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# The Paradigm Shift in Indian Oil and Gas Industry

A knowledge Paper Prepared for

 **ADEC** | India Drilling & Exploration Conference



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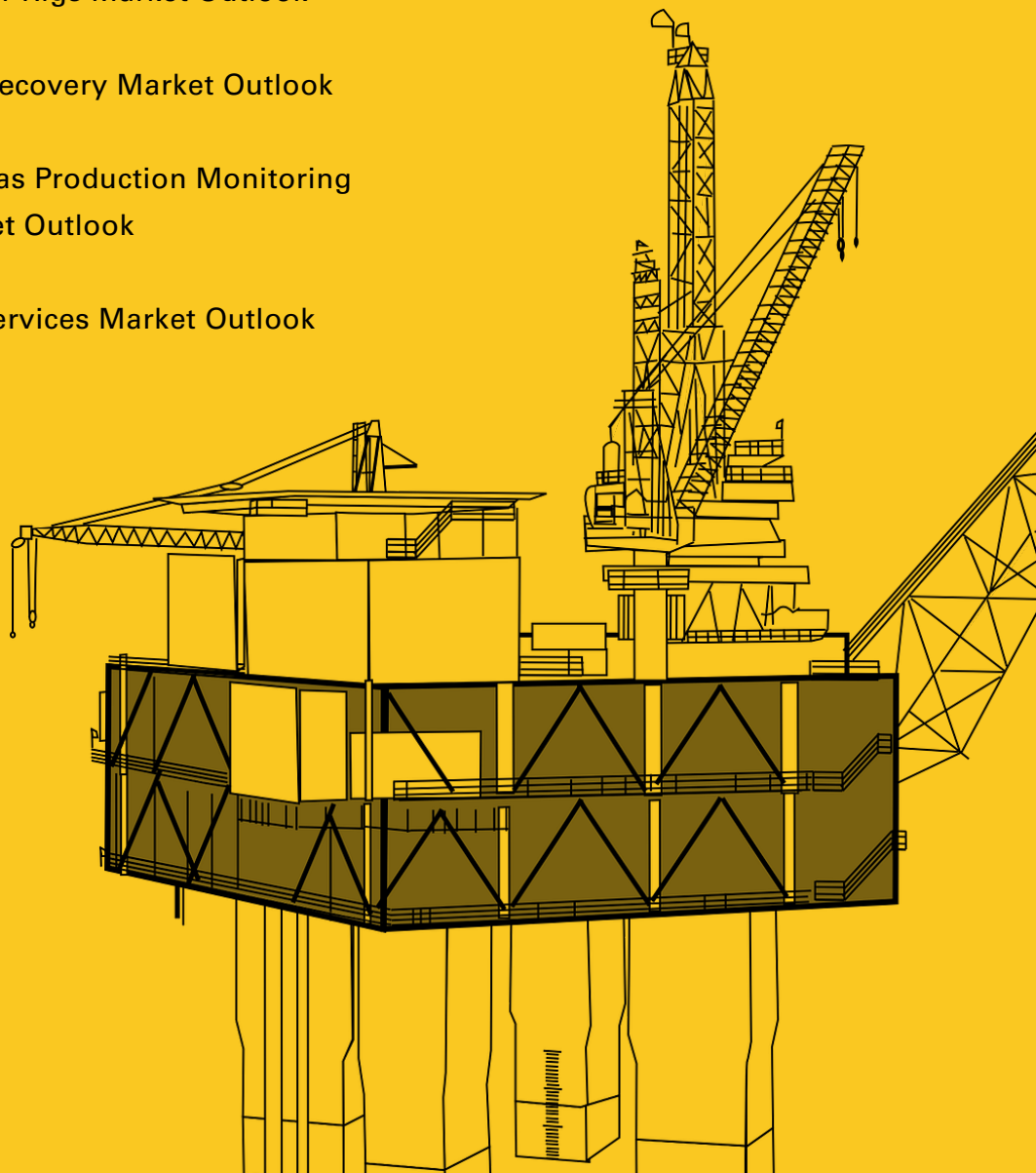
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# Oil & Gas Industry in India



## Evaluation of Indian Oil and Gas Industry

- India is among the fastest growing economies across the globe. Factors like growing economy, rising population and increasing demand for energy are driving oil & gas industry in the country.
- Several policy reforms have been taken by the Indian government to fulfil the increasing demand for oil & gas in the country and remove obstacles to attract investments and incentivize oil & gas sector on the lines of ease of doing business. The government has also allowed complete Foreign Direct Investment (FDI) in many segments of the sector which includes natural gas, petroleum products, and refineries. Indian oil & gas industry attracts both domestic and foreign investments.
- As of 2019, India is the third largest consumer of crude oil & petroleum products in the world and second largest refiner in Asia.

## Production and Consumption Trend of Crude Oil, Natural Gas, & Petroleum Products in India, By Volume, 2013-2018

### Production

	2013-14	2014-15	2015-16	2016-17	2017-18
<b>Crude Oil (MMT)</b>	<b>37.79</b>	<b>37.46</b>	<b>36.94</b>	<b>36.01</b>	<b>35.68</b>
% Growth	-0.19%	-0.87%	-1.39%	-2.53%	-0.90%
<b>Natural Gas (BCM)</b>	<b>35.41</b>	<b>33.66</b>	<b>32.25</b>	<b>31.90</b>	<b>32.65</b>
% Growth	-12.96%	-4.94%	-4.18%	-1.09%	2.36%
<b>Petroleum Products (MMT)</b>	<b>220.76</b>	<b>221.14</b>	<b>231.92</b>	<b>243.55</b>	<b>254.40</b>
% Growth	1.39%	0.17%	4.88%	5.01%	4.46%

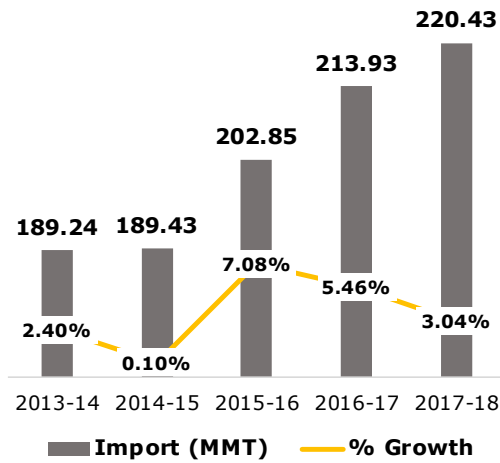
### Consumption

	2013-14	2014-15	2015-16	2016-17	2017-18
<b>Crude Oil (MMT)</b>	<b>222.50</b>	<b>223.24</b>	<b>232.86</b>	<b>245.36</b>	<b>251.93</b>
% Growth	1.50%	0.33%	4.31%	5.37%	2.68%
<b>Natural Gas (BCM)</b>	<b>48.99</b>	<b>46.95</b>	<b>47.85</b>	<b>50.78</b>	<b>52.83</b>
% Growth	-9.13%	-4.16%	1.92%	6.12%	4.04%
<b>Petroleum Products (MMT)</b>	<b>158.41</b>	<b>165.52</b>	<b>184.67</b>	<b>194.60</b>	<b>204.92</b>
% Growth	0.86%	4.49%	11.57%	5.37%	5.31%

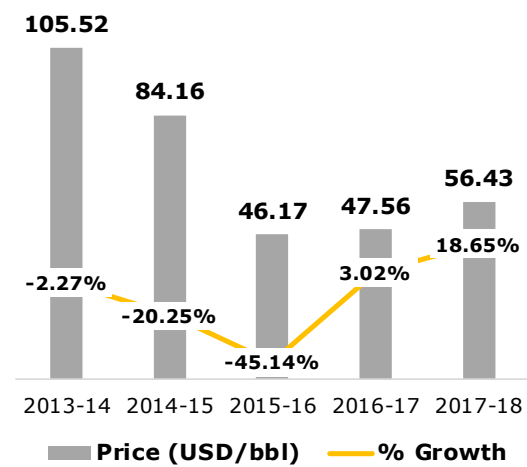
Source: Ministry of Petroleum & Natural Gas

- In FY2018-2019, the refining capacity of oil in India stood at 247.57 million metric tonnes per annum (MMPTA) with 23 refineries (18-Public sector; 3-Private sector; and 2- Joint Venture). 11 of these refineries are operated by Indian Oil Corporation Ltd. with the company's total refining capacity standing at 80.7 MMTPA, and thereby emerging as the largest refining share in India.
- Three major players operating in India refinery sector are Indian Oil Corporation Ltd. (IOCL), Bharat Petroleum Corporation (BPCL) and Reliance Industries (RIL), which collectively contribute more than 65% of the country's total refining capacity.

### India Crude Oil Imports, By Volume, 2013-2018 (MMT)



### Average Crude Oil Prices, 2013-2018 (USD/bbl)



Source: Ministry of Petroleum & Natural Gas

## Petroleum Resources and Reserves in India

Oil and gas discoveries made by ONGC in Madhya Pradesh and West Bengal are likely to create opportunities for two new sedimentary basins in the country.

### India Sedimentary Basins, By Basin Type

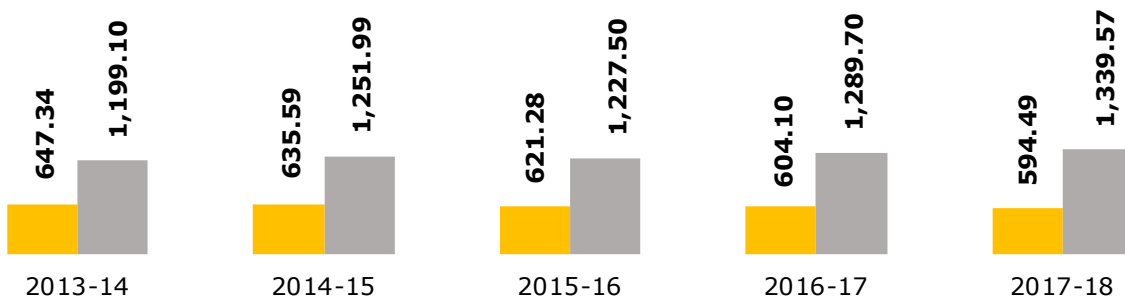
Basins Type	Area (Sq. KM)	Hydrocarbons Prospect	Basins/Region
Category I (7 Basins)	532,500	Established commercial production	Cambay, Assam Shelf, Mumbai offshore, Krishna Godavari, Cauvery, Assam Arakan Fold Belt and Rajasthan
Category II (3 Basins)	182,000	Known accumulation of hydrocarbons but no commercial production yet	Kutch, Mahanadi-NEC & Andaman-Nicobar
Category III (6 Basins)	660,000	Indicated hydrocarbon shows that are considered geologically prospective.	Himalayan Foreland, Ganga, Vindhyan, Saurashtra, Kerala-Konkan, Lakshadweep & Bengal
Category IV (10 basins)	461,200	Uncertain potential which may be prospective by analogy with similar basins in the world.	Karewa, Spiti-Zanskar, Satpura-South Rewa Damodar, Narmada, Decan Syncline, Bhima-Kaladgi, Cuddapah, Pranhita, Godavari, Bastar, Chhattisgarh
Deepwater	1,299,000	--	East & west coast from 400 m water depth to EEZ

Source: Ministry of Petroleum & Natural Gas

- Emergency stockpiles of natural gas are likely to be constructed in India, due to strategic oil reserves, supply disruption normalization and growing demand for fuel imports in India.
- The Government is focusing on increasing natural gas domestic consumption, which is considered a cleaner fossil fuel. Moreover, the Government is planning to increase the consumption by 2.5 times by 2030, for which, the Government is encouraging major investments for gas production, import, distribution and transport infrastructure.

## India Crude Oil & Natural Gas Reserves, By Volume, 2013-2018

■ Crude Oil (MMT) ■ Natural Gas (BCM)



Source: Ministry of Petroleum & Natural Gas

## Market Overview and Trends

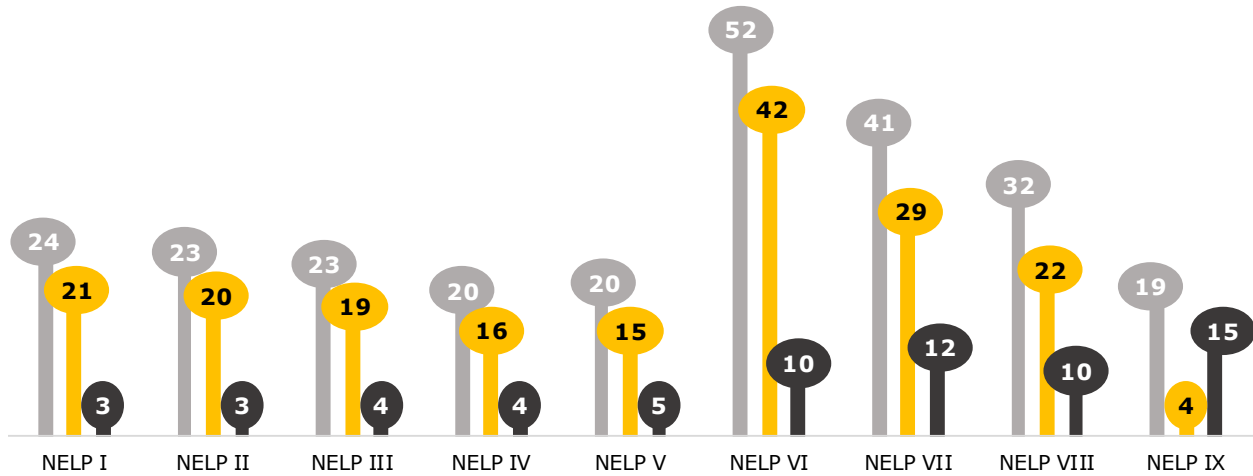
- India is among the largest contributors to non-OECD petroleum consumption growth across the globe. In India, oil imports surged to USD105 billion in 2018-19 in comparison to USD87.37 billion in 2017-18.
- India remained as the third largest consumer of oil in the world with a consumption of 4.69 mbpd of oil in 2017 as compared to 4.56 mbpd in 2016.
- In 2018, India was the fourth largest Liquefied Natural Gas (LNG) importer in Asia, with the top 3 being Japan, China and South Korea. In India, LNG imports increased to 29.02 bcm in 2018-19 from 26.11 bcm in 2017-18.
- Gas pipeline infrastructure in India was measured at 16,226 km as on February 2019.
- Increasing demand for crude oil in India can be attributed to growing population and rising per capita income.



# Status of Blocks Under NELP

## Status of Blocks Awarded Under NELP

■ Awarded ■ Relinquished ■ Operational



Source: Directorate General of Hydrocarbon

## Hydrocarbon Exploration & Licensing Policy (HELP)

- Uniform license for exploration and production of all forms of hydrocarbon
- An open acreage policy
- Gas pipeline infrastructure in India was measured at 16,226 km as on February 2019.

## Fiscal benefits to investors under HELP

Type of Hydrocarbons	Duration	Royalty Rates (Oil)	Royalty Rates (Natural Gas/CBM)
Onland	Throughout	12.5%	10%
Shallow water	Throughout	Throughout	7.5%
Deepwater	First 7 years	Nil	Nil
	After 7 years	5%	5%
Ultra-deep water	First 7 years	Nil	Nil
	After 7 years	2%	2%

Source: Directorate General of Hydrocarbon

## Open Acreage License Policy (OALP)

Open Acreage License Policy (OALP) was introduced in 2016, as part of the Hydrocarbon Exploration and Licensing Policy (HELP). OALP enables a faster coverage of the available and potential oil and gas discoveries.

- Under Bid Round-1, 55 blocks were awarded, expanding the exploration area to 150,000 square km, which was 90,000 square km earlier.
- Bid Round-2 & 3, launched in early 2019, covered 29,233 square km and 31,722 square km, respectively. The third round covers 23 blocks, which are located in Rajasthan, Gujarat, Tamil Nadu, Andhra Pradesh, Odisha, Assam, West Bengal, Nagaland, Tripura, Maharashtra, Jharkhand and Madhya Pradesh. Of the total, 19 blocks are on land, 3 in shallow water, and 1 is in deepwater.
- The fourth and fifth bidding rounds are expected to add another 50,000 and 40,000 square km of exploration area, respectively.

## Discovered Small Fields (DSF) Rounds

DSF was launched in 2015 to start production from discovered small fields and to provide a single uniform license for the production of all kinds of hydrocarbon.

### Features of DSF

- 46 contract areas with 67 oil and gas fields are offered
- Estimated to hold more than 625 million barrels of oil and oil equivalent gas
- Area coverage of over 1,500 square km in onland, shallow water and deepwater areas
- Revenue Sharing contract
- Up to 100% FDI participation by foreign companies, joint ventures
- Single license for Conventional & Un-conventional hydrocarbon
- No restriction on exploration activity during contract period
- Freedom for pricing and sale of crude oil & gas
- Open to all, no technical capability criteria
- No carried interest by National Oil Companies
- Revenue sharing after onset of production





### DSF Bid Round-I :

Launched in 2016, the first round received 134 electronic bids for 34 contract areas. The round helped oil and gas operators to remove regulatory burden.

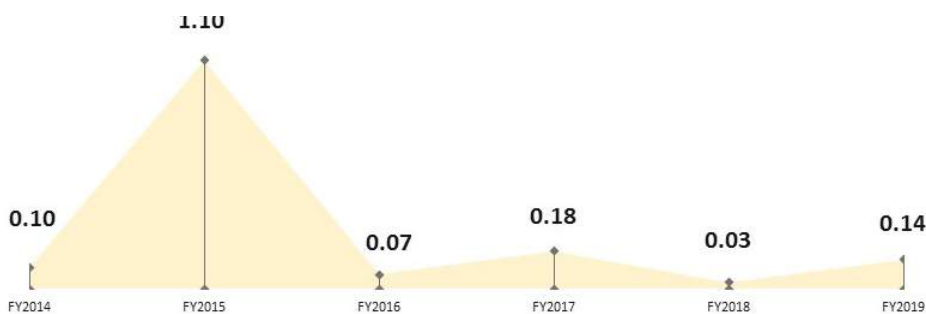
### DSF Bid Round-II :

The duration of DSF second bidding round was August 2018-January 2019. The round offered 25 contract areas including 59 fields for international competitive bidding. In addition, the round featured hydrocarbon resource base of more than 189.6 MMT and offered better fiscal benefits by revenue sharing contracts and an investor friendly policy to operators.



## Investments- FDI

FDI Inflows in Petroleum and Natural Gas, FY2014-FY2019 (USD Billion)



Source: Department of Industrial Policy and Promotion and TechSci Research Estimates

# Investments- Mergers and Acquisitions

## List of Mergers & Acquisition Activities in India Oil & Gas Sector

Date Announced	Acquirer	Target Name	Deal Value (USD Million)
Mar 2019	Brookfield	East West Pipeline (EWPL) (Previously known as Reliance Gas Transportation Infrastructure)	1,800
Apr 2018	Indian Oil Corporation Ltd (IOCL)	Shell Exploration & Production, Oman	329
Feb 2018	ONGC	HPCL (51.11 per cent stake)	57,020
Feb 2018	ONGC Videsh	Abu Dhabi National Oil Co (10 per cent stake in offshore oilfield)	600
Aug 2017	Rosneft	Essar Oil (49 per cent stake)	1,290
Dec 2016	Oil and Natural Gas Corp's	Gujarat State Petroleum Co's	1,200
Dec 2015	ONGC Videsh Ltd (OVL)	Vankor Oil Field	1,260
Jan 2015	Bharat Forge	Mecanique Generale Langroise	13
Jun 2014	Gulf Petrochem Ltd	Sah Petroleums Limited	7

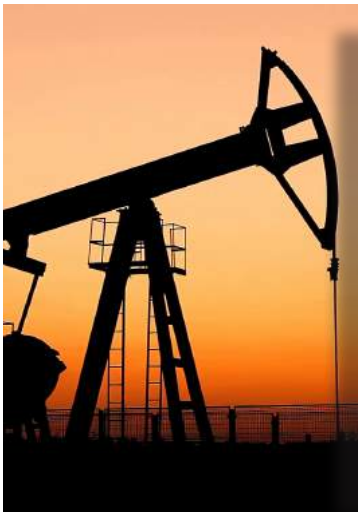
Source: TechSci Research

## Investments- Planned Investments and Expansions

- Indian companies are undertaking redevelopment plans for improving production to surge hydrocarbon recovery rates from oil wells, such as, ONGC in Mumbai High.
- In order to increase hydrocarbon production and to mend oil recovery from offshore fields, ONGC is planning to invest more than USD500 million in Mumbai High.



## Major E&P Companies- Operational Blocks (FY2018-2019)



Onshore	Operational Blocks
Oil & Natural Gas Corporation	Tripura, Ankleshwar, Karaikal, Jorhat, Assam, Mehsana, Ahmedabad, Nagayalanka, Nadiad
Joshi Oil & Gas	Dholka, Wavel
Gujarat State Petroleum Corporation Ltd.	(Tarapur-1/6), (Ankleshwar-21-40S), (Ingloi, Sanand-East), (Sanand-Miroli)
Selan Exploration Technology Ltd.	Bakrol, Indrora, Karjisan
Hindustan Oil Exploration Company Ltd.	North Balol, Asjol,
Gujarat Natural Resources Limited (HERAMEC)	North Kathana, Kanwara, Dholasan,
Essar Oil Ltd.	CB-ON/3 (ESU-EEU-ENS-ENP)



Offshore	Operational Blocks
Oil & Natural Gas Corporation	Bassein & Satellite, Eastern Offshore, KG-OSN-2001/3 (DDW)
CAIRN INDIA LTD. (CIL)	CB-OS/2 (Laksmi-Gauri), Ravva
Hindustan Oil Exploration Company Ltd.	PY-1
BG Exploration & Production India Ltd	Panna-Mukta

Source: Directorate General of Hydrocarbon and TechSci Research

## Government Initiatives

- In September 2018, Government of India approved fiscal incentives to attract investments and introduce better technology for improving recovery methods from oilfields, which is likely to result in hydrocarbon production worth USD745.82 billion by 2040.
- In December 2018, Government of India announced its plan to invest around USD9.97 billion for gas pipeline network expansion across the country.
- The Government is planning to set up about 5,000 CBG (Compressed Bio Gas) plants by 2023.
- State-run oil firms are undergoing investment planning worth USD111.30 million in Uttar Pradesh for improving LPG infrastructure in order to promote clean energy and generate employment.
- The Government of India is planning a gas exchange for bringing market-driven pricing in the energy sector in India.
- The Government is planning to set up bio-CNG plants and related infrastructure worth USD1.10 billion for promoting clean fuel.

## Technological Trends

- Rising collaborative arrangements and partnerships in oil & gas sector, for capitalizing the emerging opportunities such as supply chain integration, trading, logistics and payments.
- Many upstream oil and gas companies are utilizing cloud-based platforms for hosting their business applications under various areas such as sub-surface, land and production systems.
- Asset Performance Management (APM) and DigitalTwin initiatives are likely to collaborate for driving innovative solutions for the management of critical assets in the upstream and downstream operations.
- Growing adoption of IoT devices and edge computing in the industry.

## Practices for Operational Excellence

- Better control of complex operations in order to minimize costs and optimize the performance of employees, facilities and assets.
- Enhanced collaboration with oilfield services in order to improve logistics. This would increase mobility options and effectively manage the cost.
- Reduction of headcount while retaining the ones with core skills coupled with development of a high-performing culture through training, new systems and efficient management.
- Adoption of risk-sharing agreements with suppliers and customers.
- Implementation of IoT, real time data recovery and analysis, and analytics to mitigate risks and optimize operations.

## The Road Ahead

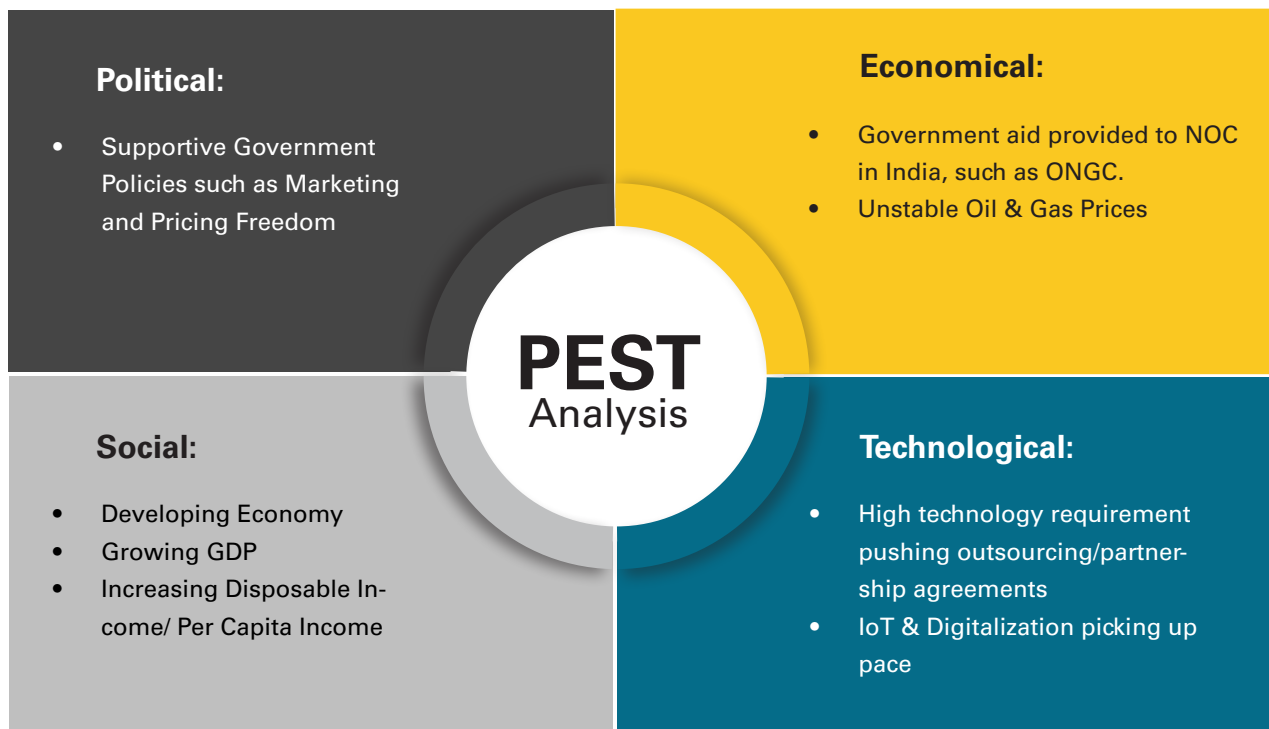
- Oil & Gas industry should consider adopting digitalization in the existing processes. This is likely to result in new operating, capital, and business models for a company.
- Cognitive computing and 3D printing are likely to be introduced in the oil & gas industry. Digitalization framework and incorporating several digital solutions will help a company to achieve its goals by improving its efficiency, increasing productivity, and providing cost optimization.
- Emergence of digitalization in India has resulted in more apparent Request for Proposals (RFPs) for digital applications in oil & gas firms. Moreover, in 2017, Reliance bagged the inaugural award for its petro retail excellence. Such developments indicate rise in demand for digital practices across the country.



# India Deepwater Drilling Overview

## Rising Deepwater E&P Activities

- In FY2017-2018, India had 594.49 MT (Million Tonnes) of crude oil reserves against 604.10 MT in FY2016-2017, witnessing a y-o-y decline of 1.59%. In India, Western Offshore and Assam have the largest oil reserves accounting for a cumulative share of more than 65% of the total crude reserves in the country in FY2017-2018.
- Natural gas reserves in India reached at 1,339.57 billion cubic meters (BCM) in FY2017-2018 from 1,289.70 billion cubic meters (BCM) in FY2016-2017, which showed an increase of 3.87% during this period. Moreover, Eastern Offshore and Western Offshore have the largest natural gas reserves with a cumulative share of more than 60% in FY2017-2018.
- More than 80% of the crude demand in India is fulfilled by imports. Various government initiatives are being carried out to reduce the imports to about 67% by 2022, for which the government is promoting local exploration, renewable energy and other sources of fuel.
- Out of the overall 250+ blocks awarded under NELP regime about 81 blocks were in deepwater areas. Several offshore and deepwater areas have been assessed through geophysical surveys and exploratory drilling as they included many unexplored and poorly explored areas. As of 2018, about 240 oil & gas discoveries have been made under various regimes out of which a majority of the gas discoveries were made in offshore areas, having 52 shallow and 40 deepwater blocks.
- In April 2018, BP and Reliance Industries Limited announced the initiation of satellite cluster project in Block KG D6 for the development of the deepwater gas fields discovered in the block. This is likely to increase the overall gas production in India in the coming years.



## Government Support

- Marketing and Pricing freedom for gas production from Deepwater (DW), Ultra Deepwater (UDW) and High Pressure High Temperature (HPHT) areas. Marketing freedom so granted would be capped by a ceiling price arrived at on the basis of landed price of alternative fuels.
- Marketing and Pricing freedom is expected to increase gas production by 6.75 trillion cubic feet (TCF) by improving the economic viability of discoveries made in 21 DW areas, 1 UDW area and 5 HPHT areas. Further, this policy would facilitate development of such discoveries over the coming years.



## Leading Companies

**Oil & Natural Gas Corporation**

**Reliance Industries Limited**

**CAIRN INDIA LTD. (CIL)**

**Gujarat State Petroleum Corporation Ltd.**

## Key Trends

- Rising large deepwater field developments
- Growing investment in greenfield activities in deepwater areas
- Increasing partnerships for deepwater explorations
- Government's plan to double natural gas production and to drill more than 100 exploration wells by 2022

## The Path Forward

- As of 2018, resources of crude oil & natural gas in India for deepwater area is estimated to be 7,000 MMT with an area of 1.32 million sq km. Moreover, in 2017, ONGC made three discoveries in deepwater.
- With the vast oil & gas reserves in deepwater followed by discoveries made in the area, NGHP expedition (National Gas Hydrate Program) needs to be carried out for assessing the gas hydrate resource potential in the deepwater and other offshore areas.
- With the implementation of Discovered Small Field Bid Round, many contract areas are likely to be awarded in future including deepwater offshore. Thereby, increasing the E&P activities in the deepwater area.

## ONGC Deepwater Investment in East Coast

In March 2017, ONGC announced an investment of around USD10 billion in the development of three deepwater blocks in the KG5 basin block (KG-DWN-98/2) by FY2023. The project is divided into three clusters.

Cluster 1 was secured with G-4 blocks for production; however, it has not been completed owing to the dispute between Reliance Industries Ltd. and ONGC. Cluster 2 was sanctioned in 2018. The declaration for commercialization process for Cluster 3 is under process by ONGC.

The cluster 2 project, entailing an investment of USD5.07 billion, is expected to complete in 2021, with the first gas production likely in June 2019 and oil production in March 2021. The cluster 2 is expected to have an output of 17 million standard cubic meters per day (mscmd) of gas and 77,305 barrels per day (bpd) of oil. The cluster is further divided into two;

- Cluster 2A primarily includes oil finds in Northern Discovery Area (NDA), which has a potential to produce 77,305 bpd (94.26 MMT) of oil and 3.81 mscmd (21.75 BCM) of gas.
- Cluster 2B, mainly comprising gas finds in NDA, is likely to produce 12.75 mscmd (51.98 BCM) of gas, with the production expected to last 7 years. Cluster-3 is the UD-1 gas discovery.

In October 2018, ONGC awarded an integrated contract of subsea production system + subsea umbilical, risers and flow lines (SPS+SURF) to a consortium of BHGE, McDermott and L&T hydrocarbon. The contract, worth USD1,694.45 million, is a planned initiative for the integrated development of KG-D5 (Cluster-2) project in East Coast of India. The project is aimed at eliminating interface issues among SPS and SURF and would lead to time and cost savings.

## RIL and BP Plc Deepwater Investment in East Coast

Block KG D6 integrated development program is divided into three projects, R Series, Satellite Cluster, and MJ.

- Approved in June 2017, R Series is the first project, which is in execution phase.
- The second project, Satellite Cluster, was certified in April 2018. The project is expected to be phased over H2 2021–2022. In June 2017, RIL and BP Plc. announced an investment of USD6 billion for deepwater KG D6 block projects, aimed at producing 30-35 million cubic meters per day of gas.

Under the program, RIL invited tenders for the development of many of its deepwater oil and gas blocks, including KG-D6 in April 2016.

- The first tender issued was for the blocks under New Exploration Licensing Policy 1 (NELP-1) and New Exploration Licensing Policy 3 (NELP-3).
- On behalf of the company and its partners BP Plc. and Niko, RIL issued the second tender specifically for the KG-D6 block.
- Reliance Industries Ltd, UK-based BP Plc. and Canada-based Niko Resources Plc. are the three project partners, holding 60%, 30%, and 10% share in the project, respectively.





# India EOR (Enhanced Oil Recovery) Overview



# Enhanced Oil Recovery Introduction

- Enhanced Oil Recovery (EOR) process involves injection of fluids, which interact with the reservoir rock-fluids system, thereby resulting in alteration in fluid properties in situ and fluid rock interactions.
- Alterations in fluid properties in situ results in oil swelling, viscosity reduction, composition and phase behavior changes. Whereas, fluid rock interactions include interfacial and surface tension reduction, rock wettability modification and reduction in capillary pressure.
- Overall oil production globally has witnessed downfall due to rise in maturity of oil reservoirs over the past few years. In developing countries such as India, oil production and consumption has a major impact on the economical development of the country. However, domestic crude production does not fulfil the country's energy demand. To minimize the gap between the supply and demand for crude oil, several methods for recovering oil have been developed for increasing the production from matured reservoirs and are referred to as Enhanced Oil Recovery (EOR) methods.
- Conventional oil and gas fields in India witness decline in output and its recovery rate as they mature. Thus, to increase recovery rate, EOR and IOR schemes like polymer injection are implemented.
- Union cabinet approved fiscal incentives, including lower cess and royalty, for oil and gas recovery from maturing fields as well as new source of fuel such as shale, hydrates and heavy oil. The move is likely to increase oil production in the country by 120 million tonnes and gas by 52 billion cubic meters by 2040. These factors will attract higher investments and better technological advancements in oil & gas sector.
- There are three major types of EOR, which include thermal recovery; gas injection; and chemical flooding.
- Thermal recovery provides heat to the reservoir for reducing the oil's viscosity. For instance, steam is inserted in the reservoir, thereby thinning the oil and increasing its ability to flow.
- Gas injection is used as a tertiary method for recovery. The method involves injecting natural gas, carbon dioxide or nitrogen into the reservoir. The gas injected can expand and push gases through the reservoir, or dissolve within the oil, thereby, decreasing viscosity and increasing flow.
- Chemical injection method introduces polymers into the reservoir for increasing waterflooding efficiency or for increasing surfactants efficiency, that helps in lowering the surface tension preventing oil flow through the reservoir.

## List of Enhanced Recovery Techniques

Tertiary Recovery Methods used for EOR	
Thermal	• Hot Water Injection
	• Cyclic Steam (CSS)
	• Steam Flooding
	• In-situ Combustion
Chemical Flooding	• Polymer Flooding
	• Alkali Flooding
	• Surfactant Flooding
	• Alkali Surfactant Flooding
	• Alkali + Surfactant + Polymer (ASP) Flooding
Miscible Gas Flooding/Injection	• CO <sub>2</sub> Injection
	• Flue Gas Injection
	• Nitrogen Injection
	• Hydrocarbon Gas Injection
	• CO <sub>2</sub> + Nitrogen + Hydrocarbon Gas Injection + Flue gas (any combination)
Others	• WAG (Miscible)
	• Foam Assisted WAG
	• Simultaneous WAG (Miscible)
	• Foam Injection
	• Microbial Flooding
	• Acoustic Technique
	• Electromagnetic Technique
	• Injection of Chemicals that generate tremendous heat and gas in-situ
	• Low Salinity Water injection
	• CO <sub>2</sub> injection (Immiscible)

### Tertiary Recovery Methods used for EGR (Enhanced Gas Recovery)

**Nitrogen injection**

**CO<sub>2</sub> injection**

**Any other Inert Gas injection (other than Nitrogen or CO<sub>2</sub>)**

**De-watering Techniques**

The above techniques can be used alone or deployed in combination.



Source: Ministry of Petroleum & Natural Gas

## EOR Policy

In September 2018, the Ministry of Petroleum & Natural Gas sanctioned a policy framework to promote and incentivize Enhanced Oil Recovery (EOR), Improved Oil Recovery (IOR), and Unconventional Hydrocarbon (UHC) production. The policy would entitle operators to a 50% reduction in oil industry development (OID) cess and a 75% royalty discount for incremental gas production.

## EOR Running Projects in India (Partial List)

Operator	Project Name	Approved Cost (USD Million)	Oil Gain (MMT)	Gas (BCM)	Physical Progress % (As on March 2019)
ONGC	MHS Redevelopment Ph-III	872.12	7.5	3.9	91%
ONGC	Neelam Redevelopment Plan	405.09	2.8	4.8	80%
ONGC	Redevelopment of Santhal Field	167.12	3.4	-	33%

Source: ONGC

Operator	Project Name	Approved Cost (USD Million)	Oil Production Capacity (BOPD) by 2025	Gas Production Capacity (mscfd) by 2025	Expected Completion
Cairn Oil and Gas	Mangala-Bhagyam-Aishwarya (MBA) fields	USD 5,316.90	0.5 Million	750 Million	2024-2025

Source: Company Press Release



## Policy Framework

### Policy Framework to Promote and Incentivize Enhanced Recovery Methods for Oil and Gas:

- The Government of India provides fiscal incentives to encourage adoption of Enhanced Recovery (ER), Improved Recovery (IR) and Unconventional Hydrocarbon (UHC) production methods.
- Enhanced recovery methods to increase the production of oil and gas include Enhanced Oil Recovery (EOR) and Enhanced Gas Recovery (EGR).



#### Political:

- Promotion of state-of-the-art technology to increase economically viable domestic production.

#### Economical:

- Government aid provided to NOC in India, such as ONGC
- Unstable Oil & Gas Prices

## PEST Analysis

#### Social:

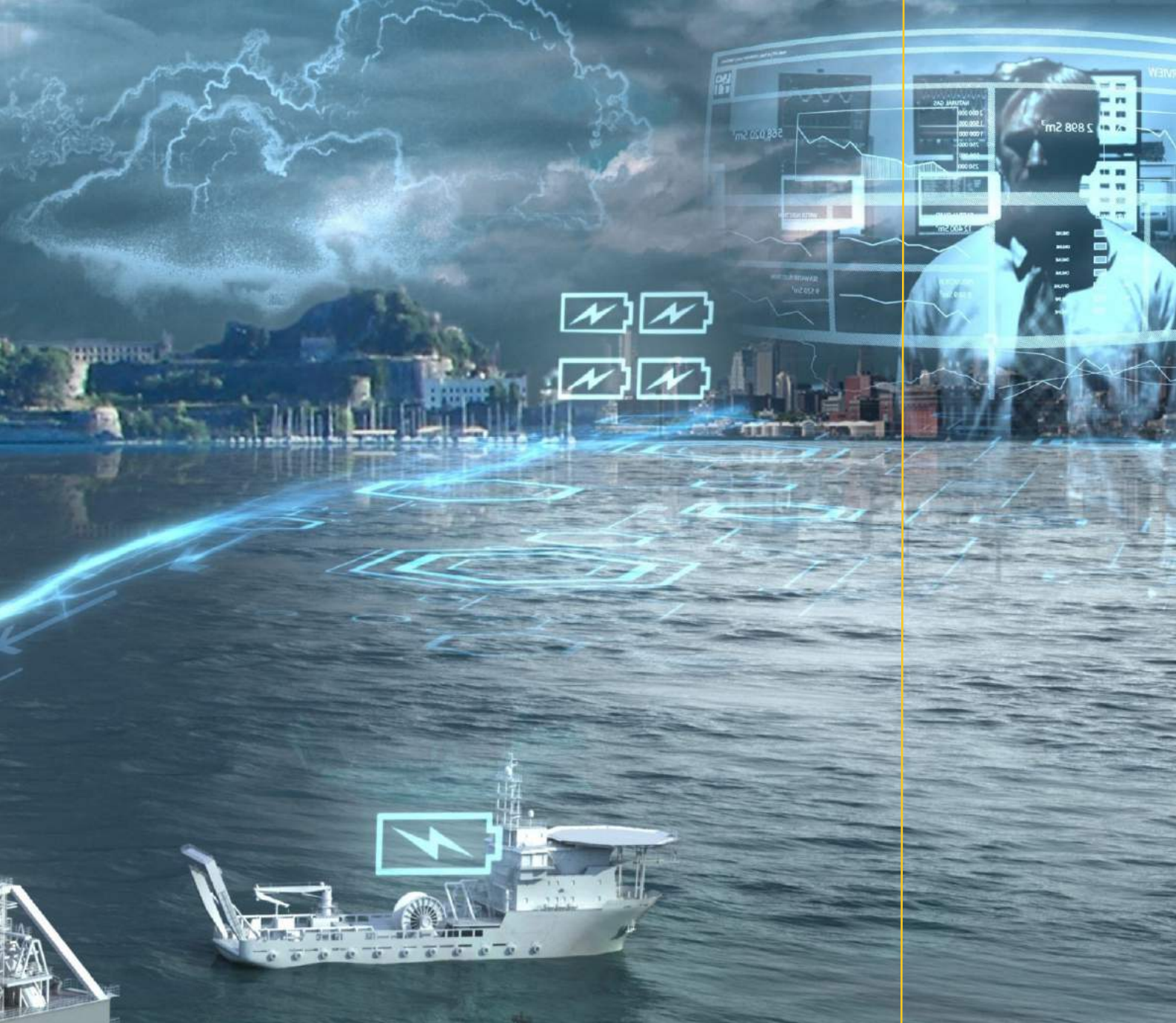
- Developing Economy
- Growing GDP
- Increasing Disposable Income/ Per Capita Income

#### Technological:

- High Technology requirement pushing Outsourcing/ partnership agreement
- IoT & Digitalization picking up pace.



# India Digitalization of Oil & Gas Operations



- Digitalization is gaining traction in oil & gas industry in India. Large as well as small independent operators are implementing new digital solutions in areas such as geological surveying, drilling and refining. The outcome is significant efficiency gains and cost savings. Industrial Internet of Things, Digital Oilfield, Machine Learning, Block-chain & Analytics are some of the key terms describing digital transformation in oil & gas sector in India. Integrated approach to digital transformation enables an organization to gain performance visibility and witness growth.
- India is aiming to reduce its dependency on oil imports from over 80% in 2017 to 67% by 2022, and therefore it has launched several initiatives and investment plans for domestic exploration and development. In December 2018, the government announced its plan to make investment for the expansion of natural gas pipeline network in India. Moreover, digital solutions including big data analytics, cloud computing, automation, etc., are further providing vast opportunities to oil & gas sector in the country.

# Digital Transformation Trends



## **Internet of Things (IoT)**

IoT provides information by collaborating with the sensors, communication devices and analytical software for generating valuable outputs. Sensors are used by the organization for tracking their assets via control rooms. The data received from connected IoT devices provide real-time insights, for planning maintenance and optimizing operations.

## **Big Data & Analytics:**

Big data analytics is used for analyzing large unstructured data for gathering informative insights and trends. Many industries including oil & gas are now shifting from the conventional methods and have incorporated data-driven approaches for reaching out to better opportunities.

## **Digital Reality:**

Rising smartphone usage and penetration of internet over mobile devices, has allowed the usage of data-intensive mobile applications in remote locations, where for oil & gas refineries are generally located.

## **Seismic Imaging:**

Seismic imaging techniques are used by players operating in the upstream sector for understanding the geology of subsurface and locating oil & gas reserves. Various technological advancements in the field of geological survey has allowed the players to reduce the bottlenecks in exploratory and logistical operations.

## **Artificial Intelligence (AI) & Machine Learning (ML):**

AI is driving changes in the major areas of the upstream sector such as oil & gas reserves locations, drilling performance in real-time, and production & exploration lifecycle. AI and machine learning along with seismic survey allow accurate detection and visualization of the oil & gas reserves.

## **Mobile Solutions:**

On account of Government initiatives, like Digital India program and Make in India, industries are shifting towards mobile technology and automation. Improved employee health & safety at work, increased production levels, reduced operational costs and environmental risks are the major benefits of automation and mobile technology.

## **UAV/Drones:**

UAV/drones efficiently perform a variety of tasks which range from monitoring accidents like fires, leakages, intrusion to carrying out inspections.



# How Indian Firms Can Become More Digital

- Adoption of digitalization and its usage are unexpectedly low in India oil & gas sector, even though the country has an oil production of more than 36 million metric tons and a wide network of around 10,299 km of crude oil pipeline in the country, as of 2018.
- Digitalization has created disruption and challenged the traditional operations in the oil & gas industry. In addition, the amount of interest and potential in 'Digitalization' are huge, along with an equal amount of risks.
- Although digital applications like IoT, drones, and seismic imaging, etc., are prominent in the Indian oil & gas industry, other applications like Machine Learning and AI are yet to gain momentum in oil & gas industry. In terms of digitalization, India oil & gas market is still at a nascent stage and emerging rapidly when compared to global oil & gas market. The demand for energy in India is expected to reach to more than 1,500 Mtoe by 2035 from around 700 Mtoe in 2016. As the demand is growing, improvement in operational efficiencies and reduction in overall cost become crucial factors. In this competitive scenario, digital solutions can offer a bulk of opportunities for the market players.

## The Path Forward

- With the emergence of digitalization in India, oil & gas industry should focus on transforming the prevailing processes through digitalization.
- New technological achievements, such as 3D printing and cognitive computing have been introduced to the oil & gas industry. Such technological advancements would help in the development of digital solutions suitable for India oil & gas industry.
- Moreover, for leveraging and incorporating several digital solutions, framework digitalization should be done.
- All the aforementioned factors are likely to provide companies a better opportunity to increase productivity, improve efficiency, and cost optimization.

## Case Studies

- Indian Oil Corporation Ltd., spends about USD1,000 per km annually for maintaining its 13,000 km pipeline network. The company started a scheme for promoting innovation and new technology in the oil & gas sector. Through such initiatives the company aims to provide a platform to commercialize the new ideas.
- State-run Bharat Petroleum has moved its attention towards surveillance drones for its pipelines. The company has shifted its focus towards underwater drone for gathering data on deep sea.
- Further, owing to fluctuation in oil price per barrel, companies are focusing on optimizing their resources. The companies are shifting from conventional methods to digitalization, which is likely to help them review their business approach and adopt a smarter business model.
- Companies should collaborate with digital experts for creating a long-term vision that may provide better solutions and help them achieve their business objectives.

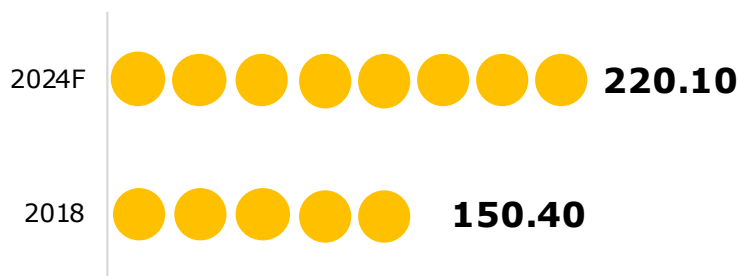
# India Market Insights



# India Deepwater Offshore Drilling Market Outlook

## India Deepwater Offshore Drilling Market Size, By Value, 2018 & 2024F (USD Million)

**CAGR: 5.45%**  
(2019E-2024F)

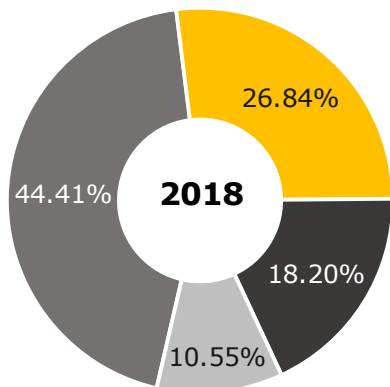


Source: TechSci Research

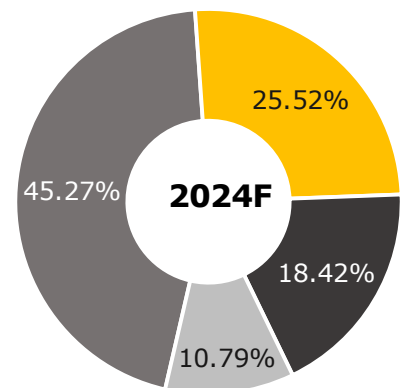
Deepwater offshore drilling includes searching for potential deep sea underwater crude oil and natural gas fields, drilling exploratory wells, and subsequently drilling and operating the wells that recover and bring the crude oil or raw natural gas to the surface.



## India Deepwater Offshore Drilling Market Share, By Services, By Value, 2018 & 2024F



- Contract Drilling
- Directional Drilling
- Logging While Drilling
- Measurement While Drilling



Source: TechSci Research

# India Deepwater Rigs Market Outlook

- As of April 2019, eight deepwater drilling rigs are operational in India.
- The market for deepwater drilling rigs is very concentrated. Moreover, it takes a longer lead time for purchasing new equipment.
- Oil & gas drilling costs can account for more than 60% of the total capital expenditures.

## India Rig Count, By Unit, April 2018-April 2019

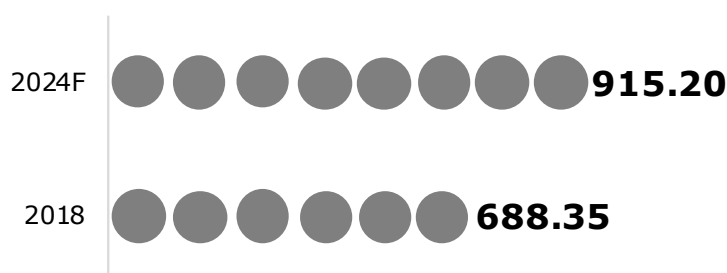
	Land	Offshore	Oil	Gas
Apr-18	84	28	91	21
May-18	84	30	94	20
Jun-18	85	31	98	18
Jul-18	85	34	101	18
Aug-18	85	34	101	18
Sep-18	85	35	102	18
Oct-18	85	35	102	18
Nov-18	85	35	102	18
Dec-18	85	39	102	22
Jan-19	85	38	101	22
Feb-19	85	38	101	22
Mar-19	85	38	101	22
Apr-19	85	36	100	21

Source: Baker Hughes

# India Enhanced Oil Recovery Market Outlook

## India Enhanced Oil Recovery Market Size, By Value, 2018 & 2024F (USD Million)

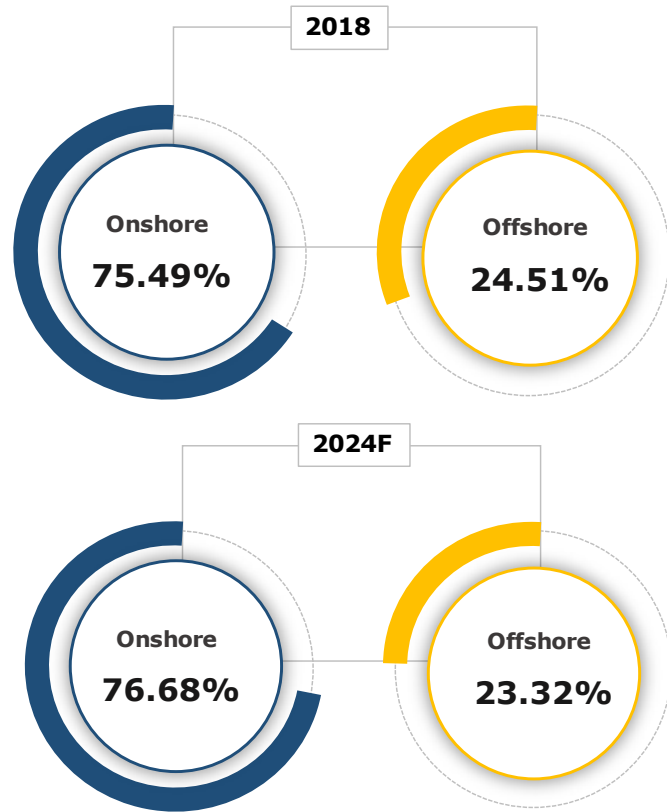
**CAGR: 4.74%**  
(2019E-2024F)



Source: TechSci Research

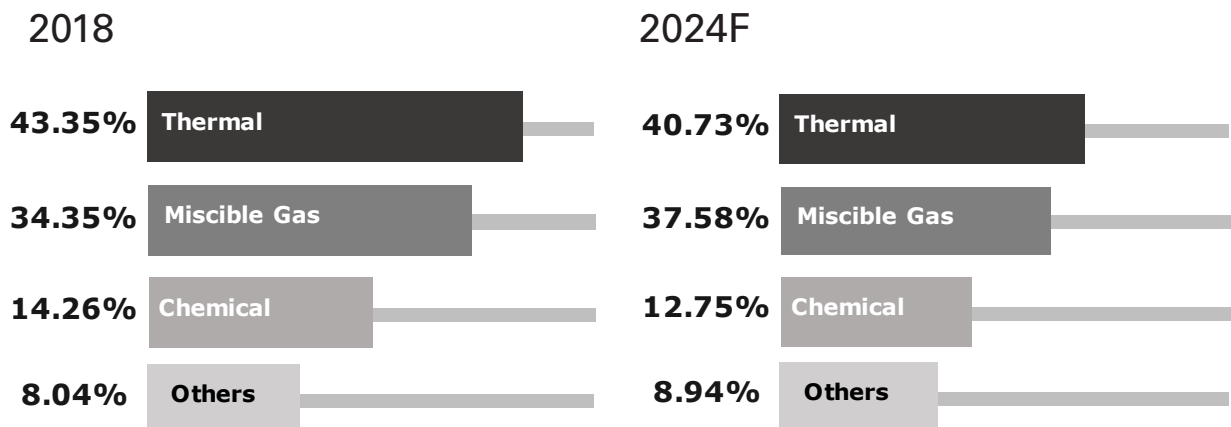
Indian State-owned company, ONGC, is carrying out major enhanced oil recovery processes in Mumbai Offshore regions. Moreover, Cairn India which is a field operator of Rajasthan Block, has also initiated enhanced oil recovery project with investment worth USD760 million, as of 2018.

### India Enhanced Oil Recovery Market Share, By Application, By Value, 2018 & 2024F



Source: TechSci Research

### India Enhanced Oil Recovery Market Share, By Technology, By Value, 2018 & 2024F



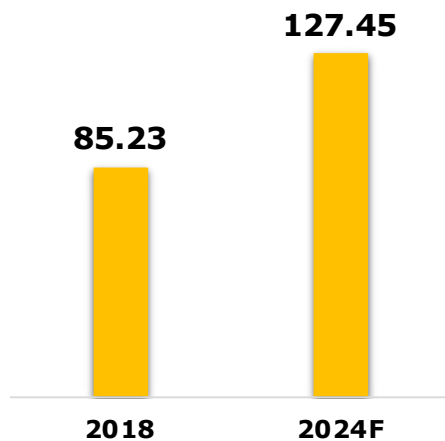
Others include Microbial, Electromagnetic, etc.

Source: TechSci Research

# India Oil and Gas Production Monitoring Software Market Outlook

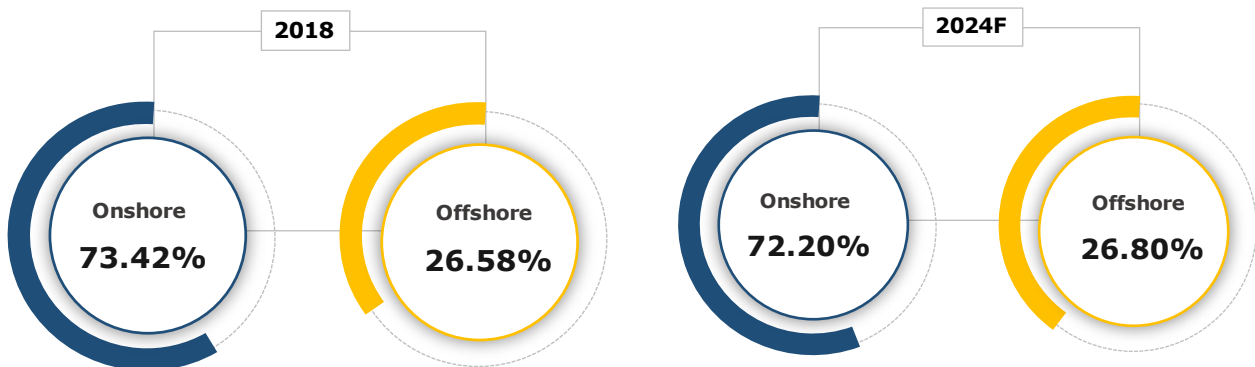
India Oil & Gas Production Monitoring Software Market Size, By Value, 2018 & 2024F (USD Million)

**CAGR: 7.30%**  
(2019E-2024F)



Source: TechSci Research

India Oil & Gas Production Monitoring Software Market Share, By Application, By Value, 2018 & 2024F



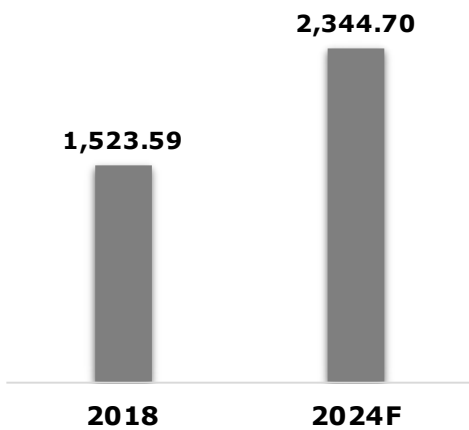
Source: TechSci Research

Production monitoring software helps in providing predictive maintenance and optimize upstream operations. Reservoir modelling, well-design optimization, artificial-lift optimization, downhole monitoring, connected rigs and predictive analytics are used during upstream operations. The combined impact of these methods are significant in decreasing operational costs and increasing the production.

# India Oilfield Services Market Outlook

## India Oilfield Services Market Size, By Value, 2018 & 2024F (USD Million)

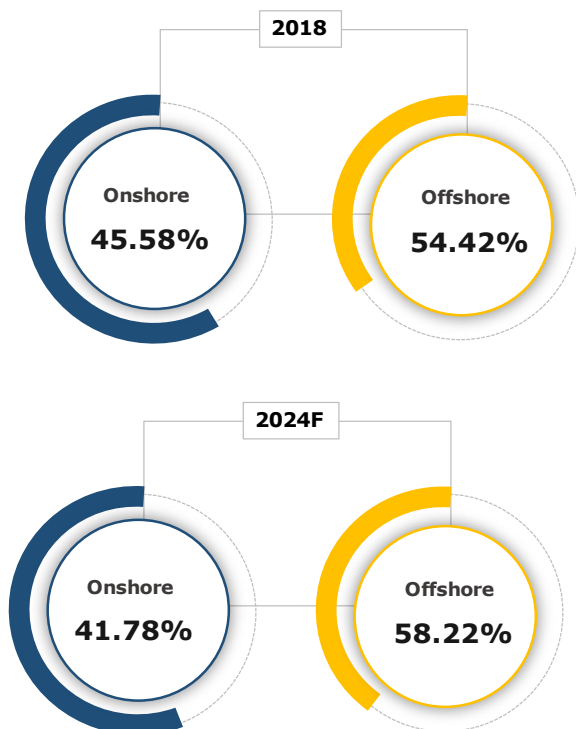
**CAGR: 7.24%**  
(2019E-2024F)



Source: TechSci Research

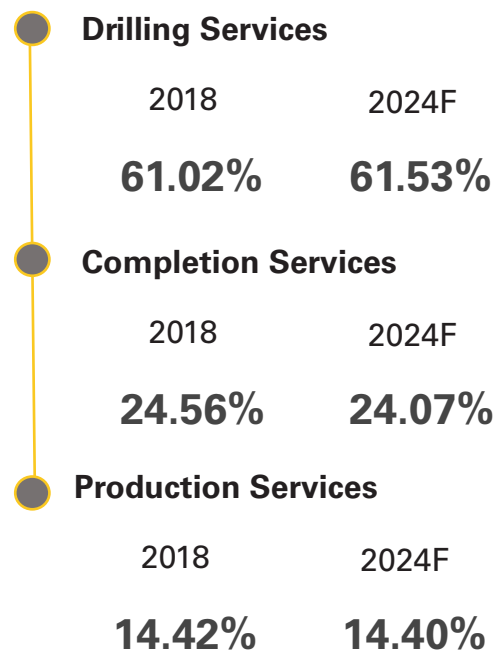
- Under the oilfield services, drilling services comprise direction drilling services, hydro fracturing services, etc.
- Drilling services accounts for the largest revenue generation in India oilfield services market.
- Drilling services play a very crucial role as they help in directional drilling process and also in drilling the same wells at multiple angles thereby maximizing the output of the well.

## India Oilfield Services Market Share, By Application, By Value, 2018 & 2024F



Source: TechSci Research

## India Enhanced Oil Recovery Market Share, By Service Type, By Value, 2018 & 2024F



Source: TechSci Research

## WE ARE TECHSCI RESEARCH



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## ABOUT "INDIA DRILLING & EXPLORATION CONFERENCE (IDEC)"



India Drilling & Exploration Conference (IDEC) was launched in 2008 as a platform to bring & share latest trends, developments & future of the oil & gas industry. Since its inception the event has seen participation from more than 180 companies from 35 countries. Running successfully, IDEC has become one of the world's leading platforms for energy experts to exchange knowledge and has become our flagship event in the industry. IDEC is one of the leading regional events dedicated to exploring the potential of offshore & onshore oil & gas sectors in India.

This is a unique conference that brings national oil companies, oil regulators, international oil companies, equipment manufacturers, oilfield service providers, financial institutions together to share knowledge, exchange ideas, gain insight, showcase expertise and enhance business relationships.

The conference focuses on technological advancements, market analysis, methodologies for production optimization from brown fields, Asset Integrity, Subsea development, Deepwater development, Well Integrity, Reservoir management & many such topics for ensuring sustainability and growth. IDEC offers participants the opportunity to hear industry's latest achievements and technologies while networking with key figures from the region's oil and gas sector. This is the only event that provides comprehensive analysis of the key issues affecting the regional oil & gas industry.

Welcome to the gateway of Indian Oil & Gas Industry.

[www.idecindia.co.in](http://www.idecindia.co.in)



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We are an innovative company engaged in research based work & producing international oil and gas conferences & exhibition with a mission to promote collaborative approach with other institutions around the world for the development of rapidly growing global oil and gas industry. We are a leading research firm, conference producers & event organizers in India, Middle East, North Africa & Southeast Asia guided by best-in-class oil and gas professionals that help produce technical program for excellence. We also aspire to give a new dimension to the world of conference organizing in terms of technical knowledge sharing, information services, product showcasing and networking.

# Notes

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# Notes

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