"NATURAL GAS- FUEL OF 21ST CENTURY

REGULATORY & POLICY FRAMEWORK"

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This dissertation is submitted in partial fulfillment of the degree of B.A., LL.B. (Hons.)/B.B.A., LL.B. (Hons)

College of Legal Studies

University of Petroleum and Energy Studies

Dehradun

2015

CERTIFICATE

This is to certify that the research work entitled "NATURAL GAS – FUEL OF 2IST CENTURY POLICY AND REGULATORY FRAMEWORK" is the work done by Shaurya Garg under my guidance and supervision for the partial fulfillment of the requirement of B.A., LL.B. (Hons.) degree at College of Legal Studies, University of Petroleum and Energy Studies, Dehradun.

Signature & Name of Supervisor

Designation

Date

DECLARATION

I declare that the dissertation entitled "NATURAL GAS – FUEL OF 2IST CENTURY POLICY AND REGULATORY FRAMEWORK" is the outcome of my own work conducted under the supervision of Dr./Prof.Rajkumar, at College of Legal Studies, University of Petroleum and Energy Studies, Dehradun.

I declare that the dissertation comprises only of my original work and due acknowledgement has been made in the text to all other material used.

Signature & Name of Student

Date

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ABBREVIATIONS

1. AGCL	Assam Gas Company Limited
2. APM	Administered Price Mechanism
3. bcm	Billion Cubic Metre
4. BP	British Petroleum
5. BPCL	Bharat Petroleum Corporation Limited
6. CAG	Comptroller & Auditor General
7. CAGR	Compounded Annual Growth Rate
8. CBM	Coal Bed Methane
9. CGD	City Gas Distribution
10. CHT	Centre of High Technology
11. CNG	Compressed Natural Gas
12. DGH	Directorate General of Hydrocarbons
13. E&P	Exploration and Production
14. ECC	Energy Coordination Committee
15. EEZ	Exclusive Economic Zone
16. EGOM	Empowered Group of Ministers
17. EOI	Expression of Interest
18. GAIL	Gas Authority of India Limited
19. GGCL	Gujarat Gas Company Limited
20. GGL	GAIL Gas Limited
21. GSPC	Gujarat State Petroleum Corporation
22. HPCL	Hindustan Petroleum Corporation Limited
23. HVJ	Hazira – Vijaypur- Jagdishpur
24. IGL	Indraprastha Gas Limited
25. IM	Investment Multiple
26. JV	Joint Venture
27. KG	Krishna Godavari
28. LNG	Liquefied Natural Gas
29. MC	Marginal Cost
30. MGL	Mahanagar Gas Limited
31. MBTU	Million British Thermal Unit
32. MMSCMD	Million Standard Cubic Metre Per Day
33. MOPNG	Ministry of Petroleum & Natural Gas
34. MOU	Memorandum of Understanding
35. MSP	Minimum Selling Price
36. MW	Mega Watt
37. MWP	Minimum Work Program
38. NCR	National Capital Region
39. NELP	New Exploration Licensing Policy
40. NFL	

41. NOC	Non Objection Certificate
42. OALP	Open Acreage Licensing Policy
43. OIDB	Oil Industry Development Board
44. OIL	Oil India Limited
45. OISD	Oil Industry Safety Directorate
46. ONGC	Oil and Natural Gas Corporation
47. PEL	Petroleum Exploration Licence
48. PLF	Plant Load Factor
49. PMT	Panna-Mukta-Tapti
50. PNG	Piped Natural Gas
51. PNGRB	Petroleum & Natural Gas Regulatory Board
52. PPA	Power Purchase Agreement
53. PPAC	Petroleum Planning & Analysis Cell
54. PSC	Production Sharing Contract
55. RELOG	Relogistics Infrastructure Limited
56. RGTIL	Reliance Gas Transportation Infrastructure Ltd.
57. RIL	Reliance Industries Limited
58. RLNG	Re-Gasified Liquefied Natural Gas
59. RNRL	Reliance Natural Resources Limited
60. TAPI	Turkmenistan-Afghanistan –Pakistan-India

ACKNOWLEDGEMENT

I would like to express my deepest of gratitude to Professor Rajkumar, who gave me this topic to research on. He provided me with necessary guidance as an when needed. Without his guidance and persistent help this dissertation would not be possible.

I would also like to express thanks to my Father who helped me understand various concepts in this dissertation and also provided me with necessary information when required.

CHAPTER 1

INTRODUCTION

Fire was very important for early man. Fire was extremely useful and was an important source of energy which has been used in an effective and efficient manner. It provided early man and women with a means of warmth and defence. The wild animals were frightened of the fire and so stayed away from the campsites. Before of the use of fire men could only eat raw food, meats, fruits and berries. Now cooking has made food eatable, it has softened the food. In the later stages, coal was used to produce fire.

Coal has been used as a heat and energy source throughout the world since the nineteenth century. Coal was an important fuel for the Romans in the west as well as in China around the same period. During the 18^{th}-19^{th} Centuries, Coal was a portable energy source and was used to power Industrial Revolution. In addition to coal being used as a source of heat and steam power, the evolution of making steel by using charcoal then to using coal allowed the process to be introduced to industrial level.

As 20^{th} century begin, every human being got dependent on Oil for many uses such as running vehicles which depended on oil, in warfare for operating tanks and transportation of various other materials from one place to another. Now in the 21^{st} century man has found another source of energy in the form of Natural Gas.

Natural Gas is the cleanest of all fossil fuel. It produces half the carbon pollution as compared to coal. Recent technological advancements make affordable the development of unconventional natural gas resources. Now natural gas can be used as a bridge fuel to a 21^{st}-century energy economy that relies on effectiveness, renewable sources and fossil fuels with low carbon content such as Natural Gas.

Energy is one of the driving forces in development of the world due to various factors like increase in demand and natural gas is the source which has the potential the match the needs and demands. We require energy constantly to heat our homes, cook food and generate electricity. It is this need for energy that has elevated natural gas to such a level of importance in our economy.

BACKGROUND OF GAS SUPPLY IN INDIA[1]

The history of discovery of natural gas dates back millions of years ago in 1609, when the first nomenclature for coal gas was made by the scientist 'John Van Helmut' who named it as "Giest" meaning "Ghost". Later on, it became "Gas". In the year 1807, the first lamp was lighted in the streets of London and a company known as London & Westminister Gas Light & Coke was formed in U.K. in the year 1821 AD. Even though transportation on localized basis started in bamboo pipeline earlier, the first systematic long distance wooden pipeline was led in North America in the year 1872.

In India, Oil & Gas was discovered in the year 1986 at Digboi in Assam. After the discovery of Oil and Gas field in Naharkatya in Assam in 1953, the first major onshore discovery came out in Gujarat in the year 1958. Offshore exploration in Bombay High started in the year 1964 and the famous mega discovery of massive Bombay High Gas came in the year 1974. A familiar discovery of high order of gas came in 1978 in the western South Basin offshore field.

In order to have efficient and optimal utilization of gas in the country an independent company was formed by the Government of India in the year 1984 which was named as Gas Authority of India Ltd. (GAIL). The first task assigned to GAIL was construction of Hazira-Vijaypur- Jagdishpur pipeline (HVJ) mainly to supply gas initially to a number of fertilizer and power plants. First phase of HBJ pipeline was commissioned in 1986 with the commencement of supply of gas to National Fertilizer Ltd. (NFL) at Vijaypur in Madhya Pradesh.

Gradually supply of gas commenced to other fertilizer plants by Indo-Gulf Fertilizers at Jagdishpur, IFFCO (Aonla), Chambal Fertilizer (Gadepan), Oswal Fertilizers (Sajahanpur) and Tata Fertilizer Plant (Babrala). All these fertilizer plants were of similar capacity i.e. 1350 TDP Ammonia and 2200 TDP urea. Also supply of gas was made to National Thermal Power Corporation Ltd. (NTPC) power plants at Anta (Rajasthan), Auriya (UP), Dadri (UP) and Faridabad (Haryana).

Presently 22 million cubic metre of gas per day (MMSCMD) is being supplied to various fertilizer units in the country to produce about 10.5 million cubic meter tones of urea per year which inturn account for almost 60% of the total urea produced in the country. Similarly over

[1] Text book on Natural Gas- Dr. U.D Choubey

6000 MW of power is produced which are based on gas, fertilizer and power sector alone. Balance is used for industrial applications, domestic, commercial and automotive applications.

Meaning of Natural gas

Natural gas is a naturally occuring hydrocarbon gas mixture consisting primarily of methane, ethane, propare and butane but commonly including various amounts of other hydrocarbons, carbon dioxide, nitrogen and hydrogen sulphide. Before natural gas can be used as a fuel, it must undergo processing to remove impurities, including water, to meet the specifications of marketable natural gas[2].

India is in transition. It is moving from a planned economy with extensive central controls to one based extensively on the operation of market forces. The potential for growth of natural gas market in India is tremendous; however this is a very price sensitive market as the ability of the consumers to pay differs between sectors. The power generation and fertilizers are the main consumers. Fertilizer producers are subsidized by the government and have limited ability to absorb higher prices.

In the power generation sector gas has to compete to coal for base load generation. Any change in the power sector or in the coal markets will have a huge impact on whether gas is used as a base load option or for peak purposes and therefore on future gas demand in the power sector. City gas and industrial users show greater price flexibility, but they are still emerging markets. Historically, gas had been allocated in priority to fertilizer and power plants, while city gas, compressed natural gas (CNG) and industrial had the remainder[3].

Furthermore, fertilizer producers and power generators were allocated gas at low Adminstrative Price Mechanism (APM) prices determined by the government. But the recent pricing reforms that took place in mid 2010 mean the end of low APM prices and that new gas supplies are likely to be more expensive, the Indian gas sector, like the whole energy sector is dominated by state-owned companies. Oil and Natural Gas Corporation (ONGC) and Oil India Limited (OIL) have dominated upstream positions, while until 2006 GAIL

[2] http://www.businessdictionary.com/definition/natural-gas.html
[3] Supra., 1

alone had been responsible for pipeline gas transport. The state has also a very important role in the regulatory framework and gas policy, in particular the allocation and pricing of gas[4].

Recent reforms have brought more private investors in the upstream and downstream sectors, but a more transparent regulatory framework will be critical to incentivice future private investments.

Formation of Natural Gas

Natural gas is a part of family of chemicals known as Hydrocarbons which also includes oil and gasoline. As its name suggests, natural gas comes out of the ground as a gas; oil, gasoline and other hydrocarbons are recovered mixed together in a liquid called crude oil.

Stage -1[5]

All of the natural gas we use today began as microscopic plants and animals living in the ocean millions of years ago. As these microscopic plants and animals lived, they absorbed energy from the sun, which was stored as carbon molecules in their bodies. When they died, they sank to the bottom of the sea. Over millions of years, layer after layer of sediment and other plants and bacteria were formed.

Stage -2

As they became buried ever deeper, heat and pressure begun to rise. The amount of pressure and the degree of heat, along with the type of biomass, determined if the matter become oil or natural gas. Very high heat or biomass made predominantly of plant material produced natural gas.

Stage -3

After oil and natural gas were formed, they tend to migrate through the tiny pores in the surrounding rock. Some oil and natural gas migrated all the way to the surface and escaped. Other oil and natural gas deposits migrated until they were caught under layers of rock and clay where they were trapped. These trapped deposits are where we find oil and natural gas today.

[4] ibid
[5] http://www.adventuresinenergy.org/What-are-Oil-and-Natural-Gas/How-Are-Oil-Natural-Gas-Formed.html

Sources of Natural Gas

There are various sources of producing natural gas[6], these are:

1. BIOGAS:

When methane-rich gases are produced by the decay of non-fossil organic matter these are referred to as biogas. Sources of biogas include swamps, marshes and landfills. Landfill gas is created from the decomposition of waste in landfills. If the gas is not removed, the pressure may get so high that it works its way to the surface, causing damage to the landfill structure, unpleasant odour, vegetation die-off and an explosion hazard. Biogas is usually produced using agricultural waste materials such as otherwise un-usable parts of plants and manure.

2. Liquified Natural Gas (LNG):

LNG is natural gas, predominantly methane, CH4 that has been converted to liquid form for ease of storage or transport. LNG is principally used for transporting natural gas to markets, where it is regasified and distributed as pipeline natural gas. It can be used in natural gas vehicles, although it is more common to design vehicles to use compressed natural gas. Its relatively high cost of production and the need to store it in expensive tanks have hindered widespread commercial use.

3. Coal bed methane (CBM):

Coal bed methane is a form of natural gas extracted from coal beds. In recent decades it has become an important source of energy in many countries. The term refers to methane absorbed into the solid matrix of the coal. It is called “Sweet gas” because of its lack of hydrogen sulphide. The presence of this gas is well known from its occurrence in the underground coal mining, where it presents a serious safety risk. Coal bed methane is distinct from typical sandstone or other conventional gas reservoir, as the methane is stored within the coal by the process called adsorption. This methane is in a near liquid state, lining the inside of pores within the coal.

Unlike much natural gas from conventional reservoirs, coal bed methane contains very little heavier hydrocarbons such as propane or butane and no natural gas condensate. It often contains up to a few percent carbon dioxide.

[6] Supra.,1

4. Shale gas:

Shale gas refers to natural gas that is trapped within shale formations. It is the latest discovery as a source of natural gas. Shale's are fine-grained sedimentary rocks that can be rich resources of petroleum and natural gas. Sedimentary rocks are rocks formed by the accumulation of sediments at the Earth's surface and within bodies of water. Common sedimentary rocks include sandstone, limestone and shale,

Over the past decade, the combination of horizontal drilling and hydraulic fracturing has allowed access to large volumes of shale gas that were previously uneconomical to produce. Hydraulic fracturing is the fracturing of various rock layers by a pressurized liquid. Induced hydraulic fracturing or hydro fracturing commonly known as fracing, fraccing or fracking, is a technique in usually a large amount of water is mixed with sand and/or chemicals are injected at high pressure into faults to release petroleum, natural gas or other substances for extraction. This type of fracturing creates fractures from a well bore drilled into reservior rock formations.

The first experimental use of hydraulic fracturing was in 1947 and the first commercially successful application in 1949. As of 2010 it was estimated that 60% of all new oil and gas wells world-wide were being hydraulically fractured. As of 2012, 2.5 million hydraulic fracturing jobs have been performed on the oil and gas wells world-wide, more than one million of them in the United States.

Proponents if hydraulic fracturing point to the economic benefits from vast amounts of formerly inaccessible hydrocarbons the process can extract. Opponents point to potential environmental impacts including contamination of ground water, depletion of fresh water, risks to air quality, the migration of gases and hydraulic fracturing chemicals to the surface, surface contamination from spills and flow-back and the health effects of these. For this reason hydraulic fracturing has been under scrutiny internationally, with some countries suspending or banning it. However some of these countries, including United Kingdom, have recently lifted there bans, choosing to focus on strong regulations instead of outright prohibition.

Whereas, Horizontal drilling is a process of drilling a well from the surface to a subsurface location just above the target oil or gas reservoir called the "kick-off point", then deviating the well bore from the vertical plain around a curve to intersect the reservoir at the "entry

point" with a near horizontal inclination and remaining within the reservoir until the desired bottom hole location is reached.

USAGE OF NATURAL GAS IN VARIOUS SECTORS

Various uses of natural gas in the different sectors of the economy are mentioned below[7]:

1. INDUSTRIAL USE

There are many industrial applications for natural gas. Industrial applications include those same uses found in residential and commercial settings – heating, cooling and cooking, natural gas is also used for waste treatment, metal preheating, drying, glass melting, food processing and fuelling industrial boilers. Natural gas may also be used as a feedstock for the manufacturing of a number of chemicals and products. Gases such as ethane, propane and butane may be extracted from natural gas to be used as a feedstock for such products as fertilizers and pharmaceutical products.

In India, the main consumers of natural gas in the industry are the fertilizer sector and the power sector. It is used to create fertilizers which are used for enriching the nutrients of soil to yield a better output. Natural gas is also used in ceramics.

2. TRANSPORTATION SECTOR

Most natural gas vehicles operate using compressed natural gas (CNG). It is used in many transportation activities e.g. DTC buses in Delhi use CNG which has led to drop in the level of pollution in the country. This compressed gas is stored in similar fashion to a car's gasoline tank, attached to the rear top or under carriage of the vehicle in a tube shaped storage tank. A CNG tank can be filed in a similar manner and in a similar amount of time to a gasoline tank. Natural gas is very safe, being lighter than air, in the event of an accident natural gas simply dissipates into thin air, instead of forming a dangerous flammable pool on the ground like other liquid fuels. This also prevents contamination of ground water in the event of a spill. Natural gas vehicles, when designed to run of natural gas alone, are among the cleanest fuels in the world.

3. ELECTRICITY GENERATION USING NATURAL GAS

[7] http://geology.com/articles/natural-gas-uses/

In India, Natural Gas, because of its clean burning nature, have become a very popular fuel for the generation of electricity, natural gas is a clean fuel as compared to coal and can be efficiently used for power generation. As the domestic coal supply is generally of low quality, with low calorific values, high degree of ash content and its adverse impacts on the environment. Government of India encourage gas based power generation in India.

4. RESIDENTIAL SECTOR

Natural gas is one of the most affordable forms of energy available to the residential consumer. In fact, natural gas has historically been a better value than electricity as a source of energy in home. Natural gas has replaced use of coal and kerosene in India.

Not only is natural gas a good value for residential consumer, it also has a number of varied uses. The best known uses for natural gas around the home are natural gas heating and cooking. Cooking with the natural gas range or oven can provide many benefits, including easy temperature control, self ignition and self cleaning, as well as being approximately one half the cost of cooking with electric range. Many of the top chefs prefer natural gas ranges for their quick heating ability and temperature control. Newer generations of natural gas ranges allow for some of the most efficient, economical and responsive cooking appliances in existence.

5. COMMERCIAL USES

Commercial uses of natural gas are very similar to residential uses. The commercial sector includes public and private enterprises, like office buildings, schools, churches, hotels restaurants and government buildings. The main uses of natural gas in this sector include water heating and cooling. For restaurants and other establishments that require cooking facilities, natural gas is a popular choice to fulfil these needs.

MERITS OF USING NATURAL GAS

Natural gas is seen as a good source of electricity supply for a number of economic, operational and environmental reasons[8]:

[8] Report on "Impact of Natural Gas Pricing on demand-Supply in India" by – Mr. Kevin Alex Jose.

- Natural gas (largely methane) burns more cleanly than other fossil fuels (45% less carbon dioxide emitted than coal and 30% less than oil)

- it is easily transported via pipelines and fairly easily using tankers.

- It can be piped into homes to provide heating and cooking and to run a variety of appliances.

- It can be used a fuel for vehicles, where it is cleaner than diesel

- It is used to produce ammonia for fertilizers, and hydrogen as well as in the production of plastics and paints.

- It is also lighter than air, so if there is a leak it will tend to dissipate, unlike propane, which is heavier than air and pools into expensive pockets.

- Natural gas is more economical, it is faster when used in cooking.

LIMITATIONS OF NATURAL GAS

1. **PIPELINES**

Natural gas requires complex treatment plants and pipelines to deliver gas from the field to the site of use. These pipelines have high maintenance costs because they need to be laid underground. Costs are high because the lines need to be checked regularly for leakage[9],

2. **EXTRACTION**

Extraction is also one of the disadvantages of natural gas because of the creation of cavities in the ground. This gas is extracted from a natural gas field. The pressure exerted by the gas helps support the layers of soil above the gas field. When the gas is extracted the soil pressure increases and cavities are created in the ground. These cavities are injected with water can sometimes cause the ground to sink.

3. **POLLUTANT**

[9] Supra., 8

one of the limitations of natural gas is that it is a pollutant to the nature. While it may give off lesser carbon dioxide than other sources of energy, it is non the less damaging the eco system.

4. NON RENEWABLE SOURCE OF ENERGY

Natural gas is limited to us. It is a non-renewable source of energy which can go depleted due to further extraction for satisfaction of demand. Thus it shall be used in an efficient manner so that when required by the future generations it could be made available to them.

CHAPTER 2

DEMAND SUPPLY DYNAMICS OF NATURAL GAS

Demand in the energy market has seen increasing amount of up's and downs in 2011-12. Against an estimated demand of 246.4 million standard cubic metres per day (mmscmd) in the same year the actual consumption was just 154.36 mmscmd. There is increasing apprehension of natural gas among all demand segments which is reflected by the use of Liquified Natural Gas (LNG) by almost all sectors despite its higher price. There are also many instances of LNG imports by power generators.

This chapter will give a detailed idea of key aspects of gas demand in the country. It includes consumption trends, demand supply analysis including key consumer segments and various issues and concerns.

A. CONSUMPTION TRENDS

The total natural gas during the year 2011-12 was reported at 154.36 mmscmd by Petroleum Planning and Analysis Cell (PPAC). Around 70% of this is from domestic supply. Domestic gas sale declined consistently during this year.

Trend in Gas Consumption[10]

YEAR	Gas sale by domestic producers	Total import	Total gas consumption	Year-on-Year consumption growth (%)
2004-05	26.50	3.45	29.95	-
2005-06	26.85	6.98	33.83	12.95
2006-07	26.77	9.33	36.10	6.71
2007-08	26.97	11.3	38.27	6.01
2008-09	27.06	10.9	37.96	-0.81
2009-10	40.83	12.22	53.05	39.75
2010-11	46.04	12.07	58.11	9.54
2011-12	41.09	17.69	58.78	1.15

[10] Petroleum Planning and Analysis Cell

As supplies from Krishna-Godavari (KG) basin's block operated by Reliance Industries Limited (RIL) fell, it has led to sharp cutbacks for consumers as the government tried to maintain supplies to the core segments of power and fertiliser.

Production also fell due to natural decline in reserves. This falling domestic availability has made doorway for LNG. But due to its high price, its consumption has not risen with the fall in domestic availability. Nonetheless, LNG imports have so far been the highest in 2011-12.

B. OVERALL DEMAND ANALYSIS

Improved pipeline connectivity and increased supplies since 2009-10 acted as catalysts in driving demand for natural gas in the country. However, with the fall of domestic production in the year 2011-12, the demand in the last fiscal as well as present in various consumer segments has risen and is significantly higher than actual consumption levels. As of 2011-12, the demand for natural gas is estimated at 264.4 mmscmd across major consumer segments.

Estimated demand for Natural Gas in Major Consumer Segments (2011-12)[11]

CONSUMER SEGMENT	DEMAND (mmscmd)	Percentage share
Power	88.4	35.9
Captive power	25.0	10.1
Fertilisers	46.0	18.7
City gas distribution	15.8	6.4
Sponge iron	7.7	3.1
Petrochemical and refineries	55.0	22.3
Others (LPG)	8.5	3.4
Total	**246.4**	**100.0**

Estimates indicate that utility based power sector accounts for 36% of the total gas demand, while the fertiliser sector accounts for 18.7 %. Together, the utility based power and fertiliser sectors account for 54.6 % of the total natural gas demand.

Off late CGD has emerged as the fastest growing consumer segment. An improved reach of pipelines have catalysed demand for gas in transportation, process manufacturing etc. Further, with clear regulations for a competitive CGD segment, many players have

[11] Industry reports; Planning Commission and India Infrastructure Research

accelerated their efforts to develop this market. As things stand, the demand for natural gas is such that certain sectors are highly price elastic while others are relatively price inelastic. In other words different sectors have varying price sensitivity. This has affected the demand and consumption scenario of gas in India.

The power and fertilizer sectors are two segments where dependence on the domestic gas in high and which have the lowest price. These markets are highly regulated and so players are unable to pass on higher input costs to consumers. In power sector, gas based units rely on domestic gas to keep costs competitive and ensure off-take of base load power which has to compete with coal based power. In the fertiliser sector, input costs are highly subsidized by the government. Other segments have shown high price inelasticity. These are segments such as CGD and industries where higher costs can be passed on to the consumers without impacting competitiveness or demand and thus offer a greater acceptability for market oriented pricing.

DEMAND ANALYSIS OF KEY CONSUMER SEGMENTS

1. POWER SECTOR

The power sector is the largest consumer of natural gas in India. There are various advantages of Gas-based power plants. Some of them are summarized below:

- ✓ Meets peeking power demand efficiently through the current regulatory regime of power tariffs and gas utilization
- ✓ Shorter gestation period
- ✓ Lower land requirement
- ✓ Cleaner combustion properties
- ✓ Lower pollutant load.

But gas based generation remains significantly unused due to various fuel challanges such as:

- ✓ Power sector is forced to depend on domestic gas availability as there is limited scope to absorb the cost of imported gas (LNG) in the country's existing power market.

- ✓ This dominant market is based on regulated power tariffs which continue to be influenced by popular political considerations rather than sound economic principles.

As a result the tariffs are considerably lower than what they ought to be.

Trend-wise, the installed capacity of gas-based power plants shows a decline. Also government estimates show that the sector requires 88.44 mmscmd for operating gas-based power plants at PLF of 90% during 2011-12. However, during the said period an estimated 8454 Mus of shortage was attributed to gas based power generation capacities, which operated at PLF of 59.94 %. The growing shortage of gas reflects in the falling PLF of gas-based plants over the years. Thus the declining share of gas in the total power mix means that lesser energy shortage can be attributed to such capacities.

2. FERTILISER

Natural gas is a feedstock for producing urea. It is more useful then other feedstock due to higher conversion efficiency and lower costs. Good policies have been a driving force for gas based urea production but inadequate domestic gas availability have restricted the industry's investments for feedstock switching and expansion.

Domestic urea production in the country is 21.15 million tonnes. Over 80% of the production capacity is based on natural gas. There are four naphtha based units which produce 1.88 million tonnes. Another four units use fuel oil for producing 2.13 million tonnes. The industry requirement is about 46 mmscmd. But currently it faces a shortage of about 2 mmscmd.

Due to uncertain gas supply there has been stagnancy in the fertiliser sector's investment momentum. With imminent increase in fertiliser requirement the government has begun considering alternative feedstock options. Another option is Coal bed methane (CBM).

3. CITY GAS DISTRIBUTION

CGD constitutes the tail-end of the gas sector's value chain. This network enables transportation of natural gas in smaller volumes to retail consumers. With improved regulatory policies in establishing and expanding CGD network, a significant demand has emerged in this category. This includes supply of compressed natural gas (CNG) for transportation and piped natural gas (PNG) for domestic, commercial and industrial consumers. Over 90% of the total consumption in CGD is accounted for by the transportation and industrial consumption.

Latest estimates indicate a gas consumption of 15.80 mmscmd through CGD networks. Between 2007-08 and 2011-12, the CGD segment's consumption grew at a compound annual growth rate of 17%. A key factor driving its growth has been the comparative advantage of natural gas vis-a-vis alternative fuel options such as LPG, high speed diesel and fuel oil.

The segment has been sourcing its gas from various domestic sources but the fall in production has been increasingly substituted by LNG. An estimated 30-40% of the gas procurement has been from LNG. In fact, many CGD companies replaced their KG-D6 gas allocations with LNG supplies. All the same, domestic gas availability is crucial for the segment to maintain its competitiveness and sustain the demand growth.

CGD network currently is limited to 77 cities in the country. Gujarat accounts more than 45% share of the pipeline network. It is followed by Delhi and Maharashtra where the network came up in the aftermath of the apex court ruling on fuel conversion for mitigating vehicular emissions. Expansion of pipeline network is the key to widening the CGD consumption base. But uncertain domestic gas supply poses restrictions in the development of CGD networks.

There are about 20 cities where CGD projects are under various stages of development. Hese cover the states of Haryana, Madhya Pradesh, Uttar Pradesh, Andhra Pradesh and Gujarat. The regulator drew up a plan to expand the network to over 200 cities by 2020.

5. INDUSTRY

Due to improved pipeline connectivity, industries are increasingly opting for natural gas. This is for both process requirement and captive power. Process requirement has been important in industries such as steel and sponge iron, refineries/petrochemicals, glass and chemicals among others. Captive power have been driven mainly by energy intensive industries

The growth rate of index of the Industrial Production declined from 15.6% in 2007-08 to only 2.5% in 2011-12.

a) Sponge Iron

India has the leading position in sponge iron production globally. The industry has registered about 10% average annual growth rate in last four years. The industry's growth prospects are driven by the demand for sponge iron from the secondary steel sector where it is used to manufacture steel products.

There are only three gas-based sponge iron manufacturing units. These are plants of Essar Steel Limited, Ispat Industries Limited and Welspun Maxsteel Limited. Together the gas based units have achieved a production of 5.79 million tonnes as of 2010-11.

Production has been hampered by the pro-rate cuts in KG-D6 gas. An estimated Rs. 100 billion worth of investments is reportedly lying unutilised due to the uncertainty surrounding natural gas availability.

b) Refineries and Petrochemicals

Refineries use variety of fuel options such as natural gas, fuel oil and LSHS towards process requirements. As of 2010-11, gas based refinery capacity, at 120.1 million tonnes per annum, accounted for a total gas consumption of 12.6 mmscmd. The demand from this segment is estimated at 34.5 mmscmd as of 2011-12. Gas consumption in refinery processes is contingent on not only higher capacity utilisation of existing refineries but also fuel conversion opportunities for efficiency improvement as well as new refineries in industry.

Natural gas consumption from the petrochemical segment is on account of gas fractions, C1 (methane), C2 (ethane), C3 (propane), that are used as feedstock. Gas is also used by petrochemical plants for captive power generations. There are three naphtha based and three gas based cracker companies in the country. Together they had an annual capacity of 2.9 million tonnes as of march 2012. About 40% of the industry capacity is based on natural gas as feedstock.

c) LPG

Gas is used for producing LPG and other liquid hydrocarbons by companies such as GAIL. Between 2005-06 and 2011-12, LPG production in the country reported a CAGR of 2.48 % while LPG consumption grew at a CAGR of 7.21%. the excess demand has been met through imports which has grown at a CAGR of 19.40 %

The total demand for gas for LPG extraction is estimated at around 4% of total demand. In order to meet the increasing demand for LPG, the GAS utilisation policy treats LPG as a priority sector and has allocated 3 mmscmd of KG-D6 gas to LPG plants on firm-basis.

d) Captive Power

The use of gas by the non-utility segment is for captive generation by industries that has grown over time. The key factor for non-utility power sector's growth has been the inadequacy of power generation from the grid to meet their needs. Energy intensive industries or high value industries such as metals, minerals, chemicals, cement, paper etc face high stakes in terms of loosing business due to either high cost of power, or poor quality or unavailability of power. The captive plant also has the opportunity to participate in the short term power market, which has boosted economics of captive power.

The share of gas for captive power is estimated at around 12%. This share has declined from around 16% in the previous year. The petrochemicals and chemicals are the largest users of natural gas as a fuel for their captive power plants with shares 55 and 14 % respectively. Metals and minerals follow next at 11%. The consumption of gas from the captive power segment was 10 mmscmd during 2011-12. This is based on analysis of total gas consumed by industries during the year and deducting the amount used for non- power generation purposes.

ISSUES AND CONCERNS

The industry segments that are consumers of natural gas are facing a number of issues, specially related to gas sourcing, policy, pricing etc. The following are some of the key challenges being faced by key gas consumers in the country.

1. Domestic gas availability: Uncertain domestic gas prevented fulfilment of demand and this has affected other activities in the value chain such as development of transmission pipelines. The power sector has been struggling to recover costs from capital investment in gas based capacity in the absence of adequate gas supply and is investigating LNG imports where feasible. On the other hand, the fertilizer segment has been considering alternative options of sourcing gas.

2. Gas Utilization policy: there is a need to clearly define the roadmap of gas allocation in the country. The existing practice of arbitrarily allocating gas to select segments bases on their installed capacity and an assumed PLF does not reflect true demand and has not been able to capture market value of the scarce fuel. In the context of energy security, a more strategic approach needs to be taken in this regard. Most importantly, market distortions as seen in the current allocation policy, affect long-term investments in the entire value chain of the industry.

3. Price: A major signal of relative scarcity in the market price. The lack if market linked price in the Indian gas market has depressed the true market value realisation of gas. As the producers are restricted from realising optimal value, it has the further ripple effect of deterring investors from the long term investments in exploration and production along with transmission infrastructure. A price reflecting market reality can help address the ongoing demand and supply gap in various segments. The government can fulfil its policy mandate for supporting certain segments based on public policy priority by directly compensating the players in those segments rather than forcing producers to bear the burden of public policy. This will help address market distortions and ensure investments where needed in the gas value chain.

4. Infrastructure: Gas pipeline network is skewed towards the western and northern regions. This infrastructure is poorly developed in the southern and eastern regions of the country. This has limited market development for natural gas in the rest of the country. Large investment is blocked as upcoming pipeline projects have earlier slowed down in the absence of gas production uncertainty or have stalled due to environmental and other statutory clearances.

C. SUPPLY DYNAMICS OF NATURAL GAS

India's dometic production of natural gas showed a sudden rise in April 2009 when Reliance Industries Limited's (RIL) production from the KG – D6 basin started. As a result, the domestic production in the year 2009-10 increased by 45% as compared to the previous year. But it cannot continue with its growth, in-fact RIL's production had fallen to around 38.82 mmscmd by March 2012. In the future years to come many new discoveries are expected to come but the overall domestic production in the next couple of years is expected to be stagnant.

YEAR	PRODUCTION	% GROWTH
2001-02	29.7	-
2002-03	31.4	5.72
2003-04	31.9	1.83
2004-05	31.8	-0.62

2005-06	32.2	1.38
2006-07	31.8	-1.41
2007-08	32.4	2.11
2008-09	32.8	1.32
2009-10	47.5	44.60
2010-11	52.2	9.95
2011-12	47.5	-8.90
Source: Ministry of Petroleum and Natural Gas		

According to MOPNG in the year 2009-10, the total production of natural gas in India was around 47.51 billion cubic meter (bcm). Then in 2010-11, even after declining production from the KG-D6 block, the total production increased by almost 10%.

The gas production from offshore fields also have witnessed a decline in the recent years leading to very less domestic production. The offshore production was 4.58 bcm in 2010 which was at its least in February 2012 at 3.6 bcm. In 2011-12 the onshore gas production marginally increased by around 5.7%, contributing approximately 19% to the total domestic production.

The sharpest declines in the production has been in the offshore fields with the major decline in the KG-D6 block. Production from this block reached a peak of 61.5 mmscmd in March 2010 and decreased from there to 30.82 mmscmd in july 2012. The production levels in 2012 have gone down even further. The total domestic production in the country was 3632.7 mmscmd in April 2012 but was 4025.2 in April 2011.

KEY GAS PRODUCING REGIONS

Principle gas producing regions in India, apart from the fields in Rajasthan and Tripura are:

- Western Offshore region
- North Gujarat, also on the west coast

- KG Basin, on the central east coast
- Cauvery basin on the sourthern east coast.

Till 2008, most of the natural gas production in India came from fields off the western coast, including the South-Bassein, Panna- Mukta-Tapti (PMT), and Mumbai-High complex and from major onshore fields in Assam, Andhra-Pradesh and Gujarat.

Most of the country's offshore production is contributed by Mumbai High but over the years its output has been declining. In order to enhance the recovery rates from Mumbai High, ONGC is drilling new wells.

In 2009-10, gas production from the eastern offshore region showed a sudden increase driven primarily by the commencement of KG-D6 basin. The KG basin was the first deep water field that is discovered in 2002 and also is the country's largest discovery in around three decades since the discovery by ONGC at Bombay High. However as mentioned earlier, production from this block has failed to meet the projected production levels and was around 30.8 mmscmd in the year 2012.

As regards the onshore production, the north- eastern states of Assam, Nagaland, Arunachal Pradesh and Tripura combined are the biggest contributors, Gas production has steadily increased from this region since 2004-05. In 2010-11 they accounted for 39% of the onshore production. This region is expected as area with immediate potential for development of oil and gas prospects, However, due to infrastructural and political constraints, as well as underdeveloped local markets, the process has not yet picked up.

Till 2008-09, ONGC and Oil India Limited, the national oil companies were the key natural gas producers of the country. They were contributing to over 75% of the domestic production. But the situation changed with the discovery of KG-B6 by RIL. The share of private/joint venture companies in domestic production increased substantially. Still in 2009-10 ONGC was the biggest natural gas producer of the country. But after RIL's KG-D6 basin, RIL overtook ONGC and become the largest producer of natural gas in the country.

In 2010-11, despite the fall in the output, RIL continued to be the largest gas producer of 20,400 mmscm accounting for 39% of the total gas production in the country. However in

2011-12, ONGC regained its position as the largest producer in the country with a share of 49% of the total natural gas production. The other key producers in the private/JV sector are Crain, British Gas, Hardy Oil and Gas, Hindustan Oil Exploration Company (HOEC) and Gujarat State Petroleum Corporation. In 2010-11, The private/JV sector accounted for over 51% of the domestic production.

CONCLUSION

Domestic gas supply has not measured up to its promise and production has not met targets for 2011-12 and production targets for next two three years have been lowered as well. This may be because of major issue of complexity of production from deep sea basins of the Bay of Bengal where the KG blocks are located. After initial production levels are as per predictions, the pressures from the wells fell and higher than expected water quantities were pumped. Production has also fallen from the PMT fields.

The Government believes that the shortfall in gas production from the KG-D6 blocks are due to, in part, RIL's failure to drill 22 wells in the block as per the approved investment. While MOPNG imposed a penalty on RIL for underproduction from its block, there is actually no development plan clause in the Production sharing contract (PSC). In order to deal with this and several other concerns the government has appointed a consultant, Boston Consulting Group, to advice it on improving the PSC.

Development of the gas fields in the offshore areas, particularly on the east coast, poses serious challenges including technological challenges and deepwater drilling, field development and production, and harsh weather conditions and environment for operations. Indian oil and gas majors do not have much experience in this highly specialized field.

RIL has tied up with British Petroleum (BP) for exploration and development in 21 of its blocks. The partnership promises to bring in new deep sea drilling and production technology into the country and also help RIL in improving production from the KG-D6 basin. ONGC has also been scouting on the eastern coast. Further CBM production has not taken place as planned. As a result operators are unable to transport gas and are forced to flare most of it.

In addition, there is shortage of deepwater rigs. Further there is also a dearth of specialised oil and gas professionals in the country, requiring development of human resources in this sector.

CHAPTER III

CURRENT PIPELINE INFRASTRUCTURE

INTRODUCTION

Currently, natural gas represents 10% of the energy consumption in India but till 2025-30 it ia estimated that this consumption will go up by 25%. But to meet this increasing demand, the growth in construction of pipelines needs to increase. The present pipeline network is not widespread. It is concentrated in some areas of the country. So there is a need for the construction of national grid.

The gas transmission network in the country is 13,428 km long and is concentrated in the northern and western regions. But the original pipeline network was set up around the historical sources of gas production. Due to this, well established networks have been created in areas of Gujarat and has left other regions such as central and eastern India completely barren to pipelines. The Hazira-Vijaypur-Jagdishpur (HJV) pipeline is the oldest and longest cross country gas pipeline in the country. There are some other regional pipelines as well concentrated mostly in Gujarat and Maharashtra.[12]

Gas Authority of India Limited (GAIL) has dominated the gas transmission network in India for a long time. Consequently, private player started entering into the market like Relience Gas Transport Infrastructure Limited (RGTIL) which entered in 2003. It was a wholly-owned subsidiary of RIL initially but later got converted into a private company in the year 2006. Other highly recognised players include Gujarat State Petronet Limited (GSPL). It is a regional player but its status is recently changed as it is awarded license for cross country pipeline.

India is progressing in the gas transmission and distribution sector with many pipeline projects underway. Recently India became a signatory to first transnational gas pipeline in the year 2012 for the Turkmenistan-Afghanistan Pakistan India (TAPI) pipeline which has the potential to take the domestic gas supplies to the sky.

[12] Report on "Indian Gas Market 2012" by India Infrastructure Research

PRESENT PIPELINE INFRASTRUCTURE

As already stated, the total gas transmission network in India is 13,489 km long and is predominantly spread across northern and western regions in the country. The current gas network is consolidated across the western regions because historical sources say that Mumbai High, PMT, Bassein and Neelam and Hira gas fields which are situated in the western regions have been the major source of gas. Further, Dahej and Hazira have two LPG terminals which extract LPG from the middle east countries.

Following table shows the Major Gas Pipelines and its Utilisation as on 31.03.2014

Source: Petroleum Planning and Analysis Cell

NETWORK/REGION	Entity	Length Kms	Design Capacity (mmscmd)	Average Flow in 2013-14 (mmscmd)	% Capacity Utilisation as on 31.03.2014	Pipeline Size
HVJ GREP -DVPL & Spur (Hazira -Vijaipur- Jagdishpur) HVJ / VDPL	GAIL	4435	57.3	42.9	80.98	36"
DVPL-GREP Upgradation (DVPL-2 & VDPL)	GAIL	1112	54	15.33	28.39	48"
CHHAINSA- JHAJJAR -HISSAR P/L (Including Spur lines) commisioned up to Sultanpur , Jhajjar- Hissar under hold (111 Km) Flow of 5 Million up to 2011-12	GAIL	262	5	0.68	15	36" /16"
DAHEJ-URAN-PANVEL(DUPL/ DPPL) including Spur Lines	GAIL	873	20	8.92	44.82	30"/18"
DADRI BAWANA NANGAL P/L, Dadri- Bawana:106Km, Bawana - Nangal:501 KM, Spur Line of BNPL : 196 Km.	GAIL	803	11	2.40	0.0	36"/30"/24"/18"
DHABHOL -BANGLORE-PIPELINE (Including spur)	GAIL	1004	16	0.97	6.09	36"-4"
KOCHI-Koottanad-Banglore- Mangalore (Phase-1)	GAIL	41	6	0.31	5.21	16"-4"
ASSAM (Lakwa)	GAIL	8	2.5	0.55	22.0	24"
TRIPURA (Agartala)	GAIL	61	2.3	1.46	64.4	12"
AHMEDABAD	GAIL	144	3.0	0.38	13.0	12"
RAJASTHAN (Focus Energy)	GAIL	154	2.35	1.09	46.5	12"
BHARUCH , BADODARA (UNDERA) included RLNG+ RIL	GAIL	670	15.4	2.25	14.6	24" ,16"
MUMBAI	GAIL	129	24.0	22.9	95.4	26"
KG BASIN (included RLNG+ RIL)	GAIL	877	16.0	6.0	37.4	18"
CAUVERY BASIN	GAIL	268	9.0	3.57	41.22	18"
EAST- WEST PIPE LINE (RGTIL)	Reliance	1469	80.0	48.0	60	48"
GSPCL Network including Spur Lines	GSPCL	1874	50.0	22.0	44	Assorted
Assam Gas Company (Duliajan to Numaligarh)	AGC	1000	6.0	4.50	75	16"
Dadri -Panipat	IOCL	132	9.5	3.11	32.8	30"/10"

The Indian Gas network consists of four major pipelines namely[13]:

1. *Hazira-Vijaypur-Jagdishpur* Pipeline:

Initially this pipeline was of 1800 km long route length and its capacity as 18.2 mmscmd. It was used to cater to fertiliser plants, power plants, LPG processing plants, petrochemical plants and other industrial consumers mainly composed in the states of Madhya Pradesh, Gujarat, Rajasthan, Uttar Pradesh, Haryana and Delhi. With the passing years the pipeline is expanded to 2650 km with a capacity of 33 mmscmd.

This pipeline is put by GAIL. GAIL further launched the Gas Rehabilitation Project (GREP) in 1998. The aim of this program was to increase the pipeline capacity from 18 mmscmd to 33 mmscmd. The additional capacity could be to meet the increasing needs of the fertiliser and power industry. This project further laid a 460 km long pipeline between Vijaypur and Dadri via Agra, Firozabad and Mathura refinery.

2. *Dahej-Vijaypur-Dadri-Bawana-Nangal-Bhatinda* Pipeline

It is one the recent pipeline which is completed by GAIL. The Dahej-Vijaypur section was existing from quite a long time but the other sections commissioned in 2011 by the company.

This pipeline is of 42 inch diameter and total length of 2200 km. This pipeline is a part of National Gas Grid project. It was put with the aim to expand the existing gas transmission network being carried on by the HVJ corridor. With the construction of this pipeline, the HVJ-DVPL pipeline network accounts for 65% of the company's transmission capacity

3. *Dahej-Panvel-Dhabhol* Pipeline

This project was started in 2008. It is a 823 km pipeline with a diameter of 30 and has a capacity of 20 mmscmd. It carries Re-gasified liquefied natural gas (RLNG) from Petronet LNG limited terminal at Dahej to Dhabhol.

4. *RGTIL- EAST WEST* PIPELINE

RGTIL is private company which was established as a wholly owned subsidiary of Reliance Industries Limited (RIL). In the year 2006 when RIL discovered substantial amounts of natural gas in the KG-D6 basin, RGTIL ownership was changed subsequently and was set up

[13] "Indian Gas Market 2012" – Indian Infrastructure Research

as a private company. It started a 1358 km long Ease-West pipeline (EWPL) in April 2009. It was initially used to vacate gas produced from the RIL's KG-D6 and afterwards be used for transporting other gases which are found in the basin. Pipeline's capacity was equivalent to the peak production demanded from KG-D6 i.e 80 mmscmd. This pipeline stretches between Kakinada in Andhra Pradesh to Bharuch in Gujarat. In the year 2011-12, the pipeline gave a throughput of 48.0 mmscmd.

This pipeline passes the four states of Andhra- Pradesh, Karnataka, Maharashtra and Gujarat. It also has interconnections with GAIL and GSPL networks. It is among the largest pipeline projects that are undertaken in India. It involves right to use acquisitions of around 78000 landowners. It is the only pipeline in the country which has a uniform 48 diameter to allow reverse flow of gas.

REGULATORY FRAMEWORK

Petroleum and Natural Gas Regulatory Board (PNGRB) was set up in the year 2006 as a body to regulate the downstream activities of refining, processing, transportation, storage and distribution , marketing and sale of petroleum and petroleum products including natural gas. This all the existing and new pipelines come within the scope of PNGRB. The authorisations and licenses for the existing pipelines are given by Ministry of Petroleum and Natural Gas (MOPNG) but all the future pipelines need to get authorization from PNGRB.

S. No.	Name of NG Pipeline	Route/Region	Entity
1	Gujarat	Guajart	GAIL (India) Limited
2	Kochi-Koottanad-Bangalore-Mangalore	Kochi-Koottanad-Bangalore-Mangalore	Gail(India) Limited
3	Dadri-Bawana-Nangal	Dadri-Bawana-Nangal	Gail(India) Limited
4	Dadri-Panipat	Dadri-Panipat	Indian Oil Corporation Limited
5	Uran-Trombay	Uran-Trombay	Oil and Natural Gas Corporation Limited
6	DVPL-GREP	DVPL-GREP Capacity augmentation	Gail(India) Limited
7	Mumbai Regional	Mumbai Regional	Gail(India) Limited
8	Chhainsa-Jhajjar-Hissar	Chhainsa-	Gail(India) Limited

		Jhajjar-Hissar	
9	Agartala Regional	Agartala Regional	Gail(India) Limited
10	Dahej-Uran-Panvel-Dhabol	Dahej-Uran-Panvel-Dhabol	Gail(India) Limited Gail(India) Limited
11	K.G.Basin	K.G.Basin	Gail(India) Limited Gail(India) Limited
12	HVJ-GREP-DVPL	Hazira-Vijaipur-Jagdishpur-GREP-Dahej-Vijaipur	Gail(India) Limited
13	EWPL	Kakinada-Bharuch	Reliance Gas Transportation Infrastructure Limited
14	Dabhol-Bangalore	Dabhol-Bangalore	GAIL
15	Gujarat regional	Gujarat regional	GAIL
16	Cauvery Basin regional	Cauvery Basin regional	GAIL (Final) GAIL (Provisional)
17	Assam regional	Assam regional	GAIL
18	Amendment letter for Agartala	Amendment letter for Agartala	GAIL
19	AGCL's Assam Gas Pipeline network	AGCL's Assam Gas Pipeline network	Assam Gas Company Ltd.
20	Dulki-Maharajganj Natural Gas Pipeline network	Dulki-Maharajganj Natural Gas Pipeline network	GAIL
21	Uran-Taloja Natural Gas Pipeline network	Uran-Taloja Natural Gas Pipeline as common carrier pipeline network	Deepak Fertilizers And Petrochemicals Corporation Ltd.

Source : Petroleum and Natural Gas Regulatory Board.

This table shows the details of Authorised Natural Gas Pipelines.

The key regulations governing the pipeline segment is mentioned in the Chapter V of this disertation which reflects the main focus areas of the oil and gas sector and also talks about key regulatory framework of upstream and downstream segment.

FUTURE PROSPECTS IN PIPELINE DEVELOPMENT

GAIL: Over the years, GAIL as a major pipeline operator has contributed to the growth and development of natural gas pipeline infrastructure and natural gas market and has existing 10,972 Kms. of robust gas pipeline infrastructure with a capacity of 210 MMSCMD. GAIL's existing natural gas pipeline network has Pan- India presence and covers 16 States (AP, Assam, Delhi, Goa, Gujarat, Haryana, Karnataka, Kerala, MP, Maharashtra, Punjab, Rajasthan, TN, Tripura, Uttarakhand, & U.P.) and 2 UT's (Puducherry & Dadra Nagar Haveli).

The existing pipeline network of GAIL has following pipelines:

	Operational Natural Gas Pipelines of GAIL	
	Common Carrier+ Dedicated	
Sl. No.	Network/ Region	Length (in KMs.)
1	HVJ-GREP-DVPL	4658
2	GREP DVPL Upgradation	1119
3	DUPL-DPPL	875
4	TRIPURA	61
5	GUJARAT	691
6	MUMBAI	129
7	KG BASIN	881
8	CAUVERY BASIN	278
9	ASSAM	8
10	CJHPL	265
11	DBNPL	810
12	DHABOL-BANGALORE PIPELINE	1004
13	KKBMPL	41

14	JAISELMER REGION	151
	GRAND TOTAL	10972

Source : GAIL

GAIL was also awarded Grant of Authorization for Surat-Paradip P/L on 25.04.2012 by PNGRB which GAIL won under competitive bidding. The capacity of the P/L is 74.81 MMSCMD stretching over a Length of approx.. 1990 Kms.

With upcoming of Jagdishpur Haldia P/L and Surat Paradip P/L, GAIL shall cover 5 more new States such as Bihar, Chattisgarh, Jharkhand, Odisha and West Bengal.

GAIL shall continue to meet the Noble objective of supply and transportation of natural gas through its state of art natural gas transmission pipeline system and shall contribute to the growth and Industrialization in India[14].

RGTIL

RGTIL stands for Reliance Gas Transportation Infrastructure Limited. Relogistics Infrastructure limited (Relog) was authorised by PNGRB to lay following cross country pipelines[15]:

- Kakinada-Basudebpur-Howrah pipeline
- Kakinada-Chennai pipeline
- Chennai-Bangalore-Mangalore pipeline
- Chennai – Tuticorin pipeline

GSPL

It is a GSPC group company developing energy transmission infrastructure and expanding regional pipeline network in Gujarat. It is the first pipeline company which is operating on Open Access basis. Presently the company transports about 21.08 mmscmd of natural gas. It transports gas to over 133 customers including all sectors where gas is required[16].

[14] http://gailonline.com/final_site/naturalgas_transmission.html

[15] http://www.rgtil.com/

[16] http://gspcgroup.com/content.php?SecType=1&CID=2

The upcoming projects of GSPL includes three cross-country pipeline projects namely

- Mallavaram-Bhilwara
- Mehsana-Bhatinda
- Bhatinda-Srinagar

The total investment for three projects would be Rs.137.04 billion

PIPELINES UNDER PNGRB REVIEW

Pipeline (tentative length in km)	**Company submitting EOI**	**Tentative route**	**Capacity**	**Source of gas**	**Status**
Durgapur-kolkata (160)	Essar Oil Limited	Durgapur-Kolkata along National Highway-2	4	CBM blocks in Ranigang (West-Bengal) and Rajmahal (Jharkhand)	Bidding completed. Project yet to be awarded
Ennore LNG terminal Nellore	APGIC	Ennore LNG Terminal to Nellore with spur line at Renigunta and Tirupati	4	Ennore LNG Terminal, alternate source from Kakinada-Chennai pipeline and Chennai-Bengluru Pipeline	Under public consulatation
Kakinada-Srikakulam	APGIC	Kakinada-Srikakulamspur line to Vizag steel	20	New gas finds in KG-D6 baisin	Under public consulatation
Shahdol-Phulpur	RGTIL	Shahdol-Phulpur	4.3	RIL's Sohagpur CBM block	Under public consulatation

Source: Petroleum and Natural Gas regulatory Board and India Infrastructure Research

NATIONAL GAS GRID

Every sector has recognized the importance of natural gas. And with the difficulty in its availability and rise in price of gas, a need has emerged to create a nationwide Gas Grid. The major issues in its creation is availability of poor gas infrastructure. But by considering the idea of having a national grid would help in recognition of many pipeline projects and will result in effective supply of gas across the country meeting the growing energy demand.

TRANSNATIONAL PIPELINES

Efforts are being made by doing negotiations regarding setting up of international gas pipelines. These pipelines include transnational Turkmenistan –Afghanistan- Pakistan-India (TAPI) pipeline. Apart from this, MOPNG in one of its press release[17] on 16 March 2015 has confirmed construction of a proposed Deep Water Natural Gas pipeline from Middle East (OMAN) to India. The project is not under consideration of Government at present.

TAPI

This projects includes construction of a 1680 km pipeline from Turkmenistan to Fazilka (at India-Pakistan Border) passing through Herat and Kandahar provinces in Afghanistan and through Quetta and Multan provinces in Pakistan. The capacity of pipeline would be 27 bcm per year. India Pakistan and Afghanistan have signed an agreement to buy natural gas from turkmenistan in 2008. The project was supposed to commence in 2010 and the delivery prospected from the construction was in the year 2015. But the security issues in Afghanistan and deplomatic relations between India and Pakistan acted as roadblocks in the implementation of the project

In the press release stated earlier, it is stated that apart from the Gas Pipeline Framework Agreement (GPFA) signed among the TAPI members in 2010, another GSPA was signed by GAIL with the Turmengas for sourcing of gas in the quantity of 38 mmscmd from TAPI pipeline for 30 years of time limit specified.

Further as per Business line newspaper report[18] said that ONGC has taken large interest in the construction of transnational pipelines and in its one of the presentations to Prime minister

[17] http://pib.nic.in/newsite/PrintRelease.aspx?relid=117130

[18] http://www.naturalgasasia.com/indias-ongc-keen-on-participating-in-transnational-pipeline-projects-12846

Narendra Modi has proposed a standard on one transnational pipeline to capture gas from Iran, Oman and Central Asia.

CONCLUSION

We have seen that there is development in the gas infrastructure in India in the last few years. But there might be come lacunas in the regulatory regime such as :

- There are varied state taxes in different states. So this leads to diverse gas pricing in different regions, leading to diverse demand and supply.

- Tariff regime is also under criticism by various participants of the gas sector. It is because present tarriff regime includes zonal tariff that is calculated on the basis of distance from source to supply. So states which are at less distance from the source of gas are charged less tariff as compared to the one at large distances. This way small states at large distances will continue to face gas shortage and stagnant infrastructure development.

- There is scarcity in gas availability as supplies from the KG-DG have fell and there are no new discoveries coming into production. So the producers are resorting to expensive imported LNG to meet there demands. This has stopped the future projects and the currently operating projects are facing gas scarcity

- There are various regulatory issues such as delay in planning and construction of gas pipelines which PNGRB has to look into.

Thus this sector has to cope up with the challenges and have to ensure adequate pipeline infrastructure and gas supplies across the nation. The relief is that demand of gas is increasing in different sectors and as gas transmission pipeline projects are low risk project they will continue to attract demand.

CHAPTER IV

MECHANISM OF NATURAL GAS PRICING

Broadly there are three different types of pricing regimes in the country. One, where prices are determined by the government for fields that are awarded on a nomination basis (or APM) or it may also be under a Joint Venture between a private and a public entity. Two, it is for operators of fields under the PSCs governed under the New Exploration Licensing Policy and third is for LNG which is based on term contracts and Spot prices.

The issue of gas pricing has been discussed by many committees during the years. The government continues to determine the price for sale of gas from blocks awarded on a nomination basis to two public sector enterprises, a) Oil and Natural Gas Corporation (ONGC) and Oil India Limited (OIL) under the APM.

The natural gas that is produced by ONGC and Oil India Limited (OIL) from nominated blocks comes either from new fields or from the existing blocks. New fields referred here are those fields which went into production after May 2005. There are separate price mechanism for these two, i.e. Administered Price Mechanism (APM) and non- Administered Price mechanism. Out of 80.02 mmscmd of total supply of natural gas in the year 2013-14, 48.18 mmscmd of natural gas was under administered price mechanism and 9.02 mmscmd was under non-administered price mechanism.

ADMINISTERED PRICING MECHANISM[19]

Gas that is produced from the existing fields of the nominated blocks of National Oil Companies (NOCs) is covered under this mechanism. National Oil Companies were allotted these blocks on the nomination basis under the tax royalty regime. Predominantly this gas is being supplied to, power plants, fertiliser plants, customers having a requirement of less than 50,000 standard cubic meters per day at APM rates.

Initially the APM price was fixed on cost plus basis[20]. However with effect from 1.6.2010, the government fixed APM price in the country at $ 4.2/ mmbtu except the north east, where

[19] Rangarajan Committee report on Gas Pricing- 2014, Available at:

http://petroleum.nic.in/docs/committee_report_on_gas_pricing_2014.pdf

APM price is 60% of APM price else-where i.e. $ 2.5/ mmbtu. The balance 40% is paid as subsidy to NOCs from the government budget.

The other price that is approved by the government includes the two major private/joint venture fields, Tapti and Panna-Mukta.

NON-APM GAS PRODUCED BY NOCs FROM NOMINATED FIELDS

National oil companies are free to charge any price as per the market for gas produced from the new fields in their existing nominated blocks. But Government has issued some guidelines and have made a pricing schedule for commercialization of Non-APM gas produced by NOCs from their new fields in their nominated blocks. Four supply zones are highlighted in the guidelines.

Further a premium of $0.25/mmbtu for production of non-APM gas from Offshore fields have been provided. The reason behind this is that higher investment is required for development and production from offshore fields.

PRE-NELP GAS

There were certain discoveries made by NOCs. These discoveries were auctioned under a production sharing contract to Private sector E & P companies to overcome funding constraints and lack of advanced technologies. In 2013-14 these blocks were suppliers of 9.85 mmscmd of gas to various customers.

These PSCs contain a condition wherein the entire gas produced has to be sold to the government nominee, mainly Gas Authority of India Limited (GAIL) as per the formula specified in the PSC. Prices of gas for these PSCs were derived on the basis of limited tender and GAIL matched the highest price bid every time.

In the Patna Mukta & Tapti (PMT) PSCs the price for gas is linked to an internationally traded fuel oil basket with a specified floor and ceiling price[21]. These PSC also have a

[20] Under this approach, you add together the direct material cost, direct labor cost, and overhead costs for a product, and add to it a markup percentage (to create a profit margin) in order to derive the price of the product.

http://www.accountingtools.com/cost-plus-pricing

[21] A price ceiling is the maximum price a product can be charged according to the government. In order for a price ceiling to be effective it must be below the natural market equlibrium.

provision of revision of these ceiling price after 7 years from the date of first supply. GAIL as a government nominee is buying gas from PMT JV at this revised rate. Out of the total allocation of gas 17.3 mmscmd, 5 mmscmd of gas goes to power and fertiliser sectors, which is being supplied at APM rate to customers.

The second pricing regime is for those fields operating under the PSC regime where prices are discovered on the basis of arm's length principle[22], for all consumers based on the government allocated priority.

NEW EXPLORATION AND LICENSING POLICY (NELP)

The following provisions of the PSC (for NELP I)[23] are relevant in the context of sale of natural gas and the price to be adopted for valuation purposes to calculate cost petroleum, profit petroleum share and royalty:

Articles 21.6 Valuation of Natural Gas

21.6.1 The Contractor shall endeavour to sell all Natural Gas produced and saved from the Contract Area at arm's length prices to the benefits of Parties to the contract

21.6.2 Notwithstanding the provision of Article 21.6.1,natural gas produced from the ContractArea shall be valued for the purposes of this Contract as follows:

(a) Gas which is used as per Article 21.2 or flared with the approval of the Government or re-injected or sold to the Government pursuant to Article 21.4.5 shall be ascribed a zero value;

(b) Gas which is sold to the Government or any other Government nominee shall be valued at the prices actually obtained; and

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Whereas, a price floor is the minimum price a product must be charged according to the government. It is only effective If it is set above the equilibrium price. Information at:

http://healthecon.wikispaces.com/Price+ceilings+and+Price+floors+%26nbsp%3BWhat+is+the+effect+of+a+price+floor+or++ceiling%3F+What+is+the+effect+of+prohibition%3F+How+does+Medicaid+function+similar++to+a+price+ceiling%3F

[22] The Organisation for Economic Co-operation and Development (OECD) has adopted the principle in Article 9 of the OECD Model Tax Convention. It is a prinicple which ensures that prices between parties are established on the market value basis. In this context, the principle means that prices should be the same as they would have been, had the parties to the transaction not been related to each other.

[23] Supra.,19

(c) Gas which is sold or disposed of otherwise than in accordance with paragraph (a) or (b) shall be valued on the basis of competitive arm's length sales in the region for similar sales under similar conditions.

21.6.3 The formula or basis on which the prices shall be determined pursuant to Article 21.6.2 (b) or (c) shall be approved by the Government prior to the sale of Natural Gas to consumers/buyers. For granting this approval, Government shall take into account the prevailing policy, if any, on pricing of Natural Gas, including any linkages with traded liquid fuels, and it may delegate or assign this function to a regulatory authority as and when such an authority is in existence.

Under NELP, initially gas pricing has been approved only in cases of RIL's KG basin discovery. In 2007, RIL submiitted a price formula for the approval of the Government. The price formula that was proposed[24] is:

*SP=112.5*K+(CP-25)0.15*ER+C*

Where,

SP is the sale price of gas in Rs/mmbtu.

CP is the annual average Brent crude price for the previous financial year, with a cap of $ 65/bbl and a floor of $ 25/bbl.

ER is the average $/Rs. exchange rate for the previous financial year.

K is 1 for ER between 25 and 65, or ERl25 when ER is less than 25 or ERl65 when ER is more than 65.

C is the premium quoted by the customer.

In the proposal, the price formula was benchmarked[25] to international crude oil price, with a floor and a ceiling price and also a constant factor to take care of bidding.

The Economic Advisory Council's chairman, Dr. Rangarajan examined the price formula and made important recommendations. In order to look into the gas supply and pricing issues government also constituted a Committee of Secretaries (COS) under the cabinet secretary. The committee recommended that the government should first frame a Gas Pricing and Gas

[24] Supra.,19

[25] A measurement of the quality of an organization's policies, products, programs, stratergies etc and there comparision with standard measurements.... Definition at http://www.businessdictionary.com

Utilization policy, before considering the price proposal. Hence Empowered Group of Ministers (EGoM) was constituted on 13 August 2007 to examine, analyse the matter and decide issues relating to gas pricing and commercial utilization of gas under NELP.

After considering various recommendations given by a number of stakeholders, and taking into account the reports submitted by the aforesaid two committees, the EcoM took the following decisions[26]:

- It would not be for the benefit of the country to step back from the PSC entered into in good faith under NELP. Sanctity of the contracts signed should be maintained.

- The price formula that is submitted by RIL may be accepted but with modifications as per the recommendations of EAC. The government will decide the price only on the basis of this formula. This should bring the price down to 8%.

- The price discovery process on arm's length basis will be adopted in the future NELP contracts only after approval of the price formula by the Government. The price discovered through this process would be applicable to all sectors uniformly.

Government finally approved the following formula:

SP = $2.5 + (CP-25)0.25 + C

In this formula, SP is the sales price, CP is the price for crude and C is the biddable component.

In case of the RIL's KG-D6 gas, the approved price of $4.2 per mmbtu was based on floor price of $25 per barrel for crude and a ceiling price of $60 per barrel. The biddable component was kept at Zero.

The above stated gas pricing framework under the NELP was examined by the Hon'ble Supreme Court. The Case analysis is discussed below.

[26] Supra.,19

SUPREME COURT'S JUDGMENT IN

RELIENCE INDUSTRIES LIMITED (RIL) v. RELIENCE NATURAL RESOURCES LIMITED (RNRL)[27]

AND ROLE OF GOVERNMENT IN PSC REGIME

Over the years there has been conflict over extraction and exploitation of natural resouces. This debate is not far from the minds of framers of Constitution of India. Article 297 vests all lands, minerals and things of value under the territorial waters and Exclusive Economic Zone in the Union of India and it also directs the Government to distribute the material resources of the community for the common good to benefit everyone and prevent the concentration of wealth in the economic system. Further this provision has to adhere to the mandatory requirements of Article 14 and Article 19(1)(g) read with clause 6 of Article 19 of Constitution of India which demands that the principle of equal treatment to all and protection of freedom of business, trade and commerce should be followed subject to the reasonable restrictions.

Supreme Court have many times tried to judicially interpret these provisions but these provisions have never been looked into from the point of view of a mechanism that protects the natural resources of the country from misuse. This is for the first time in the above cited case that Supreme Court has appreciated the said scheme in the Constitution of India. In this case the Supreme Court has enumerated the jurisprudence of scarce natural resources. And in regards of this case natural resources are restricted to non renewable natural resources such as minerals, petroleum and natural gas[28].

FACTUAL BACKGROUND

Reliance Industries entered into a Production Sharing Contract (PSC) with Union of India in the year 1999 wherein RIL was awarded the rights to explore the Exclusive Economic Zone (EEZ) of India for Natural Gas. RIL found commercial quantities of natural gas in the Krishna Godavari (KG) basin in the year 2003. RIL made plans in consultation with the Government to begin the extraction of the natural gas which was found.

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[27] (2010) 7 SCC 1

[28] Zoheb Hossain and Alok Prasanna Kumar,'The New Jurisprudence of Scarce Natural Resources' Available:

http://www.commonlii.org/in/journals/INJlConLaw/2010/6.pdf

In the meanwhile, due to the dealt of the founder of the founder of RIL Dhirubhai Ambani, RIL itself got split into two groups of companies headed by the two sons Anil and Mukesh Ambani. During the course of the split, one of the companies headed by Mr. Anil Ambani Reliance Natural Gas Limited (RNRL) claimed that it had to be supplied with 28 mmscmd of natural gas at $ 3.24 for the period of 17 years on the basis of the family MoU entered into between both the brothers. He approached Bombay High Court for the enforcement of the same. The Single Judge of Bombay High Court held that both parties should re-negotiate there agreement as suitable arrangements made to supply natural gas had to be made in accordance with the Government policy and Legislation. Both parties filed before Division Bench of High Court of Bombay. During the pendency of the dispute, the Bombay High passed interim order of injunction against creation of third party rights in the natural gas at KG-D6. But with the increasing demand for natural gas the government sought lifting the injunction in the Bombay High Court. For this purpose, Union of India impleaded as a party to the dispute.

After hearing all the parties, Court passed the orders lifting the injunction and gave permissions to do commercial exploitation of natural gas from the KG-D6 field. Due to limited availability of natural gas, Government set out the Gas Utilization Policy, giving priority to certain sectors of the economy such as Power Generation, Fertilisers, LPG and Transportation.

In its final judgement, Division Bench of Bombay High Court disposed of the appeals holding that:

- A fixed quantum of gas, i.e. 28 mmscmd for a period of 17 years stands allocated to RNRL from the KG D6 field.

- RIL will have to supply RNRL natural gas at rates prescribed in the private arrangements irrespective of Government decisions on the same.

- The price, quantity and tenure as decided in the private arrangement between Mukesh Ambani and Anil Ambani will prevail over the Government fixed price, quantity or tenure. RIL was free, as per the terms of the PSC, to sell the natural gas extracted at any price since the price fixed by the Government was only for purposes of valuation.

- Government decisions will apply only to the 10% of the natural gas extracted and saved, i.e., "profit gas".

- Any further allocations of gas made by the Government will apply only to the 10% of the gas which is the "government's take"[29].

Aggrieved by the said order the concerned parties filed appeals before the Supreme Court Of India. The most aggrieved was Union of India. The High Court's Judgement has completely subordinated the Government's power to regulate the natural gas sector as regards the private arrangements between parties. Also it ignored the fact that the extraction and supply of natural gas is regulated by PSC which is entered prior to date of MoU and hence would prevail over any further new arrangements between the parties. Further, there is a specific provision in the Constitution of India and in the PSC stated clearly that ownership of natural gas continues to remain with the Government till it reaches onshore and put into delivery to a customer.

The Supreme Court of India, hence overruled the said Bombay High Court's Judgement and held as follows:

- All natural gas vests in the Union of India by virtue of Article 297, and title vests to the delivery point in accordance with Article 27.1 of the PSC.

- Since some functions of the Union relating to the exploration and supply of natural gas have been privatized, such private parties are also bound by other Constitutional obligations that would have been applicable to the Union of India if such functions had not been privatized.

- The power of the Union of India to regulate supply and production of natural gas is paramount under the Constitution. It is put into operation through relevant statutes and the PSC itself and this cannot be superseded by a private arrangement.

- Allocation of natural gas made by the EGOM cannot be overridden by a contractor through a private arrangement.

[29] Reliance Industries Limited v Reliance Natural Resources Limited 2009 (111) Bom LR 2507.

- Contractor, i.e. RIL, is bound by the decisions of the EGOM on price, quantity and tenure of supply of natural gas.

- Supplies of natural gas can only be made in accordance with the policies of the Government and RNRL will have to approach the Government seeking allocation of gas before any supplies are made to it. Further, such supplies must be in accordance with the price, quantity and tenure fixed by the Government in the decisions of the EGOM.

ANALYSIS OF THE JUDGEMENT

This is a landmark judgement as in this case Supreme Court of India has affirmed the power of the Government to regulate the natural gas sector. If we see the present outlook of natural gas supply in the country, under the Gas Utilization Policy made by Enpowered Group of Ministers, on a large scale, consumers of natural gas requests for its supply and allocations are made in accordance with the priority listed out in the policy. But the question which is to be looked into here is that whether this manner of regulation will survive the scrutiny of Courts under Articles 14 and 19 of the Indian Constitution.

But since there were no debates as to the merits of the policy Court did not enter into this matter. Court analysed the manner of regulation and the Judgement of Reddy J , in clear depth. Reddy J, notes that in the Constitution the resources of the country are vested with the Government but this certainly does not indicate any sense of 'ownership'. It is not a power that is vested with the Government rather it is a duty placed upon the Government to make use of these resources in the manner prescribed in the Constitution. Briefly, Government of the state should ensure that there should be equal access to the natural resources and its distribution should be equal in the sense that it should not end up favouring a few to the detriment of all.

Reddy J, does not scrutinize whole scheme of regulation of oil and natural gas, however he has laid down broad principles to be followed in interpreting the scope of provisions of the Production Sharing Contract. These principles are as follows:

- Transfer title of those resources after their extraction unless the Union receives just and proper compensation for the same;

- Allow a situation to develop wherein the various users in different sectors could potentially be deprived of access to such resources;

- Allow the extraction of such resources without a clear policy statement of conservation, which takes into account total domestic availability, the requisite balancing of current needs with those of future generations, and also India's security requirements;

- Allow the extraction and distribution without periodic evaluation of the current distribution and making an assessment of how greater equity can be achieved, as between sectors and also between regions;

- Allow a contractor or any other agency to extract and distribute the resources without the explicit permission of the Union of India, which permission can be granted only pursuant to a rationally framed utilization policy; and

- No end user may be given any guarantee for continued access and of use beyond a period to be specified by the Government.

These guidelines are laid down specifically in context of production sharing contracts, however they provide a useful basis for examining the validity of regulation in other sectors as well.

Further Reddy J, laid down issues faced by every nation in its attempt to regulate the extraction and exploitation of natural resources. These are:

- adequate supplies to meet overall energy and industrial needs;
- equitable access across all sectors, especially those which have implications for quality of life; and
- equitable pricing, even if market forces are allowed to play a much larger role.
- energy security of the nation;
- energy defense links;
- and inter-generational equities

These concerns are not exclusively in the natural gas market but are valid in context of a range of natural resources which are important in meeting country's infrastructure and energy needs. These principles offer valuable guidance that should be followed in future by the courts and also by the government in framing regulatory policies for natural reources.

CONCLUSION

Reliance case provides basic framework to prevent the concentration of natural resources in few hands. The principles that are laid down in this case are laid down keeping in mind the constitutionality of the scheme of the provisions. Further this case distingwishes between the concepts of absolute *'ownership'* and lays down that although Union of India is the absolute owner of natural resources found in the territorial waters, the extent of powers and limitation of powers of the government is subject to its duty to ensure equitable access to these resources among all the citizens of this country. This is highlighted such that some functions of Union of India relating to explotation and supply of natural gas has been privatized.

However, the power of the Union of India to regulate supply and production of natural gas is paramount under the Constitution. It is put into operation through relevant statutes and the PSC itself and this cannot be superseded by a private arrangement.

RANGARAJAN COMMITTEE REPORT ON GAS PRICING[30]

The Government of India had constituted a committee headed by Chairman Mr. C. Rangarajan in May 2012 to have a look at the production sharing contract mechanism of the Production Sharing Contract in the petroleum industry. The main aim of the committee was to suggest structure and the elements of guidelines for determining the formula or the basis of calculation of price of gas produced domestically. Thus when the committee submitted its report on the above stated issue in December, 2012, it contained a recommendation regarding the formula for calculation of gas pricing produced domestically.

The Cabinet Committee on Economic Affairs considered this issue and thereafter the Government of India formulated Domestic Natural Gas Pricing Guidelines, 2014 on 10th January,2014, which set the formula for pricing of domestically produced gas on the recommendations of the Rangarajan Committee.

The Notification regarding this new formula has to be implemented with effect from 1st April 2014 but the same could not be done as the Election Commission post porned the process for notification of gas pricing till the completion of 2014 Lok Sabha General Elections. Hence it was decided that this issue of gas pricing would be re-examined and the pricing guidelines 2014, would be kept at stay till 30 September 2014 and till that period the domestic gas could continue to be priced at rate prevailing on 31st March 2014.

CONSTITUTION OF THE COMMITTEE

The committee was formed by the Ministry of Petroleum and Natural Gas on 13th August 2014 and it comprises of following members:

1. Sri P K Sinha, Secretary (Power), Govt. of India, Member

2. Sri Ratan P Watal, Secretary (Expenditure), Govt. of India, Member

3. Sri J K Mohapatra, Secretary (Fertilizers), Govt. of India, Member

[30] Available at:

http://petroleum.nic.in/docs/committee_report_on_gas_pricing_2014.pdf

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4. Sri Rajive Kumar, Addl. Secretary, (P&NG), Govt. of India, Member Secretary.

The committee was formed to undertake a comprehensive re-examination of the issue of Gas Pricing. But the committee has to consult the various major stakeholders before submitting its recommendations.

MAJOR ISSUES BEFORE THE COMMITTEE

The pricing issues before the committee has always been very complex. Initially, gas supplies were declining while non-APM gas saw a drastic increase in volume and share. Priority wise APM gas is allocated mainly to fertilisers and power generators. MOPNG has been increasing the prices to limit losses from the PSU and Ministry of Power, Fertiliser and Chemicals have been objecting against it.

ISSUES FROM THE SUPPLY SIDE:

On the supply side, low APM prices sounds detrimental to the industry and prices should be high enough to attract upstream investments and recover the production and capital costs and also to limit the difference between the international market prices and domestic retail price from PSUs. Many PSU have complained that they are undergoing losses due to low prices. Further, India is in need of increasing LNG supplies to reduce the demand supply gap[31].

ISSUES FROM THE DEMAND SIDE[32]:

On the demand side, it is difficult to maintain the consumer competitiveness alongwith keeping prices closer to the market price. The price of KG-D6 block for tne initial five years was more than twice the formar APM price level fixed by the government. So this price became the bencemark. Being a private entity RIL cannot sell gas at under cost, so their clients should be able to pay their cost plus for any of their gas. This also depicts that gas affiordabiity alongwith gas availaility is crucial for gas market.

For the power and fertiliser sectors there are two alternative fuels. One is coal and another is Naphtha. Currently, gas represents small portion of total power capacity. Also in many areas coal is cheaper than gas. Thus the test of gas utilization in these two sectors depend upon shift

[31] Rangarajan Committee Report
[32] ibid

in APM prices. In the Fertiliser sector, increasing of gas price will require some policy solution, because this increase would increase the subsidies of these customers. This will not be accepted by the Finance Ministry and would lead to drastic effect on India's self sufficiency with regard to agricultural products.

FEATURES OF THE COMMITTEE

1. The Rangarajan committee arrived at a formula for price regarding natural gas
2. The new formula will lead to doubling of prices to around $ 8/mmbtu.
3. The Rangarajan committee's formula is based on the weighted average price of natural gas in North America, Europe and Japan markets as well as imported LNG
4. The committee favours deregulating the natural gas sector in a phased manner over the next five years.
5. The panel has also recommended that production sharing contracts with oil companies in the future shall be based on the amount of oil and gas output that the company is willing to offer to the Government.
6. Under the new system of bidding, the company that was willing to offer the highest amount of oil or gas produced from the field would get the contract[33].

RECOMMENDATIONS[34] MADE BY THE COMMITTEE

1. **FISCAL TERMS UNDER THE PSC**

The current PSC mechanism allows the contractor to recover its cost before giving the share in revenues to the Government. A certain proportion of the contractor's revenue is shared with the government on the basis of investment multiple each year. These investment multiple is the ratio of cumulative net cash income to cumulative exploration and production cost. With the increase in the investment multiple the share of the government also increases.

In the present pricing mechanism it is important for the Government to do a close scrutiny of the costs. This is because there are chances that the contactor can charge as cost expenses, the costs that do not reflect the true economic costs of the contractor. Contractors view it as

[33] Supra., 8
[34] Supra.,30

Government's interference in the commercial decision making, whereas the government view it as legitimate and necessary.

Hence, since it observed that cost recovery is the root of all the problems, it is proposed to dispense with it. So, new future PSC would allow the contractor to share his overall revenues without setting off any costs. The share of revenue would be determined through a competitive bidding process. The mechanism of bidding would be such that the bidder would offer different percentage of revenue shares for different shares of production and price levels. This would ensure that as contractor earns more, Government would earn progressively higher revenue.

The committee has also recommended to expand the tax holiday to 10 years, as against 7 years which is already available for all blocks involving offshore drilling at a depth of more than 1,500 meters.

Further committee has recommended to expand the time limit of exploration in future PSC for frontier, Deep water and Ultra Deep water blocks, from eight years to 10 years.

2. CONTRACT MANAGEMENT

The committee has further recommended two mechanisms for enhancing the progress of exploration and development under the existing PSC. It has suggested the formation of Secretary-level Inter-Ministerial Committee, for giving policy solutions in policy related matters.

In cases of delay on part of the contractor in preparing for and seeking approvals and other technical issues, the present mandate of Empowered Committee of Secretaries (ECS) can be expanded. Initially, ECS was empowered to codone delays in the exploration phase only.

3. AUDIT

It is recommended by the committee that –

- List of blocks that are selected to be directly audited by CAG should be made available to the CAG.
- CAG should do the selection of blocks on the basis of its financial materiality, and should keep its prime focus on exploration and development phase when high costs are incurred.

- CAG should perform the audit within two years of the financial year under audit, as prescribed in the PSC.

4. GAS PRICING MECHANISM

At present, there are two types of gases: namely, APM gas and Non-APM gas. The difficulty in valuation of gas for determining the share of the Government is that there is no single gas price.

In India range of prices are spread significantly and there are long-term supply import contracts and spot import contracts as well. However, the re-gasification infrastructure poses restriction on the imports. The domestic gas too does not have proper transportation infrastructure to facilitate the creation of a domestic market

The PSC provides for arm's length pricing and former Government approval of the formula or basis for gas pricing, subject to policy on natural gas pricing. Since there is no market determined arm's length price for domestically produced gas and since it is not likely to happen for several more years, a policy on pricing of natural gas has been proposed.

The proposed policy would provide for estimation of an unbiased **arm's length price** based on an **average of two prices**, which can be interpreted as alternative estimates of an arm's length price for the Indian producer. The relevant price in this context would be the price producers receive in other gas-producing destinations. One price would be derived from the volume-weighted net-back price to producers at the exporting country well-head for Indian imports for the trailing 12 months. The other would be the volume weighted price of US's Henry Hub, UK's NBP and Japan Custom Cleared (on net-back basis, since it is an importer) prices for the trailing 12 months. The arm's length price thus computed as the average of the two price estimates would apply equally to all sectors, regardless of their prioritisation for supply under the Gas Utilisation Policy[35].

Thus the methodes which were recommended by the Rangarajan Committee report which can be used for pricing of natural gas are:

[35] Press Release of Economic Advisory Council on the Report of Rangarajan Committee on the PSC mechanism in the Petroleum Industry available at:

http://eac.gov.in/pressrel/press_psc0201.pdf

1. **Arm's Length pricing :** Arm's Length pricing means sales made freely in the open market, in freely convertible currencies between willing and unrelated sallers and in which such buyers and sellers have no contractul or other relationship, directly or indirectly or any common or joint interest as is likely to influence selling prices.

2. **Average of two prices:** the price would be derived from the volume-weighted net-back price[36] to producers at the exporting country well-head for Indian imports for the trailing 12 months. The other would be the volume weighted price of US's Henry Hub, UK's NBP and Japan Custom Cleared (on net-back basis, since it is an importer) prices for the trailing 12 months.

The suggested formula will apply to pricing decisions made in future, and can be reviewed after five years when the possibility of pricing based on direct gas-on-gas competition may be assessed.

ANALYSIS OF RANGARAJAN COMMITTEE'S RECOMMENDATIONS

With the introduction of new formula for acertaining the gas price, it is predicted that the new formula would lead to rise in domestic gas price from U.S. $4.2/mmbtu to $ 6.17/mmbtu[37]. This increase will impact the downstream participants. As gas contracts are governed in U.S dollars weakening of Indian Rupee, increases the purchase price. This will benefit domestic producers as higher revenues would lead to higher profits but on the other hand the same increase will adversely affect those consumers who sell in Indian Ruppee. They will be vulnerable to exchange rate movements.

[36] netback price as regards to crude oil is : all the costs of getting the crued in the market, such as shipment and refining cost are substracted from the total revenues from the sale of oil products. The net figure thus produced is the net back price of the crude oil product..... more information at:

http://www.investopedia.com/terms/n/netback.asp

[37] "Impact Assesment of Gas Price Hike" – ICRA special report Available on:

http://www.icra.in/Files/ticker/Impact%20Analysis%20of%20Gas%20Price%20Hike_Oct%202014.pdf

Thus the present change in gas pricing formula would have effect on several sectors, which is mentioned in detail below.

When asked as to what will be the impact of rise in gas price on prices of fertilizers and MSP of wheat/rice/sugar and hence, on inflation, the Ministries/ Department of fertilizers, Planning Commission and P&NG in their post evidence replies responded as under[38]:

"There is a direct impact of rise in gas price on the prices of fertilizers as increase in the price of gas by Rs.1.00 per MMBTU results in the increase of the cost of production of urea by Rs.24.893. Therefore, the additional liability of subsidy towards domestic urea would be Rs.24.893/MT of urea approximately. Eg. On an average in India around 24.893 MMBTU of natural gas is required to produce one MT urea. If gas price increase by $1/MMBTU, then per MT increase in production cost of urea will be 24.9*1*55=Rs.1369.5/MT. Therefore, an increase of USD 1/MMBTU translates to enhanced cost of production of about (55*24.9=1369) Rs.1369/MT of urea. Increasing gas price by USD 1/MMBTU translates into enhanced cost of almost Rs.2465.1 crores for 18MMT of urea produce by gas based units per annum (1*24.9*55*180/100=2465.1 crores/annum).

UPSTREAM SECTOR

The upstream sector would be a key gainer of the gas price hike. The net profits of ONGC is expected to reach 20 billion and for OIL Rs 2.4 billion for every $1/mmbtu rise in gas price. As the sales of the upstream companies are dollar dominated, weakening of the Indian rupee versus the U.S. dollar would benefit these companies in terms of higher INR revenues. But this benefit would be limited if Government of India decides to impose a higher subsidy burden or levy a higher cess. Due to anticipated rise in the gross under-recoveries as a result of depreciation of Rupee, the subsidy sharing burden for the upstream companies would remain high in the financial year 2015-16. Further, government has high fiscal deficit reduction targets which may entail upstream companies for higher share of subsidy.

PETROCHEMICAL/ LPG SECTOR

The petrochemical sector uses 8-9 mmscmd of rich gas for extraction of C2 which is used for the production of poly ethane and C3 and C4 for the production of LPG. As raw material costs account for 80% of manufacturing costs, the same will be doubled with the increase in

[38] Parliamentary Standing committee on Finance headed by BJP leader Yashwant Sinha gave insite of effect of price rise on the economy in his draft report called "Economic Impact of Revision of Natural Gas Price".

gas price. This would have a very adverse effect on the financials of petrochemical companies.

Natural Gas is used as feedstock and fuel in the fertilizer sector. It is used as a feedstock in the production of ammonia. Urea is the main fertiliser produced in the country. It accounts for 55 to 60% of domestic production of fertilisers. Natural gas is also used by some fertiliser companies to produce some chemicals such as ammonia and its derivatives, methanol and its derivatives etc.

Domestic fertiliser industry presently requires 47.8 mmscmd of gas and also there is an additional requirement of 9.93 mmscmd of gas to convert naphtha to natural gas. 85 % of natural gas requirement is currently for the production of urea. Of this requirement , domestic gas is being utilized to the extent of 30 mmscmd currently[39].

The main impact on the fertiliser industry of the price hike would be in form of increase in subsidy and would also increase the working capital requirements. It will effect the urea – earning based fertiser companies and non-urea based fertiliser companies. Currency fluctuations defines the subsidy flow. Due to delay in subsidy payments there may be a situation where internal payments may rise due to increase in working capital. This may effect non- profitability.

UREA INDUSTRY

The major impact of the price hike on the urea industry would be in the form of increase in the working capital requirements and thus would affect their profitability. With the increase in energy cost the net profit margins would be affected. Further, profitability of the players who have taken revamp projects were to be affected as these players would face rise in cost of production. It is estimated that due to the rise in the cost of production, urea production would be limited to the cut-off quantity and the Government of India is looking for an alternative policy for urea production beyond the cut off quantity.

Depreciation of rupee further increases gas costs thus increase the subsidy outgo for the urea industry. Also as the cost of production of ammonia would increase due to increase in gas price and as ammonia is sold in the market at import parity prices, there margins will get reduced which would lead to decline in profits.

[39] ICRA Analysis

POWER SECTOR

As stated earlier, increase in gas price will increase the cost of production, but for the gas based power plants profitability may not be effected for those generators who have signed cost plus pricing[40] PPAs but their cost competitiveness will be affected. Also there is huge risk of under-recovery of fixed capacity charges for many power projects as the State-owned utilities are reluctant is allowing availability based on alternative fuel such as R-LNG.

As per ICRA report, due to un-certainty on domestic gas availability huge gas based capacity of 25000 MW is idle as on date. So there is huge need of rise in the extent of domestic gas availability post the gas price revision. It is a noted fact that cost of gas based power generation is some amount higher than the coal based power generation. So this is a indicator that the demand for gas would shoot down directly or indirectly after the price hike.

The primary reasons for this price hike can be

1. Depreciation of Indian Rupee has led to increased project cost.
2. Rising fuel supply risks leading to dependency on costlier imported sources of fuel. This could be because of the recent Supreme Court's decision where allocation process for all captive generation blocks is declared illegal and block allocations are cancelled.

Due to increase in cost of supply and slow pace of tariff rationalization overall subsidy dependence has increased in the FY 2014-15. This is likely to increase more if progress of tariff rationalization remains slow, knowing that the cost of power purchase would increase with increased dependence on costlier imports and exposure to international fuel prices.

Further rise in gas price has led to many issues as highlighted by the Parliamentary standing committee on Finance in its draft report[41]:

- Whether a large rise in the gas price would attract additional investment from home and abroad and relax the supply side constraints.

1. [40] **Cost plus pricing** is a **cost**-based method for setting the **prices** of goods and services. Under this approach, you add together the direct material **cost**, direct labor **cost**, and overhead **costs** for a product, and add to it a markup percentage (to create a profit margin) in order to derive the **price** of the product.

[41] Supra.,37.

- Contractors are able to manipulate the investment multiple parameter and thereby control the production which inturn affect the supply.

- There is a requirement to frame a long term vision based on geo-political developments in the energy sector.

- To conduct a scientific study on whether there is a need or justification for increasing the price. One cannot frame a mechanism which brings super normal profits to entities thereby putting the cost of private profit on society.

- What is the reason behind the dollar denominated gas pricing when the revenues are all in rupee and the country has chronically adverse exchange rate.

- The need for consultations with the State governments in this process, as they may have to significantly increase power tariffs to cover the higher costs or drastically raise their subsidy expenditure. The impact on state budgets should be key determinant as well.

- The need to consider views of concerned Ministries, Planning Commission , Industry and experts before arriving at the decision.

- The counter-productive effect of such large increases in price by forcing consumers of gas to divert to less cleaner fuels, thereby stultifying the gas pricing policy itself.

The Finance Ministry thus, have rejected the formula and have given an alternative that takes into consideration the prices of suppliers in Qutar, Oman, Abu-Dhabi and Malaysia. Finance Ministry opposed the mechanism applied by the Rangarajan Committee which uses trailing 12 month average of the producer price of LNG imports to India and in its contention have said that there is no logic in linking domestic price to Spot LNG price.

The ministry further contented that no due diligence was done before arriving at a decision to revise the gas price. No cost-impact study was done in this regard. Also ministry suggested some points regarding some aspects that should be taken into account as an integral part of gas pricing mechanism:

- At this juncture of our economic development, transitioning from a regulated to a fully market-based system should be staggered[42].

- The Government needs to rethink certain elements in the pricing formula suggested by the Rangarajan panel, which only serves to push the Indian gas price higher than it ought to be.

- Secondly, there should be a cap on the suggested price under the formula and for this purpose, there should be a ceiling price. It cannot be the case that gas producers will be allowed to reap unlimited gains in the event of upswing in global prices at the expense of core sectors of the economy.

- The Government should also subject gas producers to closer regulation, especially on aspects of cost recovery and technical parameters related to production. A comprehensive technical study on cost estimates of gas production should be conducted for this purpose.

- The Government must ensure that the contractor responsible for delivering the major chunk of gas from KG-D6 gas field supplies, delivers the shortfall he still owes as per the Agreement at the old price of $4.2/ MMBtu, rather than getting the benefit of the new price for previous commitments.

- The important recommendation of the Rangarajan panel of moving to a revenue-sharing arrangement with gas producers should be considered. A new Production Sharing Contract (PSC) model should be evolved that will do away with incentives to control production and manipulating investments, while assuring reasonable returns to the producers.

- The government needs to do a thorough impact study of gas pricing on different sectors of the economy, particularly the core sectors of power, fertilizer, steel and small scale industry specially those effected by pollution control laws/orders. The quantum of subsidy required to compensate these sectors should be precisely arrived at over the medium term. Similarly, the extent of „revenue loss or foregone should

[42] Supra.,37

also be quantified over this period in order to grasp fully the implications of the price revision on the Union Budget.

- As gas pricing will have implications for power tariffs as well, State governments also need to be consulted and taken on board. Instead of hurrying with decisions carrying wider import and ramifications for the country as a whole, broader consultative process involving all stakeholders should be put in place.

- Divergence in views within the government cannot be ignored on such a major issue and therefore, the valid concerns expressed by key economic Ministries of the government like power, fertilizer and steel should be duly addressed before finalizing the policy.

CONCLUSION

The implementation of the recommended formula will have a disastrous effect on the energy sector. The fertiliser industry predicts Rs 16,992 crore as subsidy annually, by the termination of the 12^{th} plan in 2016-17, if the base price is considered as $ 8.8 mmbtu as raised from $4.2 mmbtu. Power ministry also senses a steep rise in the unit cost of power generation. Also an increase in US doller per mmbtu will increase the total cost of production of Urea (fertiliser Industry, at present about 18 million tonnes, by more than 2300 crore.Urea is at present being sold to farmers at an MRP of Rs 5,310 per tonne. In case entire burden is passed to farmers, the MRP would get doubled. Will the farmers, already facing a lot other problems, be able to cope with the increase of more than 100 percent in the retail price. The enhanced retail price shall dislocate the entire fertilizer industry. This would very adversly impact the fertiliser composition which will result in reduced production of food grains and other agricultural crops which will lead to shortage of food which can affect a remarkably poplulated country in a big manner.

The effect of the formula and the pricing mechanism of the Rangarajan Committee will lead to increase in the price of natural gas. Thus it will be costly for the producers for manufacturing of their products which will ultimately be charged by the consumers. Such an increase in the price will be costly for the consumers which can also lead to decrease in demand due to such high prices.

With the increase in cost of power and electricity, consumers will not be able to cope up with the increase in price of electricity and also the increase in the price of food which would be caused due to increase in the price of fertilisers.

CHAPTER V

CITY GAS DISTRIBUTION

INTRODUCTION

When gas is supplied in small volumes to a large number of retail consumers, it comes within the ambit of City Gas Distribution (CGD). It mainly consists of CNG networks through with gas is supplied to automotive industry through CNG stations and PNG through which natural gas is provided for commercial, domestic and industrial use.

In the last few years CGD sector has seen huge growth due to the commencement of PNGRB. Presently around 26,696 Km of CGD network is spread evenly across India having its main supply source in western and northern parts of the country. Also, due to tremendous growth in pipeline infrastructure, as noted earlier, CGD networks in Southern and eastern parts of the country are also increasing.

If we talk about the historical growth in the CGD sector, it began to develop in a structured manner after the initiation of Assam Gas Company Limited (AGCL) and ONGC into the business of distribution. This led to formation of locally spread CGD townships. For example in Mehsana and Hazira by ONGC and in Sibsagar and Duliajan by AGCL. But a major turning point came in the year 1999 when GAIL, IGL and MGL formed a joint venture.

After 2005, CGD sector saw a tremendous growth due to success of IGL and MGL. Further in the last few years demand of gas has also increased simultaneously, which has also fuelled growth in the CGD sector.

NETWORK SIZE AND GROWTH

The growth in the CGD sector in the year 2010 was around 64% as compared to 2009 and in 2011 there is a further growth of 47.5% as compared to 2010. The number of CNG stations has also increased from 637 operational in the year 2010 to 783 as of March 2012. The network coverage of CGD is very uneven in the country[43].

It covers states of Gujarat and Maharashtra in the west; in the north, it covers Delhi, Haryana, Uttar-Pradesh; Assam, Tripura and West Bengal in the west and MP in Central India and in the southern part of the country it is extended mainly in Andhra Pradesh.

[43] INDIAN GAS MARKET 2012- India Infrastructure Research.

There are more number of gas fields in the western regions. This is the main reason because of which more number of operators such as GAIL Gas Limited, BPCL, HPCL and many private entities such as Gujarat Gas Company Limited (GGCL) and Adani Gas operates in Gujarat.

The three major public sector player in the country are : GAIL, BPCL and Gujarat State Petroleum Corporation (GSPC). GAIL has also incorporated its wholly owned subsidury named GAIL GAS limited (GGL) to develop CGD networks in non-metro cities.

After Gujarat, CGD networks in most developed in National Capital Region (NCR). Some guidelines were issued by Supreme Court in M.C Mehta vs. Union of India[44], to Delhi Development Authority for making CNG mandatory for vehicles operating in Delhi to curb different environment problems in the city. 24% of total CGD pipeline network of the country is represented by NCR region and is under governance of Indraparstha Gas Limited (IGL).

REGULATORY FRAMEWORK

There are various policies made by MOPNG which impact the CGD sector in the country. For example : Gas Utilisation Policy – which determines the allocation of gas from the KG-DG basin to various segments and also CGD, Gas pricing policy for setting of gas prices and Policies for development of Natural Gas Pipelines and Petroleum Pipelines and city and local natural gas networks. These policies promote open access in the market. It facilitates competition in the CGD sector and this way it ensures adequate supply of gas in the country at reasonable prices.

1. Regulation authorising entities to lay build, operate and expand CGD networks[45]

These regulations are made in exercise of power given under section 61 of PNGRB Act, 2006, giving powers to PNGRB to authorise interested entities to lay, build, operate and expand the CGD network. These guideline apply to all the entities who are interested in the CGD business. Some technical guidelines regarding application of these regulations are also mentioned hereunder. Such as customers with gas requirement of less than 50000 scmd would be supplied gas through a CGD network. And customers having gas requirment

[44] Order dated 26th March 2001
[45] Notification date : March 19TH 2008 available at: http://www.pngrb.gov.in/newsite/OurRegulation/CGD-Network-GSR196.html

between 50,000 to 100,000 scmd can either get it through a CGD network or through some other source. But customers requiring gas more than 100,000 scmd would not be supplied gas through a CGD network.

These regulations lay down the procedure and rules for an entity interested in operation of CGD network. Such entity has to submit an expression of interest to PNGRB board in a form that is given in Schedule B of the regulations. If no entity shows its intention to lay, build, operate or expand CGD network through expression of interest then Board can suo-moto invite bids. Once Board has got the interested parties then it carries out preliminary assessment of the expression of interest. This assessment is done regarding:

- Is natural gas available with the interested entity.
- Does entity have any connection to the existing or proposed natural gas pipeline for the supply of natural gas to the proposed CGD network.

Then after the scrutiny of EOI Board has to make an advertisement in a renouned daily and publish the EOI and give details of the 30 days public consultation process. This is to be done within 15 days from the receipt of EOS. As soon as the public consultation process ends, within 15 days board has to make an open advertisement in the local daily regarding development of CGD network and invite bids for the same. Then Board has to scrutinise the bids and keep a check whether interested entities have fulfilled the minimum eligibility criteria. Some technical qualifications are also laid down in the regulations which is a criteria proving technical capability of the interested entity.

Once such entity is declared as a successful bidder an application cum bond has to be submitted by him in two parts, namely a) technical bid – giving general details of the entity and technical details of the project b) financial bid- covering financial details of the project. A 60 days time is allotted for the same.

The board has to declare a bidder as a successful bidder by scrutinising that it has passed the minimum eligibility criteria. And to do the same, board has to compare all the financial bids by having regard to the bidding criteria given under the regulations.

Further, once the bid is submitted, board has to grant the authorisation within 30 days of this submission. Once the entity is authorised, it has to provide details of progress in clearances obtained, targets achieved, expenditure incurred and other relevant information

It is a duty of the board to conduct technical and safety audits of the entity to check that entity is in compliance to the technical and safety standards and specifications. The board has to do a continuous monitering of the entity in achieving various targets with respect to CGD projects and if any deviations or shortcomings are there then advice the entity regarding its remedial action. To do the same, certain service obligations and standards are also mentioned in the regulations

Further Central Government also have power to authorise entity for laying, building, operating and expanding CGD network. If any other entity not authorised by the central government wants to function under the act, then it has to apply for authorisation in form given under schedule 1 of the regulations. Lastly, regulations also provides procedure for termination of the grant of authorisation of CGD network under regulation 16 (1) (d) of the Act along with schedule G.

The principle regulations were notified on 19 March 2008. Subsequently, various amendments were made to it as on, 19th November 2008, 30th April 2009, 7th June 2010 and 19th July 2010. The amendment in 2009 brought an important change in these regulations. In the 2009 amendment it is given that – the grant of authorisation shall be issued to the selected party after it furnishes the performance bond in the form of Demand Draft of Bank guarantee from any scheduled bank for the amount equal to that of a bid bond. The bank guarantee shall be valid for the period of exclusivity as granted to the entity under the provisions of the PNGRB regulations, 2008 and thereafter for the period of grant of authorisation by the PNGRB. Recently, an amendment has been brought under these regulations naming them as Petroleum and Natural Gas Regulatory Board (Authorizing Entities to Lay, Build, Operate or Expand City or Local Natural Gas Distribution Networks) Amendment Regulations, 2015. Under this amendment, the time period of submission of application cum bond by the bidder is extended from 60 days to 120 days. This period of 120 days can be further extended by the board to not more than 30 days by recording reasons in writing regarding the same.

Further various other regulations and issues regarding the same have been discussed separately under next chapter.

CHAPTER VI

FOCUS AREAS FOR INDIA

INTRODUCTION

Indian Energy sector is dependent on Petroleum and Natural Gas sector as it determines India's Energy security. Since India is short of crude oil reserves to meet the growing demand of petroleum and natural gas products, it has to import 80% of its total crude oil consumption. Due to this high amount of import dependence and high demand of oil and gas in India, its governance becomes crucial for the economic development of the country.

If we talk about the present scenario, the share of oil and gas in the total energy mix is going to increase in the coming years. Further, the dependence on imports is also going to rise. Even though oil and gas are seperate fields and are used differently, there exploration processes are similar and so many times they are adressed in the same way and have similar kind of legislations.

LEGAL FRAMEWORK GOVERNING THE OIL AND GAS SECTOR

In the year, 1934, the first legislation in this regard named ***The Petroleum Act*** was passed. The objective of the Act was to *consolidate laws relating to the import, transport, storage, production, refining and blending of petroleum* and the powers to regulate these aspects are vested primarily in the Central Government.

Subsequently, ***Oilfields (Regulation and Development) Act*** of 1948 was another major legislation under which Central Government was granted the power to make rules for the regulation and authorization of mining leases for offshore blocks.

Further, the Central Government regulatory powers in this sector came to an increase with the commencement of ***Petroleum and Natural Gas rules, 1959***, which was last amended in 2009. Under these rules, with the prior approval of the Central Government, States which own respective blocks found within their territory, can award licenses for these onshore blocks. Therefore taking into consideration the Oilfield Act of 1948 and Petroleum and Natural Gas rules of 1959, it can be easily inferred that the powers which the states enjoy is subject to the restriction of central government as regards to granting of onshore mining leases and deciding for royalty and surface rent rates.

Also, with regard to acquisition of user rights on a land where petroleum or mineral pipelines in needed to be laid down, the ***Petroleum and Mineral Pipeline Act*** was passed in the year 1962. This Act contains provisions relating to acquisition and use of land for laying down pipelines. Central Government has the authority to acquire the land. After the land is acquired, central government can either keep the land or transfer the same to either the state government or the corporation. Act also contains the provision of damages to the affected party, if any, person interested in the land have sustained any injury. Further, the liability to pay these damages rest with the concerned authority. i.e. either state or central government.

In the year 1974, the ***Oil Industry (Development) Act*** was passed. Under this Act Oil Industry Development Board (OIDB) was created. The main aim of this act was to facilitate development of the oil and gas sector. The board collects Oil Industry Development cess on the blocks that are awarded to upstream oil companies on nomination basis.

The latest of all the legislations in this sector was passed in the year 2006, called the ***Petroleum and Natural Gas Regulatory Board (PNGRB) Act*** . This board acted as a statutory regulatory board for the downstream sector.

As per PNGRB Act, the main objective of the Act was to:

"regulate the refining, processing, storage, transportation, distribution, marketing and sale of petroleum, petroleum products and natural gas excluding production of crude oil and natural gas so as to protect the interests of consumers and entities engaged in specified activities relating to petroleum, petroleum products and natural gas and to ensure uninterrupted and adequate supply of petroleum, petroleum products and natural gas in all parts of the country and to promote competitive markets and for matters connected therewith or incidental thereto."

REGULATIONS GOVERNING UPSTREAM SECTOR

PRE-NELP REGULATORY REGIMES

There were three different types of regulatory regimes governing the Oil and Gas sector mainly the upstream sector before the country got independence namely: Nomination, Pre NELP bidding rounds and NELP.

1. **NOMINATION BASIS:** The development of petroleum industry in the country was recognized by the legislators while framing the Industrial Policy Statement of 1948. This policy states that development of mineral oil industry is the sole and exclusive responsibility of the state. This policy further provides that National Oil Companies were eligible to venture into any part of the basins for exploration and production with no competition from the foreign private players. Exploration blocks were offered on the nomination basis in this regime. NOC's can themselves identify prospective exploration areas and on an application, Petroleum Exploration Licenses can be issued to them. No concept of minimum work programme was there in this regime. The PEL were initially awarded for four years and it could be further extended to two years. These NOC were obligated to pay full amount of royalty to the State or Central Government for offshore blocks along with the cess to the central government. So this combined payment burden was huge on the companies. National oil companies such as ONGC and OIL made a number of discoveries including offshore discoveries in seven basins. Mining Lease can be granted after the discovery is made. The produced hydrocarbons from these basins are sold on APM price.

2. **PRE-NELP BIDDING ROUNDS:** Government opened the petroleum industry for the private firms once they recognized the growing demand for oil and gas. The exploration bidding rounds first commenced in the year 1979. Initial rounds were not successful. Most innovative round was the ninth round in which concept of Joint Venture was introduced – to reduce the risk of private investors by making ONGC and OIL partners in exploration activities.

   The NOC did not participate in the bidding process. They acted as licensees on behalf of the Government of India. They were bound to make the payment of all the statutory levies namely: namely royalty and cess. Under this regime **Production Sharing Contracts** were made between the Government and the private entities[46]. Under this PSC, national oil companies could have maximum share of 40% and the contractors were to share profit oil and profit gas separately from each fields on the basis of post-tax returns. This way NOCs had an additional burden of royalty and cess on them.

[46] PSC is an agreement in form of a contract between the Contractor and the Government in which Contractor agrees to bear all the exploration, production and development risks and costs in return of its stipulated share in production resulting from this effort.

The profit petroleum resulting from the discovery was made biddable. Customs duty was exempted but a corporate tax of 50% was levied on the foreign companies.

Government of India have made many PSCs under the Pre-NELP rounds. Around 28 blocks were subjected to PSCs under this regime since 1993. This policy was profitable as it provided wide opportunity for private participation. Huge capital base was required to invite private participation so many incentives were granted to the investors in this regard. But the main demerit of this policy was that the responsibility of paying all the statutory payments of royalty and cess was on the NOCs.

3. **NEW EXPLORATION LICENSING POLICY:** During 1997 -98 Government of India formulated NELP to provide a level playing field to both the public sector and private sector companies in exploration and production process. Till now Government has concluded nine rounds under NELP.

MERITS OF NELP:

- It has spread a healthy competition between the National Oil Companies and Private Entities.
- Development of Exploration and Production sector (E&P) has been boosted through this policy of Government of India as it offers liberalization and has opened the sector for private and foreign companies and under which 100% FDI is allowed.
- When NELP came into effect in the year 1999 advantage was there with the participating companies through a process of open competitive bidding.

DEMERITS OF NELP

- Deep monitoring is required along with administration of PSC by the regulatory authority.
- Government of India manage the PSC under the NELP through Management Committees (MC). These committees sometimes find it difficult to solve some issues, specially the financial issues. So these issues remain unsolved for long

and thus effecting the exploration and production activities in the hydrocarbon sector.

As discussed in the earlier chapter, Rangarajan Committee has given recommendations for Modification in the PSC regime. Before we discuss the modifications let us see the existing PSC regime.

EXISTING PSC REGIME[47]

Petroleum and Natural Gas rules 1959 provide for an agreement between Government and the Licensee to lay down terms and conditions with regard to the licensee and these terms and conditions are laid down as articles of PSC. PSC are the administrative mechanism of hydrocarbon in the country. The present PSC scheme for conventional oil and gas is the one where the contractor does petroleum operations at his risk and cost and share the profit with the Government after the cost recovery. The management of these PSC are done by the Management Committee (MC). The risk is borne by the contractor and once the commercial discovery is made the contractor is allowed to set off the exploration costs and costs on development and production against the revenues earned in the production. Balance is shared between the Government and the Contractor in agreed proportion in the PSC.

Indian Government came up with the idea of PSC to invite foreign participation and to attract technological advancements in the upstream hydrocarbon sector. The PSC modal was considered more appropriate and beneficial then the nomination mechanism. But there were some issues that were noticed in the PSC mechanism:

1. The existing formula for sharing costs depends upon the cost recovery by the contractor. This may result in contractor defining infinite costs which may be detrimental for the Government.

2. Adequacy of Investments –to keep a check on the levels of production

3. Ensuring that accounting for Government's share is done accurately.

[47] Government of India 2012 report " Report of the Committee on the PSC Mechanism in Petroleum Industry" available at:

http://eac.gov.in/reports/rep_psc0201.pdf

RECOMMENDATIONS OF THE RANGARAJAN COMMITTEE:

The Rangarajan committee made some recommendations[48] on the fiscal regime of existing PSCs. The fiscal regime in the existing PSC comprises of two elements, namely:

1. Cost recovery
2. Profit Petroleum

Cost recovery is the biddable percentage of share of contract costs which the contractor is allowed to deduct from the total value of petroleum produced. The share of contract costs which is deductible in a year is called cost petroleum. Whereas the revenue which remains after full cost recovery is done is called profit petroleum. This profit petroleum is shared between the Government and the Contractor in agreed proportions in the terms of reference of PSC. This share is dependent upon Contactor's Investment Multiple in the previous year. It is the slab on which contractor's profit petroleum split in decided and is based on the bid made by the contractor at the time when the block is awarded. The higher the Investment Multiple, the more is the share of the Government. Thus the share of total revenue of the contractor includes revenue from cost petroleum + a defined share of profit petroleum.

The CAG in its report on manipulation of investment multiple called the "Performance Audit of Hydrocarbon PSCs" have laid down some constraints of IM mechanism stating:

"The structure of the IM-based profit sharing formula (especially when there is a huge jump in GOI's profit share from 28 per cent to 85 per cent on an IM slab of 2.5 or more) is such that in certain scenarios, an increase in capital expenditure, up to a point, could conceivably result in an increase in the contractor's share of profit petroleum, despite a reduction in the total profit petroleum as well as GOI's share of profit petroleum."

The new proposed modal provides that the production sharing between the Government and the Contractor will be linked to a average daily production and a prevailing average of oil and gas prices in a definitive period. For this purpose a matrix is made which consists of price ranges and incremental production computations for computation of production share between the Government and the Contactor. The share of production for each pair of price range and incremental production is biddable by the contractor further

[48] Supra 47

royalty would be paid by the Government. Also revenue will be shared between the Contractor and the Government on the basis of average daily production of a year. The contractor is required to bid a share of production that it is required to pay to the Government as per the price class and incremental production matrix. The contractor is also required to pay income tax on his share of profit. Tax holiday of seven years is also recommended for both oil and gas fields.

In the proposed model, once the share of production is shared between the government and the contractor, no further deductions will be allowed.

Further, in the existing NELP PSC, the exploration period which is restricted to seven years has been increased to ten years in the proposed model including a subsequent period of four years for deep and ultra deep water blocks.

Also there may be situations where machines required for development of huge commercial discoveries are not available, or the Field Development Plan of such big commercial discoveries needs time then a little time will be left with the contractor to initiate the development activities, especially when such activities relate to offshore blocks. Thus the proposed changes would also include some contractual terms for joint development of commercial discoveries made by the contractor.

At present a contractor is not allowed to initiate exploration during the appraisal period. But in the proposed amendment, the contractor is allowed to examine the potential of additional reservoirs through some additional exploration activities for proper insight into the commercial viability of the Discovery Area.

There may be many situations where it becomes difficult for the contractor to complete the minimum work program. So the proposed model would be more flexible regarding swapping of minimum work programs. Government may do alternative survey and provision may be introduced in the contract for the revision of target depth of wells, restructuring of MWP etc.

As there is nothing called the cost recovery in the proposed new model the functions and regulatory powers of the Management Committee becomes redundant so the operators would have more freedom to carry out the petroleum operations. The dissenting of the IM and cost recovery mechanism can solve many issues related to costs.

INSTITUTIONAL STUCTURE

Article 297 of the Constitution of India[49] says that petroleum in its natural form is vested with the Government of India. ***Ministry of Petroleum and Natural Gas (MOPNG)*** is entrusted with the responsibility of exploration and production of oil and natural gas along with refining, distribution and marketing, import, export and conservation of petroleum products and liquefied natural gas.

Further, MOPNG has a helping hand of **Director General of Hydrocarbons** which is formed in 1993 and is called the technical arm of MOPNG. Its main aim is "to promote exploration and sound management of petroleum and natural gas resources including conventional hydrocarbon resources keeping regard of environment concerns, safety of people, technological advancements and various other economical aspects. The main work of DGH is to ensure minimum exploitation of resources, review or approve management plans, work programs, budgets and give some set of corrections in relation to the discovered fields.

Petroleum and Natural Gas Regulatory Board (PNGRB) is the independent regulator for downstream sector. It covers refining, processing, storage, transportation, distribution, marketing and sale of petroleum and petroleum products and natural gas. It gives licenses for laying and operating pipelines and CGD networks. Other functions of PNGBR include:

- Monitoring prices
- Enforcing service obligations
- Checking restrictive trade practices
- Settling technical specifications for pipelines and CGD network

[49] Things of value within territorial waters or continental shelf and resources of the exclusive economic zone to vest in the Union

(1) All lands, minerals and other things of value underlying the ocean within the territorial waters, or the continental shelf, or the exclusive economic zone, of India shall vest in the Union and be held for the purposes of the Union

(2) All other resources of the exclusive economic zone of India shall also vest in the Union and be held for the purposes of the Union

(3) The limits of the territorial waters, the continental shelf, the exclusive economic zone, and other maritime zones, of India shall be such as may be specified, from time to time, by or under any law made by Parliament

For proper administration and monitering of petroleum products marketing and transportation, monitering natural gas pipeline network and their growth another institutional body named, **Petroleum Planning and Analysis Cell** has been constituted. It also undergoes tracking international market developments and forecasting domestic demand and imports.

Further, to provide financial assistance for the oil industry, **Oil Industry Development Board** was formed. It provides loans for projects, grants for research and development, funds scientific advisory committee groups and task forces etc. It also has a separate Project Analysis Cell whose work is to determine eligibility of projects.

Oil Industry has to be very careful regarding the quality of its products and instruments as a small carelessness can lead to a big hazard. So to keep such oil industry standards maintained another authority called the **Oil Industry Safety Directorate** is formed. It comes under the technical wing of MOPNG and sets standards for design, safety, operation and maintenance across the hydrocarbon value chain. It covers all areas such as exploration, drilling, crude stabilization, gas processing, pipelines, refining, storage, transmission and distribution etc. So far, the directorate has prescribed 112 standards for the industry.

In the year 1987, MOPNG further constituted another technical wing called the **Centre for High Technology.** It will provide inputs for transportation of crude oil, petroleum etc. In addition, the CHT is responsible for undertaking research, establishing a fund and coordinating the government's activities in the refining, storage and fuel transmission segments.

Energy Coordination Committee: the ECC was constituted to guide government policy in the overall energy sector. The committee is chaired by the Prime Minister of India and includes members from the Ministries of Finance, Power, Petroleum and Natural Gas, Coal and Non Conventional Energy sources; members of the planning commission, Economic Advisory Council to the prime minister, etc.[50]

[50] Indian Gas Market 2012- report by INDIA INFRASTRUCTURE RESEARCH

KEY REGULATIONS FOR DOWNSTREAM SECTOR

All the hydrocarbon exploration and production including that of natural gas is regulated by government through an independent regulator called the Petroleum and Natural Gas Regulatory Board.

1. REGULATIONS FOR PIPELINES[51]

1.	Imbalance Management Services.	17/ FEBRUARY/2014	These regulations provide for the transportor of natural gas and petroleum and petroleum products with a duty to provide Imbalance Managment Services to facilitate shippers to manage transportation imbalances.
2	Integrity Management System for Natural gas pipelines.	05/NOVEMBER/2012	These regulations outline the basic features and requirements for developing and implementing an effective and efficient integrity management plan for natural gas pipeline system.
3	Determining Capacity of Petroleum, Petroleum Products and Natural Gas Pipeline.	07/JUNE/2010	These regulations cover the procedure, parameters both constant and variable and frequency of declaration of pipeline capacity in MMSCMD for natural gas pipeline or in MMPTA for petroleum and petroleum products pipeline.
4	Technical Standards and Specifications including Safety Standards for Natural Gas Pipelines Regulations, 2009.	11/NOVEMBER/2009	This will ensure uniform application of the design principles and to guide in selection and application of materials and components, equipment and systems and uniform operation and maintenance of pipelines and safety aspects of employees and the public.
5	Guiding Principles for declaring or authorizing Natural Gas Pipeline as Common Carrier or Contract Carrier	21/APRIL/2009	This classification helps in maximizing the utilization of assets.
6	Determination of natural gas pipeline tariff.	20/NOVEMBER/2008	Tariff is determined by considering a resonable rate of return on the capital employed to a normative level plus a normative level of operating expenses.
7	Affiliate code of conduct for entities engaged in marketing of natural gas and laying, building, operating or expanding natural	17/JULY/2008	Intends to minimize the potential of cross susidization between the regulated and non regulated market of natural gas, protect the confidentiality of consumer information and ensure

[51] Petroleum and Natural Gas Regulatory Board: Notified Regulations.

	gas pipeline.		that their is no preferential access allowed.
8	Access code for common carrier or contract carrier natural gas pipelines.	17/JULY/2008	Entities can add new or abondon any existing entry and exit point on the pipeline on techno-economic considerations provided that the existing customers on the pipelines are not adversely affected by it
9.	Authorizing entities to lay, build, operate or expand natural gas pipelines.	06/MAY/2008	Authorization is mandatory for laying or operating a pipeline ans is awarded through competitive bidding. Entities need to fulfil the eligibility criteria for the same.

The pipeline are regulated by defined regulations, which specifies code of conduct and other technical specifications. Some of these are:

1. Authorisation Code

Every entity that is keen on laying, building, operating or expanding natural gas pipelines have to abide by these regulations. Such interested party needs to submit his expression of interest (EOI), or PNGRB can suo-moto invite EOIs. Then a preliminary assessment of the gas availability, spare capacity in existing pipelines or possible connectivity with other pipelines is done by the PNGRB for a period of 15 days. Then this study is published so that it can be accepted or rejected by the party having EOI within 15 days.

The economic life of any project is taken as 25 years which is further expended to 10 years. There are various bidding parameters such as pipeline tariff, reasonable rate of return. If a situation arrises where only one party came forward to submit the bid then the Board assesses the reasonability of the project through a feasibility report. If it is not find adequate then PNGRB may reject the bid. If the bid is approved, then authorization is granted after submission of a performance bond by the selected entity.

The performance bond has value equal to 2% of the estimated project cost. The authorisation is subjective to party doing a natural gas tie up and financial closure. This tie-up should be made applicable for at least 50% of the gas volumes that are proposed to be transported over the economic life of the pipeline for first five years from commissioning of the pipeline. The financial closure has to be achieved within a time span of 180 days from the date of authorisation.

2. Affiliate Code of Conduct: Companies are required to maintain separate financial records and books of accounts if it is interested to engage in transportation and marketing of natural gas. This helps in ensuring competition and also protects the interest of consumers against the actions of an entity while dealing with its affiliate or entity engaged in transportation and marketing of natural gas. The entity has to ensure that direct and indirect costs are fully allocated to the regulated activity in the transparent manner. Further company has to maintain consumer confidentiality. An entity cannot disclose consumer information to its affiliate without written consent from the consumer expect where such information is required for billing or market operations or law enforcement purposes etc.

3. Access Codes: certain Central Government approved entities which are either operating or who propose to operate gas pipelines are allowed non-discriminatory access to the transportation networks at the regulator determined tariff. The transporter is mandated to furnish details such as entry-exit point wise design and available capacity of gas pipelines.

4. Common or Contract Carrier Principle: This principle provides incentives to the independent shippers to enter into contract or common carrier arrangements with companies that own gas pipelines. This way entities can sell gas at the capacity above its own requirement, provided the contract is limited to the time span of one year. The capacity will be allocated to entities on a non-discriminatory first-come-first serve basis.

5. Tariff Regulations: A zonal tariff system has been adopted for pipelines, wherein a uniform tariff is charged for 300 Km from the delivery the delivery point and the tariff is changed at the next zone. The pipelines point of origin and termination and sequental numbering of zones will be indicated in the authorization letter by PNGRB. Discounted Cash Flow methodology based on project's internal rate of return is used for calculating the unit rate of pipeline tariff to be charged. The internal rate of return is based on 12% post tax return on capital employed which will be same for the entire lifetime of the project.

The volumes to be considered in determination of the unit natural gas pipeline tariff for the first five years of operation of natural gas pipeline is specified in the PNGRB (Authorizing entities to lay, Build, Operate or Expand Natural Gas Pipelines) Regulations, 2008.The volume that will be determined will be converted into the energy equivalence in MMBTU for determination of tariff.

6. Determining Capacity: the pipeline operators are required to determine the capacity of the pipelines that is approved by PNGRB. The capacity of the pipelines that is operating at equilibrium is based on the following parameters

    - Internal diameter
    - Length and Roughness
    - Efficiency factor
    - Velocity
    - Delivery and Source supply flow
    - Inlet and outlet temperature
    - Inlet and outlet pressure
    - Gas composition

Annually, all companies need to declare these parameters for the pipelines to PNGRB in April and October and Final Capacity of the pipelines is declared in April of every year. This capacity is used to determine the tariffs, declaring pipelines as common or contract carriers or to provide access to available capacity on a non-discriminatory basis under the relevant regulations.

7. Technical Standards and Specifications (Including Safety Standards):

These regulations have a wide coverage and is monitored by PNGRB either directly or through a accredited third party. It covers pipeline design, materials and equipments, welding fabrication, installation, testing, operation and maintenance and corrosion control of natural gas pipelines. Penalty would be imposed on the entities in case of non-conformity to the above standards.

8. Emergency Response and Disaster Management Plan:

This is applicable to hydrocarbon processing installations like refineries, gas processing, LNG re-gasification installations, pipeline and hydrocarbon products which remain in the gaseous state at normal temperature and pressure, liquid petroleum products and any other installations as may be notified by the PNGRB from time to time.

2. REGULATIONS FOR CGD

These regulations include authorization of a CGD network, pipeline tariff, pipeline access, exclusivity etc. Board selects the Geographical areas and invite bids for these areas. These geographical areas are allotted to people based on parameters such as network tariff, compression charges, exclusivity for domestic connections etc. Some of the important regulations of the PNGRB are listed in the table given below:

1	Integrity Management System for City or Local Natural Gas Distribution Networks	16/MAY/2013	These Regulations outline the basic features and requirements for developing and implementing an effective and efficient integrity management plan for city gas distribution networks to evaluate risks, improve the safety of city gas distribution network and bring more effectiveness in operations to minimize the probability of CGD network failure
2	Access Code for City or Local Natural Gas Distribution Networks	29/MARCH/2011	The authorised entity shall allow access to shipper on non- discriminatory basis to a city or local natural gas distribution network in designated geographical area.
3	Code of Practice for Quality of Service for City or Local Natural Gas Distribution Networks	01/SEPTEMBER/2010	These regulations lay down code of practice for promoting reliable service to consumers and the public and obligations of consumers besides conforming to minimum levels of service to be provided by the entity authorized for laying, building, operating or expanding CGD Networks.
4	Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks.	27/AUGUST/2008	It is intended to apply these regulations to all new and such aspects of already existing networks as design, fabrication, installation, testing at the time of construction and commissioning. However, if an entity has laid, built, constructed or expanded the CGD infrastructure based on some other standard or is not meeting the standards specified in these regulations, the entity needs to carry out a detailed technical audit of its infrastructure through a Board authorized or approved third party agency by the Board.

5	Authorizing entities to lay, build, operate or expand city or local natural gas distribution network	19/MARCH/2008	Authorization is mandatory to undertake CGD business and areas are awarded through competitive bidding. Entities need to fulfil the eligibility criteria before bidding.
6	Exclusivity for city or local natural gas distribution network	19/MARCH/2008	Infrastructure exclusivity is 25 years while marketing exclusivity is 5 years for new entities and 3 years for existing entities, entities need to abide by the service obligations. Falling which they will be penalised.
7	Determination of network tariff for city or local natural gas distribution networks and compression charge for CNG	19/MARCH/2008	Tariff is determined by considering a reasonable rate of return on capital employed at a normative level, plus a normative level of operating expenses. The unit rate to be charged for a period is based on a discounted cash flow methedology.

The PNGRB criteria for CGD includes authorising a CGD network in a geographical area for the entities that have interest in laying, building, operating or expanding a CGD network. Before the notification of PNGRB on October 1, 2007, it was MOPNG who was doing the job of granting authorisation.

An entity may seek authorisation either by showing direct expression of interest by through PNGRB by inviting suo-moto bids. In case EOI is submitted by an entity, then PNGRB undertakes preliminary enquiry based on the availability of gas and possible connectivity with the proposed or existing pipeline networks. Once satisfied with the assessment, PNGRB initiates a public consultation process for a period of 30 days from the submission of EOI.

Tne PNGRB then invites bids from entities within 15 days of completion of public consultation process. The bids received are then evaluated on the evaluation and bidding criteria laid down in the regulations. The entity further interested needs to submit its financial capability and project operations capability for the same.

In case no entity is selected then PNGRB does a re-bid otherwise authorisation is granted within 30 days. According to the regulations the economic life of a CGD project is expected to be 25 years. During this period entity needs to maintain the pipeline network, online compressors and associated equipments and facilities includiing expansion and technical up-

gradation. The entity needs to tie up its gas supply for the entire duration of the exclusivity period[52] for the volume of 50% of what was considered during network tariff determination for each year of the exclusivity period. The gas tie-up needs to be done within 90 days and subsequent financial closure within the next 30 days. After the end of the exclusivity period the entity can apply again. The entity can be granted authorisation again depending upon its satisfactory performance of service obligations and other quality obligations. The period of exclusivity starts from the date of authorisation for the new entities and from the date the physical operations commence, for those authorized by Central Government before the notification of PNGRB.

The entity has to fulfil the following service obligations:

- Providing domestic PNG connections
- Building Steel Pipelines as per prescribed physical parameters
- Reaching the wide charge areas
- Providing domestic PNG connectivity within 25 meters of pipeline at no extra charge and
- CNG supply through the entity's own dispensing facilities or ones owned by others by paying a compression charge on a mutually agreeable basis.

If the entity is not able to carry out its service obligations it is issued notice for the same. If remedial measures are adopted then no actions are taken in form of penalty. But if, even after

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Exclusivity-

a) for laying, building or expansion of the CGD network during the economic life of the project; and

b) in terms of an exemption from the purview of the contract carriage or common carrier for a limited period of time-

is envisaged with a view to facilitate the development of a planned and integrated CGD network with appropriate priorities for end-use of natural gas as also the network spread besides providing incentive to the entity for investing in such project.

SCHEDULE A Of Petroleum and Natural Gas Regulatory Board (Exclusivity for City or Local Natural Gas Distribution Network) Regulations, 2008.

SOURCE: PNGRB

repeated notices no remedy is done then PNGRB charges 25%, 50% and 100% of performance bonds for the first, second and third defaults by the entity within 15 days, failing to pay which, the authorisation is cancelled.

Computation of network tariff and compression charges for CNG and CGB is based on reasonable rate of return on the capital employed adding in it, the operating expenses in the network. The network tariff for domestic PNG customers is based on two elements

1. Network tariff charge for the common CGD infrastructure before the pipe connecting the metering unit

2. Charge towards last mile connectivity i.e. equipments and facilities from the pipe connecting the metering unit and onwards up to and including pipe connecting the burner.

Further Board has issued various guidelines for the proper administration of the CGD network such as (Model access arrangement related to access code for CGD networks) Guidelines 2014, Development of modal GTA Guidelines, 2012, Guidelines for: protection of PNG and LNG consumers from Unauthorised Intruders etc[53].

POLICY AND REGULATORY ISSUES

If we look at the Upstream Sector, there is a need for Institutional Reforms in this sector. DGH is the current regulator of the upstream sector. Also it is a body under the Government control. This raises a suspicion in the minds of people that whether this sector has major influence of Public Sector Undertakings (PSU) in the gas market.

Further the guidelines for proposed Open Acreage Licensing Policy (OALP) is yet to be specified. This policy will allow bidding round the year for open acreages on companies own assessments. However, this requires key pre-requisites such as credible data repository. Potentially, this could bring exploration and production segment in the line with global practices. But policy-wise, there has been little progress since the recommendations were made in this regard.

[53] www.pngrb.gov.in

The future of gas pricing under NELP is still unsure. The upper limit of $60 per barrel of oil is not indicative of the oil price movement in the past 4 to 5 years. Further the formula provides for considerable uncertainty about the value of biddable component, C, and the role of the government in approving it.

The provisions of the PSC regime have come in for severe criticism by the Comptroller and Auditor General's office. The government is now analysing Rangarajan Committee's recommendations, to review PSC in the oil and gas sector. The sudden rise in price has devalued Indian Currency and is harmful for growth of various sectors of India such as power, fertiliser etc. This is because with the devaluation of price the per unit cost of power and fertiliser would increase leading to sudden impact on cost of power, fertilisers. This increase would lead to food and electricity scarcity .

Further there is increased government intervention in the allocation of natural gas which goes against the policy of promised marketing freedom under the PSC regime under the NELP. This has distorted the gas market and has delayed the most economical price discovery and actual sustainable demand. Given that certain sectors are mandated to receive gas at below the market price, this leads to exaggerated demand from the sectors which may otherwise not opted for natural gas. This leads to a situation where prices do not convey the product scarcity and accordingly guide investments in the value chain. There have been many promises for a long term more suitable gas prices in the past, but none of the earlier recommendations by various government constituted committees have borne any fruit.

In the gas downstream segment, there are problems in the operation of PNGRB. No new rounds are being announced since NELP IX. Further, PNGRB's authority has been questioned. For instance, in the case of determination of marketing margins the regulator faced significant resistence. PNGRB has so far been unable to break the hold of PSU on this sector. With the slow pace of judicial process in the country, the entire regulatory process has gone standstill.

Further, the problem of gas supply from the KG-D6 basin have forced the operators to meet their existing gas demands from the more expensive LNG alternative. Also, added competition for gas allocation from the competing industries like power and fertiliser have increased worries among CGD operators to meet their operating targets and remain profitable.

The days of low priced APM are now over. LNG imports is a reliable source but its higher prices will lower profit margins for the operators unless they get high paying customers in their network. Coal Bed Methane (CBM) is also a source of fuel but its infrastructure pipelines is limited in the country for its supply. The real problem faced by the current operators is to manage the pricing in such a manner which would allow the companies to achieve adequate profit margins while selling a mix of imported LNG and produced natural gas.

Further the Indian gas market needs capital for developing an adequate infrastructure that can cut across the entire country with transmission and distribution infrastructure and make exploration and production viable. However, absence of clear, long term and unambigious policies that can result in the predictable demand and prices will prevent development of a mature gas market in the country.

POLICY REFORMS IN THE GAS MARKET

Key reform measures are overdue in the upstream segment where private investments and better technologies are the main key aspects for increasing production. At a fundamental level, there is a need for institutional reforms. This involves addressing industry perceptions on regulatory neutrality of DGH.

Other reform issues attracting policy attention include rationalising the taxation structure of the upstream companies. The tax holiday incentives for upstream companies were withdrawn for the blocks awarded after March 2012, while the cess was increased from Rs 2500 per tonne to Rs 4500 per tonne.

Further it has been noted that gas pricing policy reforms along with overall hydrocarbon pricing has been pending for long. The progress that the government will make in this sector will be subject to the political will and acceptence for price rationalisation. It is essentially policy uncertainity that is holding the sector from achieving its full potential. Any stagnancy, in a difficult economic scenario, will further increase risks associated with the sector and keep the investors away.

ISSUES OF SECTOR WISE GAS DEMAND AND POSSIBLE SOLUTIONS

POWER SECTOR

1. **Economic Growth**: Moderation or slow down in external demand could entail less demand pressure on the energy demand. This could result from sharp fall in investments in the energy market, moderation in private consumption expenditure. This could bring a positive effect on the industrial sector where the demand for gas arises for both process requirement and captive power generation. Further there is a need for market orientation of gas. The power sector remains the highest consumer of gas. This is because of its high dependence on relatively lower cost domestic gas which was in shortage since 2011. The market orientation of gas would lead to mix of consumers including sizeable segment of industrial and commercial consumers, who would be able to absorb the high price LNG in the market leading to increase in domestic gas availability and stability in the gas demand sector.

2. In terms of power, gas based projects are more cost-competitive as compared to renewable sources of power like wind and solar and is also cleaner than coal-based projects. So ideas of gas mix and fuel replacement market for natural gas based power will sound more appropriate to reduce the gap between demand-supply.

3. To realise the true value of natural gas a proper power tariff regime is required supported by gas allocation. This would help in improving the quality and supply of power

FERTILISER SECTOR

The fertiliser sector uses natural gas as its main source of feedstock. Its demand for natural gas over past five years has been constantly variable due to less availability of natural gas. This sector is important for food self-sufficiency. That is why, it has always been highly subsidised from subsidies increasing from 15,879 crore in 2004-05 to 75,849 in 2008-09. Due to this, there is an increased demand for gas in this sector as usage of gas is cheap and also because of sudden increase in supplies from the KG-D6 basin. But the main issue is subsidy policy for urea production. The only solution which i can think off for this subsidy issue is a

future shift to a greater role of imports as it would reduce domestic gas consumption and would inturn lessen the subsidy burden on the central government.

CITY GAS DISTRIBUTION:

The residential sector uses biomass which is the primary component and represents 80% of its energy demand. But due to urbanisation and higher incomes this share is going to drop. So far, gas has played a restricted role in the residential sector and is limited to major cities; this sector thus represents a little share of total gas demand. The growth will require improved infrastructure development, and a clear regulatory framework to boost the development of gas distribution in cities.

Since the gas demand cannot be met through any other fuel in such a large extent, it would be fulfilled by gas sourcing from other countries. Thus regulations for international gas sourcing could be made.

Pipeline infrastructure's demand is increasing as the network is being expanded to other parts. Further a national gas grid could be made to ensure that all the consumption centres in the country have access to gas.

CNG

There are considerably less number of Natural Gas Vehicle as compared to the share of total vehicles. The two main reasons for this is

1. Improving local air quality
2. Reducing the cost due to oil products price subsidy.

Introduction of large number of CNG programmes would sound beneficial for CNG sector in this regard. Further, at the residential level, improvement in gas transportation infrastructure by making adequate regulations in this regard would be helpful.

GAS PRICING

To solve the issues of gas pricing some of the suggestions are:

- To increase the price paid to NOCs and link it to the wholesale price index in the future
- Or a uniform domestic price instead of magnitude of prices

CONCLUSION

The gas market in India is at an interesting position with policy reforms getting the attention that it demanded for so long. Falling production from the new fields and delays in the start of production from other new discoveries combined with increasing energy shortages have helped focus on policy issues. The uncertainty has ended and clear vision of policy and its impact on allocation and pricing will stabilise the market. The demand of gas in the economy may be slow in case of power and industries. This is because of limited supply.

The issues regarding policy are perhaps the most important: India desires a clear policy and regulatory framework in order to draw the investments needed in the energy sector, not only to maintain a high economic growth, but also to cope up with poverty which leaves millions of people without energy. The role and powers of the regulators have to be visibly defined. India has opened up to private and foreign companies and these want regulatory constancy with minimum interference from the state.

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