1 ENERGY AND GAS SECTOR REVIEW

1.1 Background

Energy is a key resource for the development of any country. The GDP of India on nominal terms is $2.45 trillion, which makes it the sixth largest economy of the world. However, India ranks third in terms of purchasing power parity with a GDP of $9.49 trillion (IMF, April, 2017). India, home to 18% of the world population, (1.3 billion people) uses merely 5.3% (year 2014) of the world’s primary energy. India has a low per capita consumption of 0.62 toe as against the world average of 1.90 toe (IEA, India Energy Outlook, 2015). The thirteenth plan document of government of India envisages more than doubling of the per capita energy consumption in India to 1.2 toe by 2030, which would, further add pressure on the energy availability. However as per latest estimates the per capita consumption has declined to circa 0.56 toe, demonstrating the efforts put in by government are either ineffective or inadequate.

Furthermore, the energy demand in India is targeted to grow at 6% with the targeted GDP growth rate of 9% (GoI M., 12th -13th five year plan, 2013). In the year 2016-17, the government spent $70 billion (Rs 4.70 lakh crore) to import 213 million metric tonnes (MMT) of oil. This oil import bill is estimated to increase to $80 billion (Rs 5.23 lakh crore) to import 213 MMT of oil the in the financial year 2017-18 (PPAC, 2017, Nov). Energy security is a key strategic priority for India. Securing access to adequate and affordable sources of energy is fundamental to supporting India’s economic growth aspirations. (Kelkar, 2014). To achieve this, domestic production of oil & gas needs to increase, to reduce import dependence by 10% (from current, 77% to 67%) by the year 2022. Further, the import dependence needs to be brought down to 50% by the year 2030 (Indian Global Hydrocarbon Summit, 2015).

The challenge, for India is to ensure that, energy is available and accessible to its 1.3 billion people at affordable price, while it meets its obligations on carbon emissions. Different countries have taken different routes for meeting this objective. The route to energy availability and self-sufficiency depends upon factors like; availability of
energy sources within the country along with the infrastructure to transport such energy, import options, stage of its economic development, choice of fuel mix, and depth of development of its core institutions required for governing such development

Thus, the challenge for India is dual, making energy available at affordable price and meeting its emission targets (COP21, INDC). In this backdrop, India needs to explore clean fuel option of increasing share of gas in the energy mix along with renewables. This cannot happen without a well-developed strategy and roadmap.

The primary energy consumption of the world in the year 2016 was 13,276 Mtoe. Asia Pacific consumed around 5579 Mtoe of which India’s contribution was 723.9 Mtoe.

![World Primary energy consumption (Mtoe) & India energy mix](image)

Top 5 nations (China, US, India, Russia and Japan) consumed 54% of the total primary energy consumed in the world. India retained its position as the third largest primary energy consumer in the world in the year 2016 (after China and US) accounting for 5.4% of the world consumption. In the year 2016, oil & coal constituted 86.3% (29.4% oil & 56.9% coal) of the India’s primary energy consumption. (BP, 2017).
Historically, oil and coal have dominated the world as the main source of energy. However, the past few decades has seen a quantum jump in development of gas and renewables as an energy resource. Gas being considered a clean fuel, has increased in importance, in the energy map of the world. Worldwide, the consumption of gas has increased fivefold in the last 50 years, increasing from a meagre 644 Billion cubic meters (BCM) in 1965 to 3543 BCM in 2016. India has a higher coal usage in the energy mix compared to the world average and much lower gas in the energy mix (figure 2). (BP, 2017).
India has 0.7% (43.3 TCF) of the proven gas reserves of the world. The current production of gas in India is just 0.8% of the total world production at around 27.6 BCM while it consumes around 50.1 BCM of gas which is circa 1.4% of the total world consumption (BP, 2017). Even with imported gas, the share of gas in the Indian energy basket has always been below 10% in last few years. In comparison, the developed world markets like United States, United Kingdom, Japan and Australia have 15-35% of the gas in the total energy mix (Figure 3) while the world average has been a healthy 24.1%. There has been a steady decline in the share of gas in India while the share of coal has increased. The decline in share of gas was primarily due to lower availability of cheaper domestic gas, which in turn as driven by lack of interest in the oil & gas acreages in India. Even with increase in capacity of the import terminals due to expansion of existing terminals and commissioning of new terminals, gas could not increase its share due to unavailability of transmission pipeline to connect markets (Kochi terminal operating at 15% capacity) and unaffordable LNG prices.

The gas production in India has always lagged the consumption. The deficit has been in the range of 20-45% in the last 10 years (figure 4) with the gap met by imported LNG. India (6.5%) is the fourth largest importer of LNG after Japan (31.3%), South Korea (12.7%) and China (9.9%). Asia remained the key market for LNG trade consuming circa 70% of the world LNG supply while Qatar retained its position as the largest supplier contributing 30.1% of the world LNG (BP, 2017). The unmet demand for gas is very high in India, but such demand is price sensitive and cannot afford high

![Figure 3: Comparison of Gas in energy mix - Developed world Vs India](image-url)
cost of imported gas and hence the demand is met by cheaper and higher polluting fuels like coal & oil.

The growth rate of the Indian oil & gas industry in the last five years has been negative. Table 1 shows the growth rate of Indian oil & gas sector in last five years (DIPP, 2016). The negative growth rate, even after steep decline in years 2012-13 and 2013-14 is discomforting. Also, the foreign direct investment in the oil & gas sector in last 16 years, from April 2000 to September 2016 was only USD 6.7 billion. This is only 2.6% of the total FDI received in the country, during this sixteen year period. (DIPP, 2016)

Table 1: Growth of oil & Gas Sector in last 5 years

<table>
<thead>
<tr>
<th>Financial Year</th>
<th>Oil</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-13</td>
<td>-0.6%</td>
<td>-14.5%</td>
</tr>
<tr>
<td>2013-14</td>
<td>-0.2%</td>
<td>-13.0%</td>
</tr>
<tr>
<td>2014-15</td>
<td>-0.9%</td>
<td>-4.9%</td>
</tr>
<tr>
<td>2015-16</td>
<td>-1.4%</td>
<td>-4.2%</td>
</tr>
<tr>
<td>2016-17 (Until Dec)</td>
<td>-3.2%</td>
<td>-3.3%</td>
</tr>
</tbody>
</table>

The decline in gas production continues although at a slower pace (refer Table 1) demonstrating that the policy measures of government of India (GoI) is not able to reverse this trend. This despite the fact, that GoI declared in 2013 that the share of gas in the primary energy mix is projected to grow from current 8.7% to at least 20% by the year 2030 (GoI M. , 12th -13th five year plan, 2013).

India would be the driver of world energy growth in future due to a) Rising Income and urban population; b) Need for large infrastructure development and c) Make in India push by the current government. (IEA, Key world energy statistics, 2015) (BP, 2017) (GoI M. , 12th -13th five year plan, 2013). GoI has envisaged that natural gas would have to play a bigger role in the Indian energy mix (20 percent target by 2030) and would be a factor in the economic growth of the country.
The total investment required in the oil & gas sector in the 12th five year plan was USD 75 billion (GoI M., 12th -13th five year plan, 2013). The investment required in the gas sector alone is to the tune of USD 38-45 billion if share of gas require to go up from current 5-6% to even a modest 15% (ibef, 2017). To achieve this, government of India needs to attract investment in the gas sector which is possible by sending right price signals which can be achieved only through development of a vibrant, liquid, transparent and an efficient gas market.

(Mehrotra, Gupta, & Pandey, Oct, 2015)

1.2 History of Indian oil & Gas market

The start of the development in the Indian oil and gas sector started in the year 1859. The evolution of the Industry can be divided into five distinct phases for ease of understanding.

a) Pre- Independence Era (1866-1946)
b) Nomination Era (1947-1978)
c) Pre-NELP Exploration era (1979-1990)
d) Pre-NELP Field round era (1991-1996)
e) NELP era (1997 - 2105)
f) HELP era (2016- until date)
a) Pre-Independence era (1866-1946)

The history of Indian oil & gas industry started in the year 1866. Edwin Drake, in the year 1859 drilled the world’s first oil well in Pennsylvania, USA. In the year 1866, Stewart and Company, drilled 102 feet well in upper Assam, however they failed to establish satisfactory production. But, they were successful in their second attempt on March 26, 1867 when oil was stuck at 118 feet in Margherita (Makum) area of Upper Assam, which was also the Asia’s first mechanically drilled well.

The first commercially successful discovery was registered in London in September 1889. This was for a production of 200 gallons per day for a well dug in Digboi Assam at a depth of 662 feet. The company to achieve this was Assam Railways and Trading company and they later drilled 10 more wells in Digboi, Assam. Assam oil company formed in 1889 by the same company and later took over the oil interests (Digboi and Makum concessions) of Assam Railways and Trading company.

In the year 1911, UK based Burma Oil company (BOC), acquired the petroleum interest of Assam oil company. The first ever license provided in India was a geophysical license by the Assam government to British Petroleum and Shell when they put forward a proposal for carrying out survey of all important plains of India. (DGH, 2014-15).

No gas pipeline was built during this period. Gas was basically flared.

b) Nomination Era (1947-1978)

Post-independence, the government of India provided top priority to the development of oil in the industrial policy of 1948. In the year 1953, the first oil discovery in independent India was done by Assam oil company in the Upper Assam area. The government then felt the need of a directorate to focus on the exploration activities. Keeping this in mind, Oil and Natural Gas Directorate (ONGD) was formed in the year 1955. This was later changed and named as Oil and Natural gas commission (ONGC), in the year 1956 which even continues to explore Indian basin even today. Within a year of being formed ONGC discovered oil in Cambay and many more discoveries
were made thereafter. Meanwhile Oil India Private Limited (OIL) was formed in 1959. This company was owned by Burma oil company (2/3rd) and government of India (1/3rd), which later become equal partners in the JV Company. It was in this year (1959) that OIL started gas supply in India.

Until now all exploration was onshore, however in the year 1962, ONGC, initiated the exploration in the offshore basins of Gulf of Cambay and western India. ONGC started gas supply in India in the year 1964. This led to the India’s biggest commercial discovery in Bombay High in the year 1972-73. First offshore production from Bombay high was in the year 1974. This was very encouraging for both ONGC and OIL which later drilled more than 3000 wells in India.

ONGC and OIL which were the pioneers of exploration in India dominated the sector until the year 1970. Most of the licenses were awarded to these two companies on nomination basis by the government of India. (DGH, 2014-15).

Gas produced during this phase was mostly used locally, in absence of cross country pipelines.

c) Pre-National Exploration Licensing Policy (NELP) exploration Era (1979-90)

In the year 1979, to meet the future commitment and challenges of the Indian oil & gas exploration sector, the government of India took the strategic step of offering 17 offshore and 15 onshore blocks to foreign companies through bidding in order to attract foreign capital, investment and technology. Total 3 rounds under this were conducted from the year 1980 to 1986. These rounds known as Pre-NELP were not very successful, with very limited participation. The fourth round was conducted in 1990, where it was a competitive bidding in which both Indian and foreign companies participated.

The gas produce until this stage was used locally until GAIL was formed in 1984 to set up gas transportation infrastructure. The first high pressure transportation pipeline,
the Hazira-Vijapur-Jagdishpur (HVJ) was fully operational in the year 1991. The price of gas, for the fields under this era was determined on a cost plus basis, known as Administered price mechanism ("APM"). North East of India was provided a discount of 40% on the APM price so determined (DGH, 2014-15).


Most of the liberalization in the Indian economy took place in the year 1991. Licensing requirement for most of the core sectors were removed during this year, including the petroleum sector (also see liberalization in section 4).

As an outcome of this liberalization, following key changes happened

a) An independent regulatory body was conceived in the year 1993. This was essential to send signals to the market that the decisions will be made by an independent regulator. Also, the government felt that they needed a body which has expertise in oil and gas exploration and can oversee development program for the concessions granted. This body would also protect the nations interest. Therefore, on August 8, 1993, Director General of Hydrocarbons (DGH) was formed, as an arm of the petroleum ministry. However, being an arm of the ministry, I do not consider the same as totally independent.

b) ONGC was reorganized under the companies Act 1956 to Oil and Natural gas corporation limited.

c) The government of India offered 126 blocks in five rounds of bidding between the years 1994-1996.

Due to the above measures, foreign companies participated in the bidding rounds and contracts were awarded to them. The foreign companies included Shell, Enron, Amoco and Occidental.

Price of gas for such fields was decided based on the formula provided in the PSC, which is primarily linked to oil indices.

The demand for oil was continuously growing post liberalization of Indian economy in the 1990’s. However, to increase production, India needed to attract significant risk capital, knowledge on geology of various kinds of basins, best of class management ideas and practices, latest innovations in the oil exploration and production and state of art technologies. This was available with the big international oil and gas companies. The capital was also available in India but with large corporations.

To meet these requirement, government of India came out with then new national exploration and licensing policy (NELP), under which international competitive bidding would be carried out and the winning bidders would be granted a license and entered into with a production sharing contract (PSC). The PSC was awarded based on the revenue sharing principles as were the bids.

The NELP bidding rounds were approved by the government of India in the year 1997 and became operational in February 1999. Under the NELP rounds, the government of India has come out with nine rounds of bidding and have awarded 254 exploration blocks to Indian and foreign companies.

In the year 2004, the first regas terminal was operational in the western part of India, with first spot cargo reaching India shores in 2006. With the Reliance Industries declaring large finds in KGD6 block in 2002-06, the prospects of large gas being available within India was looking good. The first CBM discovery took place in 2007 and D6 started production in 2009 post commissioning of the East – West transmission pipeline. (DGH, 2014-15)

The Petroleum and Natural Gas Regulatory Board (PNGRB) was constituted in 2006, starting the phase of liberalisation in midstream and downstream sector. The downstream regulator started international competitive bidding for setting up transmission line and granting city gas licenses, mandated plain vanilla third part open access for transmission pipeline and provided for accounting separation of
transmission and marketing business. These measures took place from 2008 till 2012.

The price under the NELP regime is based on the PSC signed between government and the contractor, which envisaged that the contractor follows a price discovery process, on an arm’s-length basis for such price discovery, with the approval from the government. However, government has, since determined the price of such gas through devising of formula, with linkage to various world indices to determine the price of gas at the well head. The current formulae devised as part of a report by Dr Vijay Kelkar, recommended that the price of gas be determined through volume weighted linkages to Henry Hub, National Balancing Point, Alberta and Russian Hubs (Kelkar, 2014). This changed the earlier formulae set up, as part of Rangarajan report (Dr Rangarajan, Report of the committee on PSC mechanism in petroleum Industry, Dec, 2012), dropping Japan LNG and local LNG import indices.

**Figure 5 : History of oil & gas sector**

Dr Vijay Kelkar, recommended that the price of gas be determined through volume weighted linkages to Henry Hub, National Balancing Point, Alberta and Russian Hubs (Kelkar, 2014). This changed the earlier formulae set up, as part of Rangarajan report (Dr Rangarajan, Report of the committee on PSC mechanism in petroleum Industry, Dec, 2012), dropping Japan LNG and local LNG import indices.
f) Hydrocarbon Exploration Licensing Policy (HELP) Era (2016 until date)

The Indian Oil & Gas exploration sector has been mired with numerous issues with contractors granted license under the nine rounds of NELP. The government set up two committees first one headed by Dr Rangaranjan and the second one headed by Dr Kelkar to come out with recommendations to resolve issues and improve investment in the exploration and production sector.

Based on the recommendations of the two committees, on March 10, 2016, The Indian federal government approved the New Hydrocarbon exploration licensing (HELP) regime. The key difference between NELP and HELP policy was the mechanism of sharing profits by the contractor with the government. While the NELP production sharing contracts allowed complete recovery of costs incurred, before the profits are required to be shared with the government, which mostly were based on investment multiples quoted in the bid round, the HELP, production sharing contracts envisages upfront sharing of profits through a share of revenue which would be the bidding parameter. This mechanism although reduces administrative hurdles, but has shifted the exploration risk to contractor, which may not be very popular with the investors.

The success of HELP is yet to be tested, but the opinion is already divided that government by passing the risk to the investors will be unable to meet its target for increasing gas production in India. A more detailed discussion is provided on new hydrocarbon policies and HELP in the next section.

The history of oil & gas sector is depicted in Figure 5.

1.3 New policy initiatives in oil & gas sector since 2015

The year 2015 saw many changes in the Indian oil and gas sector. This was necessitated by the fact that the blocks awarded under the NELP rounds did not evoke the desired response from the international oil and gas majors. Also, most of the blocks which were producing and got awarded under various stages of pre-NELP and NELP rounds are surrounded with controversy. Most of the private contractors developing and operating these blocks are under various stages of litigation with the government,
due to variety of disputes arising out of the interpretation of the production sharing contract. Also mired into controversy is the control of gas price, by the government, at the well head. This move further reduced the incentives for the investors to bring in risk capital in the sector.

As explained earlier, the Government of India set up two committees to address the challenges faced in the production sharing contract (PSC) regime. The first committee was chaired by Dr Rangarajan and he released his report in December 2012. The second committee was formed under Dr Kelkar and he released his report in September 2014. While Dr Rangarajan recommended a need to move away from the existing PSC regime of Profit share to Revenue share (RSC model), Dr Kelkar recommended continuation of current regime with curtailment of powers of the managing committee and the government along with developing mechanism within Profit share model to increase government take.

Let’s us now discuss the recommendation of both the committees in detail since the policy measures taken by the government has elements taken from both the recommendations.

**The key recommendations of the Dr Rangarajan Committee** (Dr Rangarajan, Report of the committee on PSC mechanism in petroleum Industry, Dec, 2012) are

- Shift to Revenue sharing (RSC) model since Profit share model allows all costs recovery before arriving at profit share. To delay profit share contractors have been alleged to indulge in gold plating of costs. Most arbitration under current regime is linked with cost recovery limits and Investment multiples.
- Shift away from the cost recovery method would reduce delay in approvals of the management committee.
- Biding parameters for minimum work program and fiscal package should remain the same.
- Limit role of managing committee and the government to monitor and control technical aspects.
• Allow 10 year tax holiday for ultra-deep water blocks due to the higher risk associated with such blocks.

• Contractors should be allowed to carry out exploration throughout the mining lease period, which will help enhance recovery.

• RSC model being a new fiscal regime should be reviewed every 5 years

• Dr Rangarajan recommended gas prices to be based on volume weighted average price of a set of indices like Henry Hub, UK Balancing Point, netback of LNG prices to Japan and netback of India’s contracted LNG.

The key Recommendations of the Dr Kelkar committee (Kelkar, 2014) are

• The main objective for the government should be to increase production by attracting investments in oil and gas industry, which will help to enhance security of supply.

• Provide stability of contractual and fiscal terms to the contractors which are a must for attracting investments.

• Dr Kelkar has actually criticized revenue share model due to its inherent misaligned risk-return structure.

• The report by Dr Kelkar proposed the following fiscal regimes
  1. Existing PSC with modified contract administration
  2. PSC model with supernormal profit tax

Kelkar committee believed that the above models can achieve the government target of higher take while still maintaining the risk reward balance.

• The kelkar report strongly recommended introduction of open acreage licensing policy (OLAP) by the government as soon as all preparations are done, but the same needs to be expedited.

• Provision of flexibility in completion of minimum work program.

• Primary responsibility of the managing committee and the DGH should be to ensure management of oil and gas resources.

• Managing committee (MC) and DGH should not get involved in checking and auditing costs and fiscal oversight. Self-certification by operating committee should be sufficient for assessment of profit petroleum.

• Higher weightage (at least 50%) for technical criteria in the bid.
• Establish model to allow contract extension of the current and future acreages until the end of the economic life of the asset.
• Gas prices were recommended to be linked to volume weighted linkages four hubs i.e. Henry Hub, National Balancing Point, Alberta and Russian Hubs

Based on the recommendation of the Dr Rangarajan and the Dr Kelkar committee, the government came out with many policy changes in the year 2015 and 2016. The key changes are captured below

Policy no # 01 - September 02, 2015 – Policy for Marginal fields (MFP) of ONGC and OIL (GoI M. , 2015)

Under the MFP, 69 oil fields discovered and held by ONGC and OIL will be opened up for competitive bidding with three key changes

• Production sharing contract would be based on revenue share principle instead of profit share basis
• Single license will be provided for all types of hydrocarbons
• Freedom provided to contractor to sell gas at arm’s length prices

Policy no # 02 - March 21, 2016 – India is not bestowed with very large producing acreages. The geological structured don’t seem to be the best. This calls for going deeper for increasing production and hence to attract investments, for such fields (deepwater, ultra deepwater, high temperature high pressure), government decide to provide freedom to market the gas and determine its price.

(GoI M. , Policy, 2016)

The above policy is applicable for all discoveries which are yet to start their commercial production (Jan 1, 2016). However the policy provides a ceiling on gas price to protect interest of consumers

The ceiling price shall be the, lowest of the

a) Fuel oil imported landed price
b) Weighted average import landed price of substitute of fuels (30% x price of coal + 40% x price of fuel oil + 30% x price of naphtha) and

c) LNG imported landed price

The ceiling price will be based on 12 months lagging data, with one quarter lag and calculated once in six months.

In case there is any arbitration going on between government and the contractor on the existing discovery on gas price, the above policy will not be applicable

**Policy no # 03 - March 28, 2016** - India started to award acreages in the 1990’s, some of these where the PSC was signed, the PSC is going to expire in the next few years. To provide a basis for granting any license extension the government came out with the policy to grant extension to private companies

(GoI M., Policy, 2016)

- The policy is applicable for 28 pre-NELP discovered fields
- Provides a framework for non-discriminatory extensions
- The extension would be granted for the balance economic life of the filed or 10 years whichever is more
- The application of extension can be made within 2-6 years before the expiry of the license.
- The time given before expiry will help to make right investment decisions
- The terms of the extension will be altered compared to the original concessions in the following areas
  a) No concessional royalty will be provided
  b) The profit petroleum will be higher by 10% compared to the original contract
- In case the contractor does not opt for extension, the field will either be awarded to the national oil company or take up for re-bidding

**Policy No # 04 - March 30, 2016** - Hydrocarbon Exploration and Licensing Policy (HELP) (GoI M., Policy, 2016)
The salient features of the policy are

1. **Single License** - A single license would be given for both conventional and unconventional resource.

2. The contractor can access the basin database and opt for an exploration block which will then be taken up for bidding without waiting for pre-defined exploration bidding rounds

3. Instead of Profit sharing mechanism, the bidding will take place on basis of highest revenue share

4. The changed bid parameter will help in reducing administrative cost since the regulator will not be required to go into details of cost recovery and hence profitability.

5. Contractors and operators will have more freedom to make day to day decisions.

6. Royalty altered for offshore blocks (refer Table 2)

### Table 2: Royalty under NELP and HELP regimes

<table>
<thead>
<tr>
<th>Blocks</th>
<th>Duration</th>
<th>NELP royalty rates</th>
<th>HELP royalty rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Oil</td>
<td>Gas</td>
</tr>
<tr>
<td>Shallow Water</td>
<td>-</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Deep Water</td>
<td>First 7 years</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>After 7 years</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Ultra-Deep Water</td>
<td>First 7 years</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>After 7 years</td>
<td>10%</td>
<td>10%</td>
</tr>
</tbody>
</table>

7. The contractors will have freedom to sell oil in the local market on an arm’s length basis. However, the profit share of the government will be based on the higher of the oil price determined by the petroleum planning and analysis cell (PPAC) or the one determined on arm’s length by the contractor. This will help protect the interest of the government while providing freedom to sell oil

8. Similarly, contractors will be provided freedom to sell gas in the local domestic market, but the government take will be based on the higher of that determined under the Domestic Natural Gas Pricing Guidelines and that determined through and arm’s length contract.
9. Exploration phase has been increased by one year for onshore (current 7 years) and for two years for offshore blocks (current 8 years)

10. Exploration will be at the sole risk of the contractor and exploration can be carried out during the entire contract period.

11. 100% participating interest allowed for foreign and Indian companies without any requirement of participating from government or government nominee companies.

12. Exemption of custom duty on all machinery, plants, equipment’s, materials and any supplies related to petroleum operations.

13. Site restoration process of field/ block will be governed as per Government of India guidelines. (DGH, 2015-16)

To understand if the policy announcement under HELP and other policies are helpful, let us discuss and understand the key differences in past and present fiscal regime and outline any issues with the new regime.

However, to compare the NELP and HELP PSC, let’s first discuss each of the mechanism in detail with its advantages and disadvantages.

**Key features of NELP**

a) 100% foreign direct investment (FDI) allowed under NELP.

b) Foreign companies will be allowed to bid without any state participation or carry over interest.

c) International competition between local and foreign companies and no blocs will be awarded on nomination basis as in the past rounds.

d) Continuous availability of exploration acreages through multiple bid rounds, providing many windows of opportunity.

e) The contractors will be granted freedom to determine price on arms’s length basis and market oil and gas in India (however this was not really followed and therefore the contract was not followed in letter and spirit by the government.

f) Royalty payments on crude oil will be at 12.5% for on land blocks and 10% for offshore areas. Royalty for natural gas will be 10%.

g) A hydrocarbon development fund was created to promote and fund exploration activities. This fund will receive 50% of the royalty collected under NELP.
h) To promote deep water exploration (more than 400m bathymeter), the royalty will be half for the first seven years.

i) NELP rounds did not envisage any bonus to government in form of signature bonus when contract is granted or on discovery or on more than expected production.

j) Tax holiday from the date of commercial production for 7 years

k) Oil produced under NELP was exempted from paying any cess.

l) The Policy stipulated to provide fiscal stability to contractor during the entire period of contract i.e. no changes in fiscal and contractual terms.

m) Full cost recovery will be allowed under NELP for exploration, development, and production cost, with unlimited carry forward period on contract area basis unlike the past regime where exploration cost was allowed to be recovered on contract area basis and development cost on a field wise basis.

n) Profit share to be based on investment multiples achieved pre-tax instead of post-tax sharing.

o) Agreement between contractor and government governed through a production sharing contract

Thus, it could be appreciated from the above measures that NELP in the year 1997 was a big bang reform with complete opening up of the exploration and production sector and introduction of production sharing contracts based on best international practices.

**Key features of HELP**

1. Single License - A single license for all kind of hydrocarbons discovered to be provided. This does away the requirement of multiple licenses for different form of hydrocarbons discovered by the contractor.

2. Open Acreages – Contractor to decide which blocks to bid for including the timing of the same.

3. Revenue sharing model – Move to upfront profit share through share of revenues, with/without any cost recovery for the contractor.

4. Marketing and pricing freedom – Pricing to be determined based on arm’s length basis.

5. Increased exploration phase
6. Reduction of royalty for deep water and ultra-deep water blocks. This would promote exploration in these high risk areas.

7. Curtailment in role of managing committee due to PSC model based on revenue share and not profit share where costs are to be audited

**Comparison of NELP and HELP**

Table 3 provide comparison between key features of NELP and HELP regimes.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>HELP</th>
<th>NELP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fiscal terms</td>
<td>Revenue Sharing</td>
<td>Profit sharing</td>
</tr>
<tr>
<td>2</td>
<td>Cost Recovery</td>
<td>Not allowed</td>
<td>Allowed before sharing profit</td>
</tr>
<tr>
<td>3</td>
<td>Cost efficiency</td>
<td>Encouraged</td>
<td>Neutral</td>
</tr>
<tr>
<td>4</td>
<td>Royalty</td>
<td>Low rates for offshore</td>
<td>Standard Rates</td>
</tr>
<tr>
<td>5</td>
<td>Exploration Period</td>
<td>8 years for Onland &amp; Shallow waters AND 10 years for deepwater and Ultradeepwater</td>
<td>7 years for Onland &amp; Shallow water AND 8 years for Deepwater</td>
</tr>
<tr>
<td>6</td>
<td>Management Committee</td>
<td>Focus on reservoir management. Micro management not required since costs are not linked with profit share of government</td>
<td>Technical and financial examination</td>
</tr>
<tr>
<td>7</td>
<td>Revenue to Government</td>
<td>On production</td>
<td>After cost recovery i.e from profit petroleum</td>
</tr>
<tr>
<td>8</td>
<td>Exploration in ML areas</td>
<td>Allowed</td>
<td>Not allowed</td>
</tr>
<tr>
<td>9</td>
<td>E&amp;P Activity for all hydrocarbons</td>
<td>Allowed</td>
<td>Not Allowed</td>
</tr>
</tbody>
</table>
The key difference between NELP and HELP is the mechanism of profit recovery by the government from the contractor.  
(Mehrotra & Gupta, NELP to HELP; Indian exploration & production sector at Cossroads, 2017)

**Issues with HELP and other policy Initiatives**

The government of India in its new policy directives has tried to do a balancing act. While on one hand they have tried to meet the requirement of the petroleum Industry, on the other hand they have tried to protect the interest of the government; but while doing so it has not been able to provide the optimal balance which would have helped to increase investments in exploration and production sector and reduce import dependencies.

**The man issues with the new HELP policy are**

- It has failed to balance the risk reward between the contractor and the government.  
  It is well documented that by moving to the Revenue sharing model, the government is asking contractors to take higher risk. In revenue sharing model the contractor shares profit with government from its revenue while the risk of cost recovery is entirely taken by him.

- Revenue Sharing mechanism is inherently inefficient since it is extremely difficult to design RSC systems to adjust to any variations to cost, timing and pricing.

- The Indian acreages (geology) are not classified among the best; also evident from the fact that India is one of the largest importers of oil and gas. It is expected that more oil & gas would be found in the deep water and frontier blocks, were cost of production would be higher. Therefore the contractors are not ready to take risk for such blocks under revenue share model.

- Since the revenue sharing model brings the economic limit forward, this makes fields susceptible to premature abandonment and hence not allowing full recovery, leaving valuable resources in the ground.
• While the government has tried to provide marketing freedom for oil and gas, it remains to be seen how this would function with the current allocation regime of the government. Even the NELP had provided for pricing on arm’s length basis; however, the allocation of gas to specific sectors acted as a cap for the pricing. In addition, there remains multiple price points for various gas streams.

1.4 Structure of Indian Gas market

The current state of gas market in India can be best described as controlled largely by government with oligopolistic characteristics (few large players control the market) with government intervening across the gas chain. There are only few producers even, after opening up the sector for international competitive bidding (under the New exploration and licensing policy 1997-98). Transmission infrastructure is under development and major players act as integrated suppliers, shippers or marketers of gas. The large part of domestic gas is allocated by the Government of India under the principles of gas utilization policy and price is determined by it for such sources of supply. The gas market is in growth phase with large number of customers, like power and fertilizer are very sensitive to the price of gas they can afford largely because of the distortions which continue in the downstream markets.

1.5 Governing framework of the Indian oil & gas sector
The Indian oil and gas sector is divided into the upstream, midstream and the downstream sector. The upstream sector is controlled by the policies formulated by the Ministry of Petroleum and Natural Gas (“MoPNG”) at the federal level. MoPNG is assisted in its efforts to formulate policies and grant concessions and monitor the exploration and production by Director General of Hydrocarbons (“DGH”). The planning and safety issues are dealt by petroleum, planning and analysis cell (“PPAC”) and safety issues by Oil and safety directorate (“OISD”). All these upstream agencies work under the direction of the MoPNG and hence the government is still the regulator for the sector and therefore in a position to take decisions which may be motivated by political consideration. The Government of India (“GoI”), in the year 2006 enacted through an Act of parliament the Petroleum and Natural Gas Regulatory bill (“PNGRB”) to establish an independent regulator to regulate the midstream and the downstream sectors of oil & gas industry. The governing framework of oil and gas sector is depicted in figure 6.

1.6 The key attributes of the gas market in India

The government and the regulator have tried to liberalize the sector through measures like international competitive bidding, open access norms and transparency. As per the PNGRB Act, 2006 the regulations are intended to be light handed with consumer end price unregulated and competition brought in through removal of marketing exclusivity. But the midstream sector remain underdeveloped with monopoly rights
granted to the LNG regas terminal operators which coupled with allocation of gas from domestic sources is hindering any market mechanism to evolve. The key attributes of the gas market in India can be summarized as

1.0  Domestic gas allocation and pricing determined by GoI [although Production sharing contracts (“PSC”) provide freedom to determine gas price on competitive arm’s length basis, but approved by GoI] in large part of gas production.

2.0  Huge gap in demand and supply of gas as demonstrated in figure 7

3.0  LNG import under OGL but exclusivity rights granted to terminal owners and operators

![Indian Gas Market - Demand Supply Balance](image1)

**Figure 7: Indian Gas Market - Demand & Supply**

![Pipeline Density - India v/s World](image2)

**Figure 8: Pipeline Density - India v/s World**
4.0 Transmission pipeline under development with major slippages in timeline; open access norm in place, however they seem not be robust enough to be implemented. Pipeline density lowest in the world, figure 8.

5.0 Bundled entities allowed to transport and market gas with accounting separation principle

6.0 Distribution and marketing struggling due to unaffordable LNG prices coupled with distortions in Power, Fertilizer and transport fuel markets

7.0 Multiple price points of gas (discussed in more detail in next section)

1.7 Price determination of gas in India

There is multiple marker for gas price in India. The price of gas in India varies based on the source of production and type of regime. Primarily there are five types (as on January 2018); 1) APM and Non APM gas; 2) Pre-NELP gas; 3) NELP gas; 4) CBM gas; and 5) Gas from High pressure, high temperature blocks, Ultra deep and deep water blocks. Details of pricing are discussed below

1) APM and Non APM Gas – Initially the price was determined by the government of India on multiple basis, which from the year 2014 is governed by the modified Rangarajan or Kelkar formula. Details of price from the year 1959 to 2018 is provided in table 4 (exclusive of royalties, duties and transportation charges).

<table>
<thead>
<tr>
<th>Year</th>
<th>Price &amp; basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959</td>
<td>Rs 9/MCM – by OIL in Assam</td>
</tr>
<tr>
<td>1964</td>
<td>Rs 50/MCM – by ONGC in Gujarat</td>
</tr>
<tr>
<td>Late 1960s</td>
<td>Rs. 52.50/MCM – by OIL and ONGC in Assam</td>
</tr>
<tr>
<td>1971-76</td>
<td>Rs. 66/MCM – by ONGC fixed for old customers in Gujarat</td>
</tr>
<tr>
<td>Early 1970’s</td>
<td>Rs. 115-135/MCM – by ONGC for new customers in Gujarat</td>
</tr>
<tr>
<td>1974</td>
<td>Rs. 210/MCM – by ONGC based on thermal equivalence of Coal</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>1977</td>
<td>Rs. 350/MCM – (inclusive of royalty but exclusive of transportation)</td>
</tr>
</tbody>
</table>
| 1978 | Rs.1170-2630/MCM for power  
       Rs. 633 - Rs. 3438/MCM for fertilizer plants – by ONGC offshore in Maharashtra |
| 1979 | Rs.320/MCM for the tea industry  
       Rs.250/MCM for the HFC Ltd and other consumers,  
       Rs.185/MCM for the ASEB – By OIL in Assam |
| 1982 | Rs.2100 - 2500/MCM for fertilizer and other industries |
| 1987 | Rs.1400/MC – Price of gas, both onshore and offshore - Prices fixed by government from 1987 |
| 1992 | Rs.1550/MCM – Price of gas both onshore and offshore |
| 1997 | Rs. 2850/MCM – Price Linked to LSHS/fuel oil |
| 1998 | Rs. 2239/MCM – consumer price of gas and price discount for NE region |
| 1999 | Rs. 2385/MCM for first 2 quarter and Rs. 2850/MCM for last 2 quarter |
| 2000-05 | Rs. 2850/MCM and Rs. 1400/MCM for NE region |
| July 2005 | Rs. 3200/MCM for consumers of power, fertilizers, covered under court and with allocation less than 0.05 mmscmd of Gas |
| June 2010 | US $ 4.2/MMBTU APM price fixed by government (inclusive of royalty) |
| April 2014 | Modified Rangarajan formula or Kelkar Formula  
             Based on volume weighted average of various hubs across the world |
| Nov’14 – Mar’15 | US $ 5.05/MMBTU (GCV) |
| Apr’15 – Sep’15 | US $ 4.66/MMBTU (GCV) |
| Oct’15 – Mar’16 | US $ 3.82/MMBTU (GCV) |
| Apr’16 – Sep’16 | US $ 3.06/MMBTU (GCV) |
| Oct’16 – Mar’17 | US $ 2.50/MMBTU (GCV) |
2) **NELP gas** - Setting of price of gas, under NELP was allowed on an arm’s length basis, however the government has intervened to decide the price which was initially set at $4.2/mmbtu (Based on formula decided on arm’s length for crude $\geq$ US$ 60/barrel till Oct, 2014) and now based on Kelkar formulae as notified by government every six months (refer details in table 4 from the year 2014)

3) **Pre-NELP Gas** – Fuel oil linked formulae as per PSC basically for Panna Mukta Tapti and Ravva fields; The current ceiling price of PM gas is US$ 5.73/MMBTU and Tapti is US$ 5.57/MMBTU since June, 2004 on NCV basis. Current price of the Ravva satellite field is US$ 4.27/MMBTU.

4) **CBM gas** – Pricing for CBM blocks is based on bidding, on an arm’s length basis for which approval of government required.

The contractors have freedom to sell gas in market as long as it is on arm’s length basis, with prior approval from government. Till date prices are approved by the government for the following blocks:

Raniganj (South) CBM Block: July 2007 - USD $ 6.79/MMBTU
- M/s Great Eastern Energy Corporation Limited
Raniganj (East) CBM Block: May 2013 - USD $ 4.2/MMBTU
- M/s Essar Oil Limited
Jharia CBM Block: July 2009 - USD $ 5.1/MMBTU
- M/s Oil and Natural Gas Corporation (ONGC)
Sohagpur CBM Block: May 2017 – Pricing Freedom $4.5/MMBTU
- M/s Reliance Industries Limited (RIL)

5) **HELP gas** (Gas from HP/HT blocks and DW and UDW blocks) – Price based on a formula linked to alternate fuels, capped by a ceiling price.

The price decided based on the formula for various periods are as below

<table>
<thead>
<tr>
<th>Period</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr’17–Sep’17</td>
<td>US $ 2.48/MMBTU</td>
</tr>
<tr>
<td>Oct’17–Mar’18</td>
<td>US $ 2.89/MMBTU</td>
</tr>
</tbody>
</table>
Oct’16-Mar’17 – US $ 5.30/MMBTU
Apr’17-Sep’17 – US $ 5.56/MMBTU
Oct’17-Mar’18 – US $ 6.30/MMBTU

1.8 Analysis of gas price determination in India

There are at least five if not more price points for domestic gas in India. In past few years the government has set up two committees, Rangarajan committee in 2012 and then the Kelkar Committee in 2014 to decide on the formulae for gas pricing. Rangarajan (Dr Rangarajan, Report of the committee on PSC mechanism in petroleum Industry, Dec, 2012) in 2012 has recommended revising the price of all domestic gas in India linking it to various indices. This was accepted by the empowered group of ministers with a slight modification. But the formulae would have increased the domestic gas price to 8$/mmbtu up from 4.2$/mmbtu prevailing at that time, at the beach. Hence this formula was challenged by the power and fertilizer sector as not sustainable for their usage. The current formulae devised as part of a report by Dr Vijay Kelkar, recommended that the price of gas be determined through volume weighted linkages to Henry Hub, National Balancing Point, Alberta and Russian Hubs (Kelkar, 2014). This changed the earlier formulae set up, as part of Rangarajan report (Dr Rangarajan, Report of the committee on PSC mechanism in petroleum Industry, Dec, 2012), dropping Japan LNG and local LNG import indices. However, it is worth stating at this point that none of the formula seems correct since these
- Fail to accurately reflect the cost of alternate fuels to gas
- It does not provide balance between producers and buyer, while providing price to producers which reflect global cost of production.

A high gas price is not workable since people of the nation believe in their entitlement on the natural resources and any high price becomes politically unacceptable. However, if the prices are too low it does not send the right signal to the market for attracting new investments and this eventually leads to shortage of commodity. Multiple price points of gas don’t help in market developed either. Hence it is best to leave the gas price to the forces of demand and supply (refer section 4) to help increase domestic production.
Government of India, started in the right course by providing freedom under NELP round to the producers to determined market price of gas, but it has subsequently moved backwards by imposing riders on allocation of gas to nominated segment of customers and formulating the price formulae(s). The government is again trying to free the market by providing pricing freedom to high pressure and high temperature (HPHT) fields, however the jury is not out on this. As discussed, the multiple price points further complicate the issue. Also, the free market mechanism is further suppressed by the action of government to subsidize the key gas consuming segments of power and fertilizer.

1.9 Motivation and Need for research

A good research can be undertaken if there is enough reasons and motivation to carry out the research. My motivation to carry out this research on developing a Framework for creating an efficient gas market in India are

1) Oil and gas sector has seen a sustained negative growth rate in in last 5 years. If gas, which is an environmentally clean fuel, must play a role in Indian energy sector the decline needs to be reversed.

2) Gas needs to be positioned as the fuel for the future, along with other clean fuels like renewables. Need for clean and affordable energy should drive development of gas markets.

3) India has got 1.3 billion people, whose per capita consumption is expected to double. This would require all key forms of energy, including gas, to have substantive share in the energy basket.

4) India needs to make energy available to its people while meeting its environment obligations (COP21). Gas need to play a role along with Solar and other renewables.
5) Gas being a clean fuel should play a dominant role – world average is 24.1% (India 6.2%).

6) Solar and wind have limitations in meeting base/peaking loads. Solar can play a larger role when coupled with gas.

7) Indian gas market is unique with price sensitive power & fertilizer consumers and no heating load; hence learning's from international market cannot be applied directly, to develop gas markets.

8) Lack of systematic approach to development of gas markets – low interest in the sector and no clear way forward from the government.

9) There is lack of comprehensive work on Indian gas market. Development of gas market will need a step by step approach; gas markets internationally have taken decades to develop. This is evident from the fact that last five years has seen negative growth rate for gas sector.

10) Gas on gas competition (demand & supply mechanism) is the preferred gas price formulation mechanism; 38% of the world already uses the mechanism; Oil indexed markets moving towards market determined prices.

11) Henry Hub, proxy for most developed market has managed to deliver the cheapest gas in last many years demonstrating the power of the market.

The debate is not whether the share of gas in the energy mix needs to be increased, the debate and discussion is about how does the government and nation go about achieving the objective of attracting more investment in the sector, which would help to achieve this objective. One way to achieve the same is through creation of efficient gas market. However, we do not have any comprehensive work done in this area. My thesis attempts to address this gap.

(Mehrotra, Akhil, 2017)