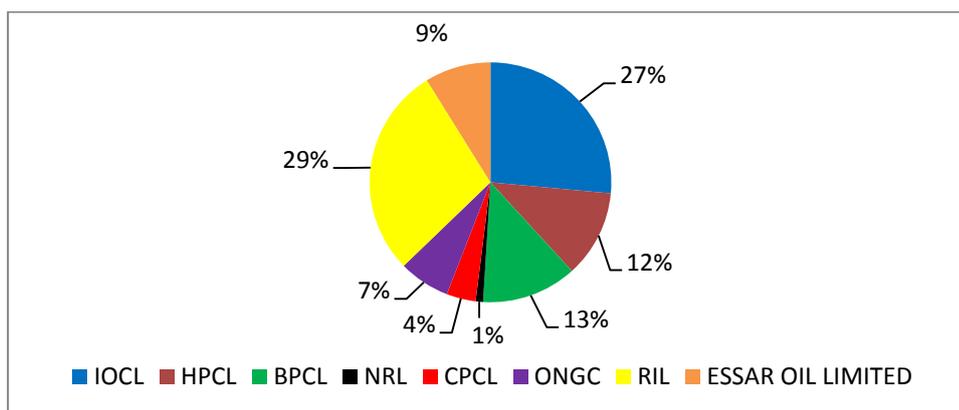


Source: PPAC

Consumption of crude oil has increased at a CAGR of 2.9% during the period FY 2012-13 to FY 2016-17, indicating a rise in energy requirements. Indian refineries produce LPG, naphtha, MS-III, MS- IV, MS others, ATF, SKO, HSD-III, HSD- IV, HSD others, LDO, Lubes, FO, LSHS, Bitumen and RPC/Petcoke.

\*MS: Motor Spirit, LPG: Liquefied Petroleum Gas, ATF: Air Turbine Fuel SKO: Superior Kerosene Oil HSD: High Speed Diesel, LDO: Light Diesel Oil, FO: Furnace Oil, LSHS: Low Sulphur Heavy Stock, RPC: Raw Pet Coke.

**Chart 5: Consumption/ Crude Processing by the Oil Refining Companies in FY 2016-17**



Source: PPAC

During FY 2016-17, Reliance Industries Limited (RIL) was the major consumer of crude oil, using almost 514.4 million barrels of crude oil during the year (1.4 million bpd), followed by Indian Oil Corporation Limited (IOCL) and Bharat Petroleum Corporation Limited (BPCL) consuming 477.8 million barrels (1.3 million bpd) and 232.5 million barrels (0.6 bpd) during the year respectively. Others refineries like Hindustan Petroleum Corporation Limited (HPCL), Essar Oil Limited, Oil and Natural Gas Corporation Limited (ONGC), Chennai Petroleum Corporation Limited (CPCL) and Numaligarh Refinery Limited (NRL) consumed around 207.7 million barrels, 153.3 million barrels, 117.7 million barrels, 75.4 million barrels and 19.7 million barrels of crude oil on an annual basis, during FY 2016-17.

**Table 3: Crude Oil consumption scenario in FY 2017-18 (in Million Barrels)**

	FY 2016-17(Apr-Dec)	FY 2017-18(Apr-Dec)	% Change
Consumption of Crude Oil	1,348	1,378	2.2%

Source: PPAC

Consumption of crude oil has increased by 2.2% during the April-December FY 2017-18, period as compared with the corresponding period during the previous year. The rise in prices of crude oil since September, 2017 has not affected the consumption in the short run. Rise in consumption can be attributed to the robust refining activities undertaken. India is not only self-sufficient in the refining capacity for its domestic consumption but also exports a sufficient quantity of petroleum products.

**Policies undertaken for the Enhancement of Exploration and Production of Hydrocarbons**

The Government has been extremely proactive in introducing measures to give a boost to petroleum and hydrocarbon sector. The reforms in hydrocarbon sector are based on the following guiding principles:

1. Enhance Domestic Oil and Gas Production
2. Bring Substantial Investment
3. Generate Sizable Employment
4. Enhance Transparency
5. Reduce Administrative Discretion

Policies undertaken to revolutionize the E&P sector-

- Discovered Small Field Policy
- National Seismic Programme of Un-appraised areas
- Gas Pricing Reforms
- Hydrocarbon Exploration and Licensing Policy (HELP)
- Permission of Extraction of CBM to Coal India Limited (CIL) & its subsidiaries in coal Mining area.
- Hydrocarbon Vision 2030 for North East
- National Data Repository (NDR)

Note: Policies related to crude oil exploration and production has only been discussed.

**Discovered Small Field Policy:** The Discovered Small Field policy provides for single uniform license for producing all kinds of hydrocarbon, no cess on the oil production, moderate royalty structure, customs duty exemptions and complete marketing and pricing freedom for the sale of produced crude oil and natural gas. These small fields are envisaged to be put on production through expeditious efforts.

The Government has awarded 31 contract areas comprising of 44 discovered small fields (28 onshore and 16 offshore) of Oil and Natural Gas Corporation (ONGC) and Oil India Limited (OIL). These areas were discovered long back but these discoveries could not be monetized due to various reasons such as isolated locations, small size of reserves, high development costs, technological constraints, fiscal regime etc.

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

These contract areas have been awarded under the new regime of Revenue Sharing Model. Award of contract is expected to provide faster development of fields and facilitate production of oil and gas thereby increasing energy security of the country. It is expected that in-place locked hydrocarbons volume of 40 MMT oil and 22.0 BCM of gas will be monetised over a period of 15 years. The production from these contract areas will supplement the domestic production.

**National Seismic Programme of Un-appraised areas:** Government of India has taken up an ambitious programme for undertaking 2D seismic survey of entire the un-appraised areas across the country for potential oil and natural gas reserves as almost half of the India's Sedimentary areas are yet to be appraised. This project has an estimated expenditure of ₹5000 crore.

Out of 48243 line kilometres (LKM) of 2D seismic, ONGC and OIL will carry out 40835 LKM and 7408 LKM respectively. ONGC will carry out the national seismic programme (NSP) in most parts of the country while Oil India Ltd will undertake the project in North Eastern states. NSP will be covering 26 sedimentary basins divided into 11 units.

The national seismic Programme is likely to be completed by 2019-20. Annual milestones have been fixed.

**Hydrocarbon Exploration and Licensing Policy (HELP):** In order to further incentivise and encourage domestic production government introduced the Hydrocarbon Exploration and Licensing Policy (HELP), a new fiscal model based on Revenue Sharing Contract. This is an upgraded version as compared to the previous New Exploration Licensing Policy (NELP) and Production Sharing Contract (PSC). It also addresses various industry concerns that contributed to a slowdown in upstream oil and gas investment over the last few years.

In March 2016, Hydrocarbon Exploration and Licensing Policy (HELP) replaced New Exploration Licensing Policy (NELP). Four main facets of this policy are:

- (1) Uniform license for exploration and production of all forms of hydrocarbon,
- (2) An open acreage policy,
- (3) Easy to administer revenue sharing model and
- (4) Marketing and pricing freedom for the crude oil and natural gas produced.

HELP was devised to ensure higher domestic oil & gas production, to attract substantial investment in the sector and generate sizable employment. The policy is also aimed at enhancing transparency and reducing administrative discretion. The uniform licence will enable the contractor to explore conventional as well as unconventional oil and gas resources including CBM, shale gas/oil, tight gas and gas hydrates under a single license. The concept of Open Acreage Policy will enable E&P companies choose the blocks from the designated area.

The earlier contracts were based on the concept of profit sharing where profits are shared between Government and the contractor after recovery of cost. Under the profit sharing methodology, it became necessary for the Government to scrutinize cost details of private participants and this led to many delays and disputes. Under the new regime, the Government will not be concerned with the cost incurred and will receive a share of the gross revenue from the sale of oil, gas etc giving rise to a new fiscal model based on Revenue Sharing Contract

Recognising the higher risks and costs involved in exploration and production from offshore areas, lower royalty rates for such areas have been provided as compared to NELP royalty rates to encourage exploration and production. A graded system of royalty rates have been introduced, in which royalty rates decreases from shallow water to deepwater and ultra-deep water. At the same time, royalty rate for onland areas have been kept intact so that revenues to the state governments are not affected. On the lines of NELP, cess and import duty will not be applicable on blocks awarded under the new policy. This policy also provides for marketing freedom for crude oil and natural gas produced from these blocks.

**Open Acreage Licensing Policy (OALP):** OALP was introduced vide a Cabinet decision of the Government, as part HELP or Hydrocarbon Exploration and Licensing Policy. OALP gives an option to a company looking for exploring hydrocarbons to select the exploration blocks on its own, without waiting for the formal bid round from the Government. Under Open Acreage Licensing Policy (OALP), a bidder intending to explore hydrocarbons like oil and gas, coal bed methane, gas hydrate etc., may apply to the Government seeking exploration of any new block (not already covered by exploration). The Government will examine the Expression of Interest and justification.

**Hydrocarbon Vision 2030 for North East:** The objectives of the plan are to leverage the region's hydrocarbon potential, enhance access to clean fuels, improve availability of petroleum products, facilitate economic development and to link common people to the economic activities in this sector. The states covered include Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The Ministry also undertook series of consultations with the state governments while drafting the vision document. The Vision aims at doubling Oil & Gas production by 2030, making clean fuels accessible, fast tracking projects, generating employment opportunities and promoting cooperation with neighbouring countries and targets an investment of ₹1.30 lakh crore till 2030 in North East India.

The vision statement lays out a detailed roadmap for the entire hydrocarbons value chain, covering upstream, midstream and downstream segments. This report includes an action plan – of immediate, medium-term and long-term initiatives – to help achieve the objectives.

Other than production, the focus areas in the Hydrocarbon Vision 2030 for North East also includes exploring hydrocarbon linkages and trade opportunities with Bangladesh, Myanmar, Nepal & Bhutan; implementation of ‘Make In India’ in the region; development of health & medical facilities; industrial policy & infrastructure related action points; focus on skill development; and employment generation requirement in the region.

**National Data Repository (NDR):** National Data Repository (NDR) had been set up to populate all the geo-scientific data available in the country. NDR has been formulated to provide data to various Industry E&P operators through launching of OALP/HELP programme. The interested E&P companies would be able to view geo-scientific data from anywhere in the world and firm up an opinion regarding prospectively of the blocks prior to bidding for the block.

## World Crude Oil scenario

**Table 4: Top 10 countries with the highest proven crude oil reserves by the end of 2016**

Sr. No	Country	in Billion Barrels	Reserves/Production Ratio
1.	Venezuela	301	341.1
2.	Saudi Arabia	266	59
3.	Canada	172	105.1
4.	Iran	158	94.1
5.	Iraq	153	93.6
6.	Russia	110	26.6
7.	Kuwait	102	88
8.	UAE	98	65.6
9.	USA	48.4	310.1
10.	Libya	48	10.6

Source: BP Stats June 2017

Note: Reserves-to-production (R/P) ratio - If the reserves remaining at the end of any year are divided by the production in that year, the result is the length of time that those remaining reserves would last if production were to continue at that rate. Reserves include gas condensate and natural gas liquids (NGLs) as well as crude oil.

Venezuela may have the largest oil reserves but the production of crude oil is considerably lower than Saudi Arabia. Saudi Arabia has almost one-fifth (1/5<sup>th</sup>) of the world's proven oil reserves and ranks as the largest producer and exporter of oil in the world. India has 4.8 billion barrels of proven crude oil reserves.

USA is the largest consumer of crude oil followed by China and India. Saudi Arabia tops the production table as the top crude oil producer in the world, followed by Russia and USA.

**OPEC:** The Organization of Petroleum Exporting Countries (OPEC) is a group/cartel consisting of 14 of the world's major oil-exporting nations. OPEC was founded in 1960 to coordinate the petroleum policies of its members, and to provide member states with technical and economic aid. OPEC aims to manage the supply of oil in an effort to set the price of oil on the world market, in order to avoid fluctuations that might affect the economies of both producing and purchasing countries. Countries which are presently part of the OPEC are: Algeria, Angola, Ecuador, Equatorial Guinea, Gabon, Iraq, Iran, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, UAE and Venezuela. Currently OPEC's headquarters is in Vienna, Austria.

OPEC's influence on the market has been widely criticized as its market structure results in forming an oligopoly (OPEC holds the majority of crude oil reserves (about 80%) and nearly half of natural gas reserves in the world). Due to this OPEC has considerable power in these markets. As a cartel, OPEC members have a strong incentive to keep oil prices as high as possible, while maintaining their shares of the global market.

**USA:** Traditionally all the countries were dependant on the middle-east to fulfil their growing energy needs, including the USA, but all this changed with the emergence of the “Shale Revolution”. The shale revolution is referred to as the production of oil and gas using the combination of hydraulic fracturing and horizontal drilling that has enabled the United States to significantly increase its production of oil and natural gas, particularly from tight oil formations, which now accounts for 36% of total U.S. crude oil production.

This new production capacity has reduced the United States' dependence on oil imports from overseas and continues to provide an important economic boost. OPEC views the Shale revolution as a threat as there has been continuous supply of oil from US which has led to a rise in US inventories. An excess of supply and stable demand has led to a global supply glut of crude oil which had led to prices of crude oil to fall globally.

### Pricing of Crude Oil

Brent Oil, West Texas Intermediate (WTI) and Dubai Crude are the main crude benchmarks which serve as a reference price for buyers and sellers. Benchmark crude oil also makes it easier for sellers and buyers to determine the prices of multitudes of crude oil varieties and blends, as there are nearly 200 varieties of crude oil.

Brent crude oil is a sweet light crude oil but it isn't as sweet as the WTI crude oil. Brent serves as the leading global price benchmark for Atlantic basin crude oils and it is used to price 2/3<sup>rd</sup> of the world's internationally traded crude oil supplies. Brent is a combination of crude oil from 15 different oil fields in the Brent and North Sea areas.

India uses the Indian Basket of crude as benchmark crude. It is used as an indicator of the price of crude imports in India and Government of India watches the index when examining domestic price issues. The composition of Indian Basket of Crude represents Average of Oman & Dubai for sour grades and Brent (Dated) for sweet grade in the ratio of crude processed during previous financial year.

Due to its huge stature in the crude oil market, Brent crude oil prices are influenced by a number of factors. These factors influence the price of just about any crude oil blend. However, because it's a benchmark, it tends to be more sensitive to these factors than other crude oil blends. Prices of crude oil are highly positively correlated with the other benchmark crude oil.

### How to gauge or what influences oil prices.

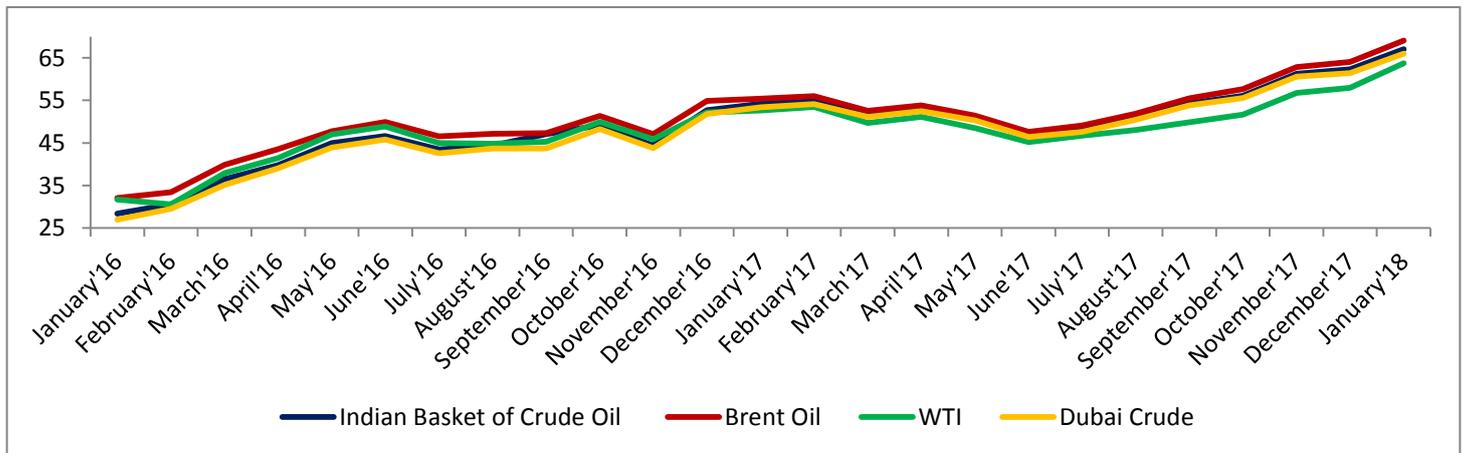
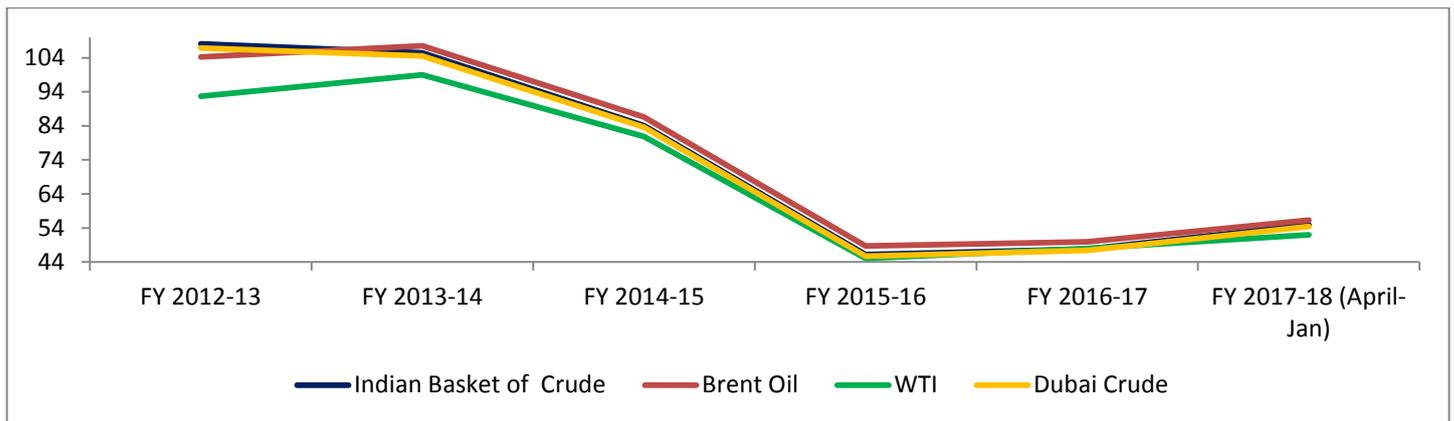
Price of oil is determined by a number of factors. Oil prices are a function of global supply and demand. Prices of oil are also influenced by the political and economic conditions prevailing in the oil producing and refining countries as well. Potential world crises in oil-producing countries dramatically increase oil prices. Environmental hazards too have an effect on oil prices as it has the potential to stall oil production. When it comes to the macroeconomic policies and its influence on oil prices, it is expected that a strong economy is likely to increase the demand for crude oil and on the other hand, an economic crisis would lead to a decline in oil prices.

Since USA is the major consumer of crude oil the demand conditions prevailing in the country affect the prices. Estimates of fuel consumption which are provided monthly by the Energy Information Agency (EIA) have a high bearing on the price.

Usually demand tends to rise during the summer vacation driving season. To predict demand, forecasts for travel from AAA are used to determine potential gasoline use. During the winter, weather forecasts are used to determine potential home heating oil use.

Level of supply of crude oil in the economy is an important determinant as well in factoring crude oil prices. That means if the supply is less then there are chances of prices of crude oil projecting upwards. Hence OPEC's decisions are important in the oil market because OPEC owns about 2/3rd of the global oil market. If OPEC decides to cut down on production the supply will reduce leading to an increase in crude oil price.

**Chart 6: Price movements of the crude oil benchmarks and the Indian Basket of crude (\$/bbl)**



Source: Bloomberg, PPAC, IndexMundi

**Major landmark events which caused movements in the benchmark crude oil prices.**

Financial Year	Price of Brent Crude Oil	% Change	Major landmark events which caused movements in the benchmark crude oil prices.
2012-13	104.2	-	Prices rebounded on expectations that policymakers in the United States, Europe, and China were to take up quantitative easing to stimulate economic growth, Disruptions of oil production in Sudan, South Sudan, Yemen, Syria, and the North Sea

2013-14	107.5	3.2%	The on-going tensions in Libya and Ukraine, Eruption of sectarian violence in OPEC's second largest producer, Iraq
2014-15	86.7	-19.4%	Fed Tapering, More than expected surplus US oil production (production increased from 7.5 mbpd to 8.7 mbpd) i.e. shale revolution, subdued oil demand from the leading oil importers, OPEC decision of not cutting down production.
2015-16	48.7	-43.8%	Oversupply of oil by the OPEC, Rise in US crude oil production coupled with lack of demand from the major oil consuming countries, Devaluation of China's currency, Strengthening of the US dollar, Iran Nuclear Deal
2016-17	50.0	2.6%	Switch in strategy from OPEC, a drop in US crude oil supplies, strengthening Chinese demand, Supply outages in Nigeria and Libya.
2017-18 (April-Jan)	56.3	12.7%	Shortfall in US Inventories, Disruption in production caused by the cyclonic activity in the US, Stronger than expected demand due to recovery of world economies, Supply cuts taken by OPEC and Russia, Temporary closure of Fortis Pipeline, Geopolitical Tension between Iraq and Kurdish forces as Kurdistan region of Iraq (KRI) pressed to hold a referendum on independence

Source: Care Ratings

### Financial Performance of Companies engaged in Exploration and Production of Crude Oil

Exploration & Production (E&P) companies are involved in the high-risk/high-reward and are focused on finding, augmenting, producing and merchandising different types of oil and gas. We have observed the segmented financials of ONGC, Oil India, Cairn India and Reliance Industries.

Chart 7: Sales Growth

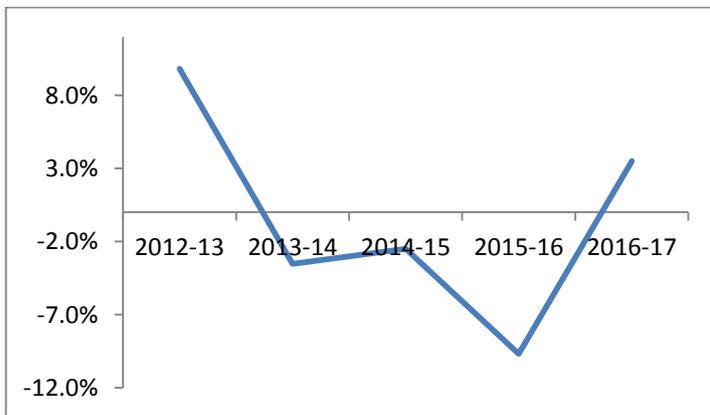
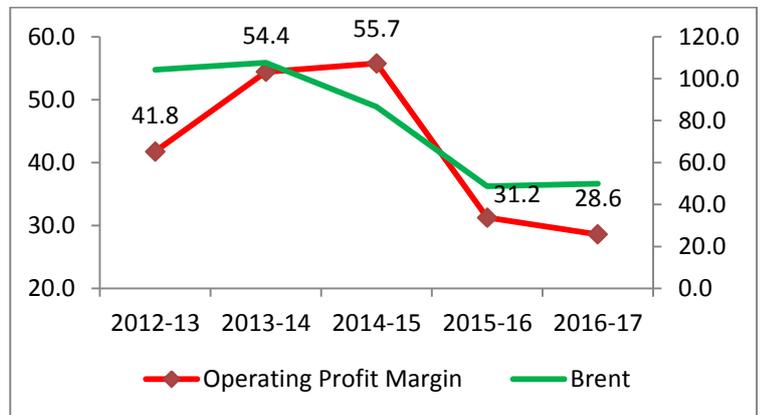


Chart 8: OPM of Upstream Oil exploration Companies (%)



Source: BSE India, Care Ratings.

Note: We have only observed the segment which is pertaining to only the exploration and production of crude oil only specifically. Sales Growth rate includes sales numbers of ONGC, Oil India, Cairn India and RIL, whereas for OPM ONGC is not included as ONGC operating profit margins for the segment are not available in the public domain.

The sales realisation and operating profit margins of the domestic crude oil producers largely depends on the crude oil prices globally and in the domestic markets. High prices of crude oil have resulted in higher revenue realizations. Oil produced from nominated crude is sold through a Crude Oil Sales Agreement (COSA). ONGC has a COSA with BPCL, HPCL,

IOCL, CPCL and MRPL. Sale price of crude oil is denominated in United States dollar (USD) though billed and received in Indian Rupees (INR). Therefore, movements in the USD/INR also have an effect on the sales revenue.

There is a strong correlation between the operating profit margins of upstream crude oil exploration companies and prices of Brent oil. High crude oil prices have a positive effect on the operating profits of the upstream exploration companies i.e. oil producers, as they can charge a higher price to the crude oil consumers. Setting up of infrastructure needed to facilitate oil exploration needs considerable investments as well. High crude prices make it profitable for producers to undertake exploration.

Operating profit margins of upstream players was at its peak when prices of crude oil were its highest. Post the FY 2014-15 debacle the profit margins started to fall (a 44% drop) and operating profits were the lowest in FY 2015-16. As crude oil prices started to recover during FY 2016-17, the profits of oil exploration companies have seen some recovery as well.

### Conclusion and Care Ratings views and opinion on the Outlook of the E&P sector

*Indian economy is to grow by 6.5% in FY18. With infrastructure and industry projects being the integral part of the investment cycle, demand for energy will increase. The Government has targeted to reduce import of oil and gas by 10% by 2022. If India plans to cut imports of Oil and Gas by 10% by 2022, the oil imports for FY 2021-22 need to be 1411 million barrels. Imports can only be reduced by either increasing domestic crude oil production or by curtailing consumption.*

- *The government needs to focus on increasing domestic production and attract more investments in the E&P sector. **We believe that given the current circumstances India will be able to reduce import dependence by 10% in gradual manner but not by 2022, maybe by 2030.***
- ***Domestic crude oil production is expected to further increase and become more stable by the end of FY 2018-19.** With the introduction of Hydrocarbon Exploration and Licencing Policy where companies get to carve out their areas of interest to explore through the open acreage licensing coupled with the rise of crude oil prices globally, domestic production will rise steadily at a stable growth rate.*
- ***The inclusion of US as a source for crude oil imports is a great move for India.***
  - *In terms of cost it will be beneficial as the US crude oil is \$2 per barrel cheaper than the imported Dubai crude which will help in reducing the import bill and help act as a soothing balm in reducing the current account deficit.*
  - *Politically it will go a long way in avoiding the price hikes arising out of geopolitical disruptions which will help usher price stability and energy security. The sourcing of crude oil from the US is a step towards strengthening India-US ties in the hydrocarbon sphere. Having US in the picture helps India maintain diversity in the supply base.*
- *As per our forecasts **the consumption of crude oil by refineries to grow a rate of 4.5% CAGR and reach the level of 2145.3 million barrels during FY 2021-22.***
- *There lies a flipside for crude oil consumption on account of increasing use of natural gas as India is on the move towards a gas based economy, natural gas being a cleaner and greener fuel alternative.*
- *Rapid adoption of electric vehicles by 2030 could cause oil demand to plateau.*
- *On account of price of crude oil **price of Brent will not break the resistance of \$70/bbl but it will be above the support levels of \$65/bbl, on a monthly basis.***

- *Rise in crude oil price leads to an increase in the inflation levels of the country which in turn worsens the current account deficit and fiscal deficit. WPI inflation gets directly impacted as the pass through of price increase is automatic for most products.*
  - *The WPI could increase by 0.5-0.7% on account of 10% increase in crude oil price. CPI impact would be less pronounced given the lower weight of oil related products and could be in the region of 0.3-0.35%.*
  - *India is world's third-largest consumer of crude oil. India imports around 4.2 million bbl/per day. At the macro-level, with imports of 1,568 million barrels of crude oil on an annualised basis, a dollar increase in prices on a permanent basis would increase the bill by roughly ₹10,000 crore on an annual basis (156.8\*64) assuming no change in exchange rate.*
  - *Import bill would increase by approx. \$ 1.5 bn for every dollar increase in crude oil price.*

## Annexures

### A Primer on the concept:

**Brent** is a reasonably “light” and sweet crude oil with API gravity of 38.3 degrees and about 0.37% of sulphur. Brent blend is ideal for making Motor Spirit (Petrol) and middle distillates. Brent crude production is also on the decline, but it remains the major benchmark for other crude oils. Prices for other crude oils are generally priced as a differential to Brent, i.e., Brent +/-.

**West Texas Intermediate (WTI)** crude oil is a high quality crude and is excellent for refining for maximizing of Petrol (Motor Spirit). WTI is a light crude with API gravity of 39.6 degrees. Also it contains about 0.24% of sulphur, marking it as “sweet” crude. This set of characteristics, combined with its production location (US), makes it an ideal crude oil to be refined in the United States.

**OPEC** collects pricing data on a "basket" of seven crude oils:

- Algeria's Saharan Blend
- Indonesia's Minas
- Nigeria's Bonny Light
- Saudi Arabia's Arab Light
- Dubai's Fateh
- Venezuela's Tia Juana Light and
- Mexico's Isthmus

**New Exploration Licensing Policy (NELP):** New Exploration Licensing Policy (NELP) was a policy adopted by Government of India in 1997 indicating the new contractual and fiscal model for award of hydrocarbon acreages towards exploration and production (E&P). NELP was applicable for all contracts entered into by the Government between 1997 and 2016.

The main objective was to attract significant risk capital from Indian and Foreign companies, state of art technologies, new geological concepts and best management practices to explore Oil and Gas resources in the country. Since then licenses for exploration were being awarded only through a competitive bidding system and National Oil Companies (NOCs) were required to compete on an equal footing with Indian and Foreign companies to secure Petroleum Exploration Licenses (PELs).

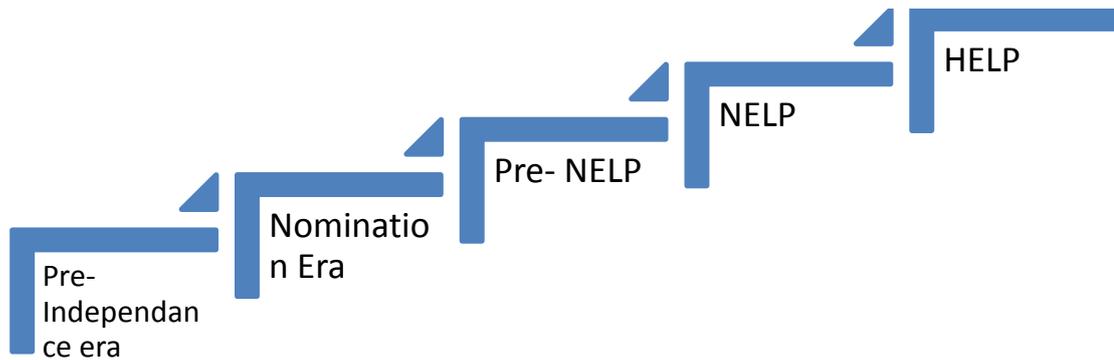
The Government has taken number of measures to bring in healthy competition and public participation by the way of NELP for exploration & production of Oil & gas in the country. NELP regime was able to accelerate the quest for hydrocarbon exploration, and also bring in state of the art technology and efficiency of operations /management to the country.

**Product Sharing Contract (PSC):** Production Sharing Contract (PSC) is a term used in the Hydrocarbon industry which refers to an agreement between the Contractor and the Government whereby Contractor bears all exploration risks, production and development costs in return for its stipulated share of (profit from) production resulting from this effort. The costs incurred by the contractor are recoverable in case of commercial discovery. Thus, PSC is a fiscal regime existing in the exploration and production of hydrocarbons.

Production Sharing Contracts became widely adopted as part of the New Exploration and Licensing Policy (NELP) launched by the Government in 1997 for enhanced exploration of oil and gas resources in the country.

The Production Sharing Contracts (PSCs) under NELP are based on the principle of “profit sharing”. When a contractor discovers oil or gas, he is expected to share with the Government the profit from the venture, as per the percentage given in his bid. Until a profit is made, no share is given to Government, other than royalties and cesses.

Thus, in production sharing contract (PSC), Government's take depends on biddable share of profit petroleum/ gas after allowing for cost recovery. In other words, PSC allows the contractor to recover his cost, before giving Government its share in the contractor's revenues, in case there is commercial discovery leading to production (Not all drilling leads to discovery of oil/gas). Thus, a certain proportion of the balance revenues of the contractor are shared with the Government.



Pre Independence: 1886- 1946; Nomination Era: 1947- 1990; Pre-NELP: 1991- 1996; NELP: 1997- March 2016; HELP: March 2016- Till date

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