

# Natural Gas- A Clean Energy Solution To India's Present Energy Crisis

## Abstract

Life without energy is impossible. No fire, no food, no hot water in the cold-cold winters, no telephone, no television etc and the dreadful list goes on and on! Energy no doubt is crucial for the survival of man and his nation. In fact energy status marks how well a country is developed. There are different sources of energy but it is not energy that is important but clean energy. In this natural gas is the only option for us.

**Keywords:** ONGC, GAIL, Methane Propane, HBJ Pipeline

## Introduction

In the category of non-renewable sources of energy the only environmental friendly, non pollutant source of energy is natural gas. In terms of economic environmental and social concerns, natural gas is the only option. The past decade has witnessed an increase in the share of gas in meeting the country's energy demand. The use of environment friendly sources has attained significant importance in the recent years. Thanks to the increasing awareness for clean environment and strict pollution control regimes we are probably moving towards a cleaner world.

## Advantages of this Natural Gas

Natural gas can not only be easily handled but also has very low oxides of sulphur and nitrogen emissions. In addition to being environment friendly fuel, gas based projects also have an economic advantage. For example, the gas based power plants are less capital intensive and have lower gestation periods compared to the power plants based on other fossil fuels. Simply put, they cost less and can be quickly built.

If everything is so viable, why don't we immediately switch over to Natural Gas. The use of natural gas, unfortunately, does depend on a few things. First it has to be available in plenty – basic factor! Then of course proper distribution network for supply from source to consumers: environmental and economic viabilities etc.

## Availability of Natural Gas in India

Our estimated reserves of natural gas is about 685 BCM ( billion cubic metres ). As you know how much we produce yearly? Current annual production is around 27 BCM (74 MMSCMD). You might be wondering what this BCM and MMSCMD is a unit measurement which signifies billion cubic meter and million standard cubic meters per day.

Existing Supply (MMSCMD)	DEMAND (In MMSCMD)				
	Existing	2001-02	2006-07	2011-12	2024-25
65	110	151	231	313	391

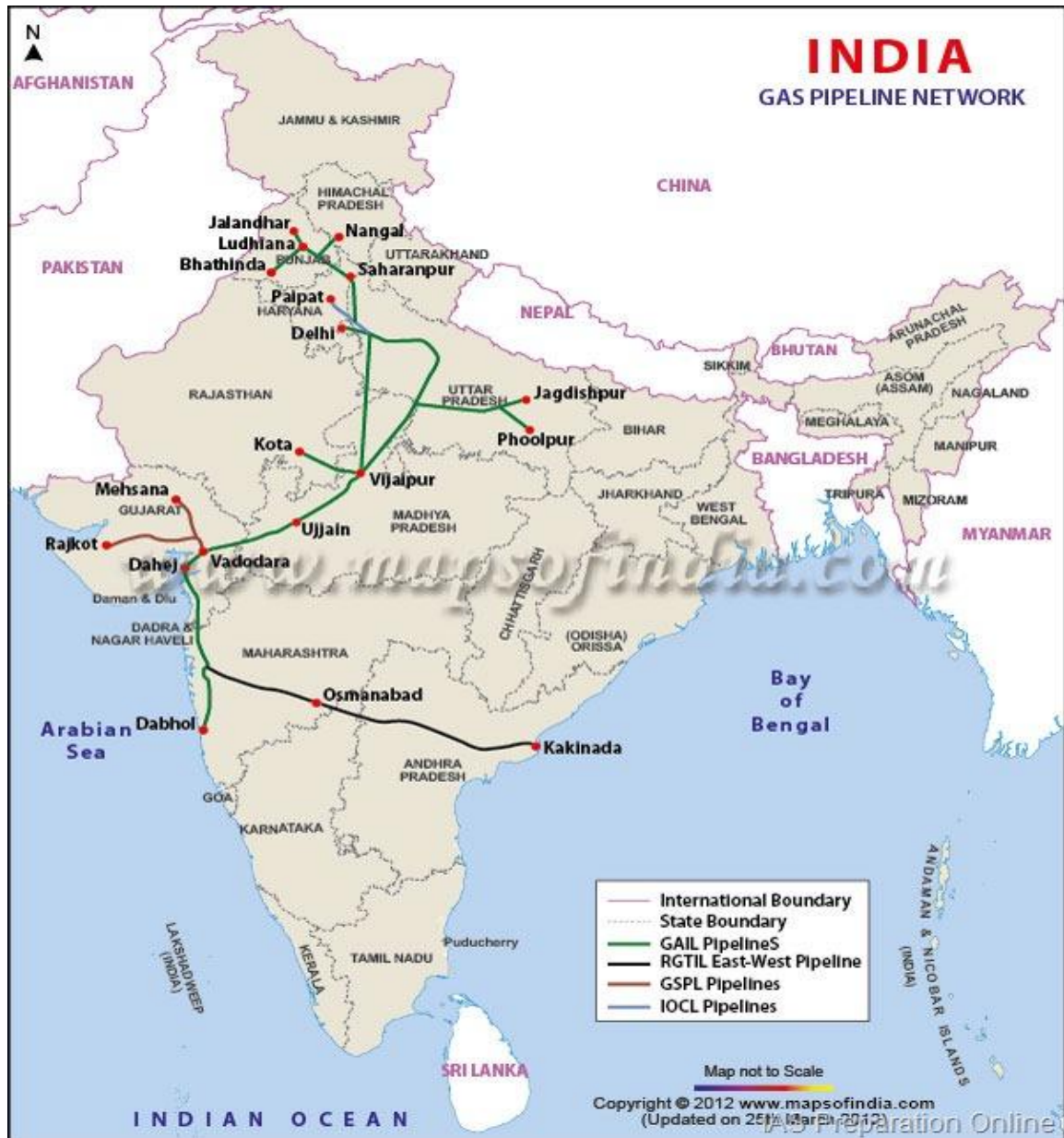
So much for production, how much of this wonder gas do we use? Unfortunately. Gas utilisation is less than 10 percent of the country' overall energy needs. The world average of 23 percent of natural gas usage in the overall energy mix will further convince you that we need to tighten our act. Moreover, at present, the demand for natural gas exceeds the supply, making it all the more difficult to set up plants. The only answer is to increase the production. Gas production established fields is expected to reach a peak of and 100 MMSCMD in 2002 then slowly decline to around 25 percent of level by 2020. (At current rate of usage existing proven reserves existing reserves). The prospects significant new finds from exist producing areas are small.

Take a look at the India hydro can Vision – 2025 table above. It projects that the demand for natural gas is expected to rise further in the coming years.



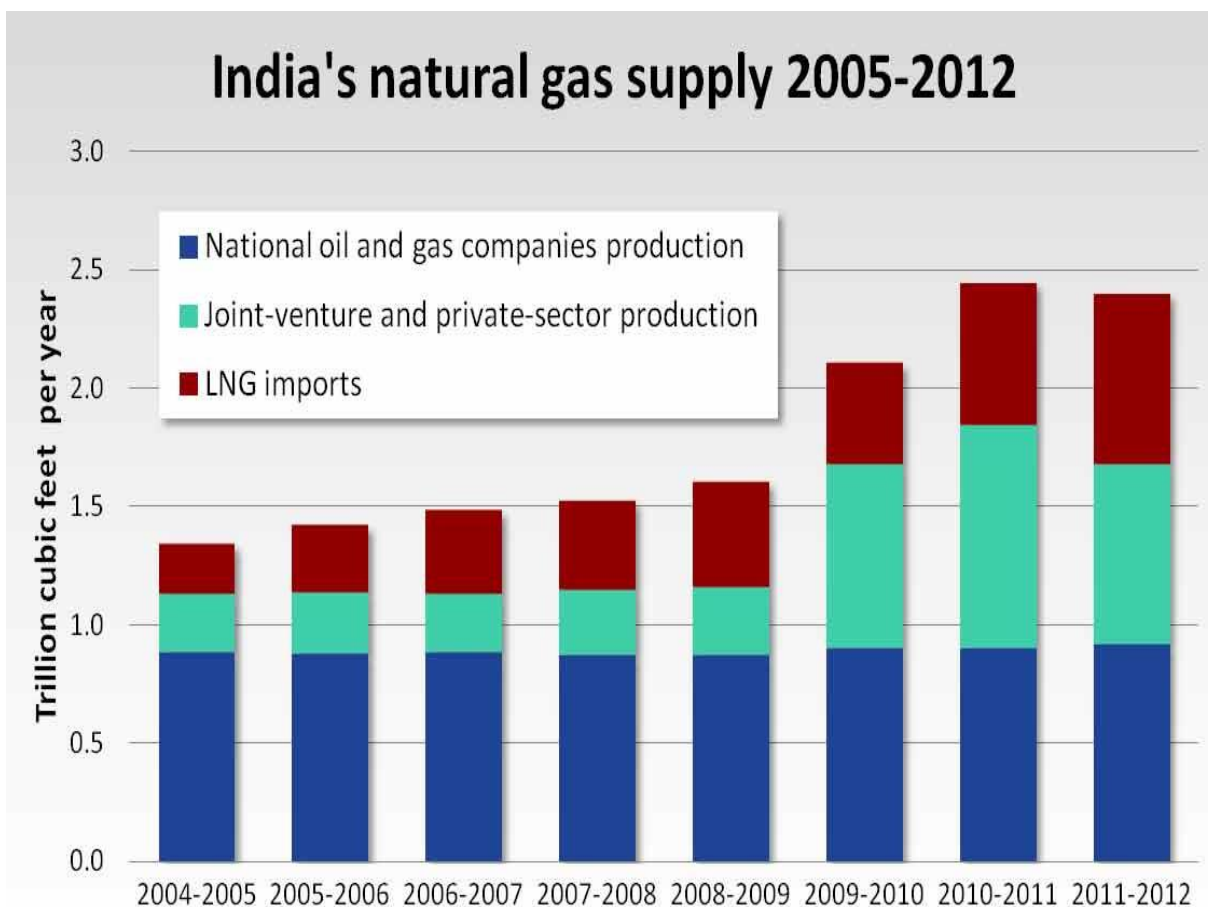
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Why this sudden spurt in projected demand? It seems the power and fertilizer sector has suddenly woken up to the usability of natural gas! The power sector has an increased gas demand, where the capacity addition requirement is projected at around 8,000 MW per year. There is also great demand from

the existing fertiliser plants which are either under-supplied with gas or are running on naphtha- a far more expensive proposition! Moreover, some existing base load demand from sponge iron plants has also emerged.



Source :energy conservation India report 2012 - 13

Thus the relatively favourable economics of gas based power generation, growing demand in various industrial sectors, potential demand in residential, commercial and transport sectors and growing environmental concerns are also factors responsible for increasing the demand for gas.

**Major Gas Based Projects**

Project	State	Commissioned Capacity (MW)
RGPPL, Anjanvel	Maharashtra	1480
Dadri	Uttar Pradesh	817
Paguthan	Gujarat	654.73
Auraiya	Uttar Pradesh	652
Jhanor-Gandhar	Gujarat	648
Kawas	Gujarat	645
Faridabad	Haryana	430
Anta	Rajasthan	413
Vemagiri Power Generation Ltd.	Andhra Pradesh	388.5
Rajiv Gandhi CCPP Kayamkulam	Kerala	350

Source-Non-renewable Energy Report Govt. of India 201516

**Availability of Natural Gas In India**

Your interest will surely be rewarded if you visit gas producing sites at South Bassoon. Panna-Mukta and Tapti fields in Gujarat. Bombay High fields, marginal fields in Rajasthan, Krishna-Godavari Basin, Cauvery Basin, Assam and Tripura. Did you know that around 70 percent of the current gas production comes from the offshore Bombay High fields and from onshore fields in Gujarat?

Now that the natural gas is produced, how does it reach the units where it is used? Well there is a Public Sector Organization known as GAIL (Gas Authority of India Limited) that takes care of all post-exploration activities related to natural gas. Natural gas is received from ONGC (Oil and Natural Gas Corporation), OIL (Oil India Limited) and other joint venture companies such as Enron, and transported and marketed by them to various consumers through its gas pipeline networks, GAIL currently transports over 62 million standard cubic meters of natural gas per day (MMSCMD) representing approximately 93 percent of the total volume of natural gas transmitted by pipelines in India. And who distributes the remaining 7 percent ? Percent ? Well, there is Gujarat Gas and Time Natural Gas covering this portion.

The pipelines, the primary transport network, comprise of the offshore pipeline network connecting Uram Hazira terminals, and the Has Bijaipur-

Jagdishpur line (HBJ Line) which is fed by gas from Bombay High fields.

Other producing regions have Relatively localised distributor networks. The prime distribution companies Mahanagar Gas in Mumbai Baroda Municipal Distribution Company, Gujarat Gas and Assam Gas Company Well, documents from GAIL proudly declares that it owns and operates 4400 km of pipelines of varying ranging from 4", to 36" including HBJ pipeline in North Western India It supplies gas as fuel for power plants for generation of over 4500 MW power, as feedstock for gas based fertiliser plants to produce about MMTPA (Million Metric Tonnes Annum) of urea and to other industrial units to meet their energy and process requirements.

#### **Natural Gas Consumption in Power and Fertilizer Sector**

You may be already aware that power generation based on natural gas is a relatively new idea. Nearly 40 percent of the natural gas is consumed by the power sector. The capacity addition programme, more stringent environmental stipulations, and advancements in gas turbine technologies have resulted in natural gas as a preferred fuel for power generation. In fact the choice of natural gas as a fuel to generate electricity offers many advantages, both economic and environmental, as compared to other fuels. Few of them have been mentioned alongside.

The fertiliser industry consumes about 45 percent of the natural gas produced in the country. Gas is predominantly used as feedstock for the production of ammonia and subsequently urea. Where gas is yet not available, naphtha is used and some older plants use fuel oil and coal. The major advantage of a gas fertilizer plant is its cost-effectiveness. Here, the sponge iron industry gains favour. Natural gas is used as a primary energy agent for the production of iron oxides into metallic iron, either in the form of Hot Briquetted Iron (HBI) or iron carbide for subsequent use in the manufacture of steel lads and billets.

#### **Other Important Sector Where Natural Gas is Used**

1. Sponge iron industry
2. Cement industry
3. Glass and Ceramics Industry
4. Methanol plant (as feedstock)
5. Commercial and domestic establishments (in place of kerosene, LPG, etc.)
6. Transportation sector (as CNG) etc.

#### **What Will Happen If We Use Up All of this Wonder Gas?**

Perusal of the above account may have convinced you about the demand supply gap we already have! The limited availability of natural gas vis-à-vis its growing demand has made it imperative to look for alternate sources. What are these alternate sources? Check out some of them that are briefly outlined in the following paragraphs.

#### **Import in the form of Liquefied Natural Gas (LNG)**

Importing LNG will perhaps assist in bringing together remote gas reserves and customers in need. Although, a number of proposals for setting up of LNG terminals in India are under various stages of

evolution, the pressure on the fiscal situation of the country is yet to be established.

#### **LNG (Liquefied Natural Gas)**

Liquefied natural gas is a natural gas in a liquefied form with more methane CH<sub>4</sub> and ethane C<sub>2</sub>H<sub>6</sub> primarily for ease of storage and transportation. LNG is a clear, colourless, non-toxic liquid that can be transported and stored more easily than natural gas because it occupies up to 600 times less space.

When LNG reaches its destination, it is returned to a gas at regasification facilities. It is then piped to homes, businesses and industries.[iii]

#### **LNG Terminals**

LNG Terminal	Capacity (MMTPA)
Dahej	5
Dahej Exp	5
Kochi	2.5
Shell Hazira	2.5
Dabhol	2.5
Mangalore	5
Kakinada	2.5
Total	25

Source-Non-renewable Energy Report Govt. of India-201516

#### **Supply of Natural Gas through Trans - Border Pipelines.**

Pipelines of the future are pipelines that break border barriers! Trans-border pipelines have a long term potential to meet the projected demand of natural gas in the country apart from being economical. Look around you! There are significant gas reserves in countries adjacent to ours which are still at various stages of exploitation. Iran might be a help from the West, while Bangladesh and Myanmar are the East possibilities Iran has proven natural gas reserves of around 23,000 BCM and about 50-75 MMSCMD of gas can be imported from Iran. Bangladesh too is known to have considerable natural gas reserves which has been estimated to be around 300 BCM and could be a potential exporter to India. But, a look at the newspapers will convince you that international events do take some serious consideration before implementation. Long term supply requires political will, enduring supply commitment and several other contemplations between supply, transit and receiving countries. If all goes well, it is expected that the import of natural gas through trans-border pipelines may become a reality within next decade.

#### **Exploitation of Coal Bed Methane**

What is this coal bed methane? Well, it is methane in the coal bed! Ok, jokes apart, substantial reserves of methane are sometimes trapped within the seams of coal. In India Coal Bed Methane (CBM) resources can significantly augment domestic gas production. The technology required to exploit CBM is quite similar to that of oil and gas production. However, development techniques and the subsurface expertise required are quite different.

You would be amazed to discover that when we said substantial we actually meant it! We have over 200 billion tonnes of coal resources and the methane potential is around 1000 BCM. The gas availability from CBM is estimated to be around 40 MMSCMD for 15-20 years. Where can we find this gas? Well, the potential areas for CBM include West Bengal, Bihar, Madhya Pradesh Orissa and Gujarat.

Methane extraction from natural gas hydrates from under the ocean Energy from a thousand leagues under the sea! These amazing natural gas hydrates nestled in deep sea, promise us an abundance of gas that would adequately counter the gas deficits in India.

A National Gas Hydrate Program (NGHP) has been launched under the Ministry of Petroleum and Natural Gas involving organisations such as, ONGC, GAIL, DGH (Director General of Hydrocarbons) and CSIR. (Central Scientific Research Institute) and more. Several prospective areas have been identified along the east and the West Coast and preliminary resources have been estimated (by DGH) to be around 1890 trillion cubic meters. That is indeed a whole lot of gas .

But whatever might be the potential in the country, the gas always seems greener on the other side of the fence. What fence? Well, the international kind! Policy makers think that LNG and trans-border pipeline routes are the options that hold the maximum promise of making gas available in substantial quantities in short and medium term.

#### **Oil & Natural Gas Companies**

##### **Reliance**

The Reliance Group was founded by Dhirubhai H. Ambani (1932-2002). The group's annual revenues are in excess of US\$ 34 billion. The flagship company, Reliance Industries Limited, is a Fortune Global 500 company and is the largest private sector company in India.

The Company's operations can be classified into four segments namely:

1. Petroleum Refining and Marketing business
2. Petrochemicals business
3. Oil and Gas Exploration & Production business
4. Others

##### **Cairn Energy**

Cairn is an Edinburgh-based oil and gas exploration and production company listed on the London Stock Exchange since 1988. There are two arms to the business: Cairn India is an autonomous business listed on the Bombay Stock Exchange and the National Stock Exchange of India and has interest in a total of 14 blocks in India and Sri Lanka. And Capricorn. Cairn

##### **Oil India Limited**

Oil India Limited (OIL) is a premier National oil company, engaged in the business of exploration, production and transportation of crude oil and natural gas. Oil India Limited is a "Schedule A" company under the Ministry of Petroleum and Natural Gas, Government of India.

##### **Indian Oil Corporation Limited**

Indian Oil Corporation Ltd. 18th largest petroleum company in the world and has a current

turnover of R. 247, 479 crore (US \$59.22 billion). And profit of Rs. 6963 crore (US \$ 1.67 billion) for fiscal 2007. The Indian Oil Group of companies owns and operates 10 of India's 19 refineries with a combined refining capacity of 60.2 million metric tonnes per annum (MMTPA, .i.. 1.2 million barrels per day). These include two refineries of subsidiary Chennai Petroleum Corporation Ltd. (CPCL) and one of Bongaigaon Refinery and petrochemicals Limited (BRPL).

##### **ONGC**

Oil and Natural Gas Corporation Ltd. (ONGC) is engaged in E&P activities both in Onshore and Offshore. The Corporation is now venturing out to new areas i.e. deep-water exploration and drilling, exploration in frontier basins, marginal field development, optimization of field development plan field recovery and other allied areas of service sector.

##### **HPCL**

HPCL is a Fortune 500 company, with an annual turnover of over Rs. 1,03,837 Crores (\$ 25,142 Millions) during FY 2007-08, 16% Refining & Marketing share in India and a strong market infrastructure. Corresponding figures for FY 2006-07 are: Rs. 91,448 crores (\$20,892 Million). The Corporation operates 2 major refineries producing a wide variety of petroleum fuels & specialties, one in Mumbai 5,5 MMTPA capacity and the other in Vishakhapatnam, (East Coast) with a capacity of 7.5 MMTPA. (West Coast) of

##### **Engineers India Limited**

Engineers India Limited was established in 1965 to provide engineering and related technical services for petroleum refineries and other industrial projects. In addition to petroleum refineries, with which EIL started initially, it has diversified into and excelled in other fields such as pipelines, petrochemicals, oil and gas processing, offshore structures and platforms, fertilizers, metallurgy and power. EIL now provides a range of project services in these fields and has emerged as Asia's leading design and engineering Company.

##### **BPCL**

Bharat Petroleum Corporation Limited engages in refining, storing, marketing, and distributing petroleum products in India. It also involves in the exploration and production of hydrocarbons. The company offers various products, including liquefied petroleum gas (LPG), naphtha, motor spirit, special boiling point spirit/hexane, benzene, toluene, polypropylene feedstock and more.

##### **GAIL (India) Limited**

GAIL (India) Limited operates as a natural gas company in India and internationally. The company involves in the exploration, production, processing, transmission, distribution, and marketing of natural gas. It also offers LPG and other liquid hydrocarbons, and petrochemicals. The company owns approximately 5,800 kilometers of natural gas high pressure trunk pipeline.

##### **Premier Oil**

Premier Oil plc engages in the exploration, development, and production of oil and gas properties. It has oil and gas producing interests

principally in Asia, Middle East and Pakistan, the North Sea, and west Africa. As of December 31, 2006, the company had proved plus probable reserves of 722 billion cubic feet of gas and 152.1 million barrels of oil equivalents of oil.

#### **Adani Group**

Adani Group has forayed into the Oil & Gas sector and has been awarded two oil & gas blocks in Gujarat and Assam Gujarat and another block with an area of 95 sq. kms. Is situated in Assam. Under the recently concluded NELP VI and also plans to participate in the upcoming NELP VII bids and is actively looking at oil and gas blocks overseas. One Block with an area of 75 sq. kms is situated in Cambay.

#### **Simon Carves**

In Simon Carves as a part of its offshore development, projects have been carried out in India and Indonesia in providing oil and natural gas development facilities. In gas processing they have carried out projects in Singapore, Indonesia and India in providing natural gas processing facilities and gas field developments. A key part of many of these projects is the provision of pipeline and tanks where in conjunction with Punj Lloyd they have considerable expertise in the design and construction of these facilities in often very difficult environments.

#### **Petronet LNG Limited**

Petronet LNG Ltd, one of the fast growing companies in the Indian energy sector, has set up the country's first LNG receiving and regasification terminal at Dahej, Gujarat, and is in the process of building another terminal at Kochi, Kerala. The Dahej terminal has a nominal capacity of 5 million metric tonnes per annum (MMTPA) [equivalent to 20 million standard cubic meters per day (MMSCMD) of natural gas], the Kochi terminal will have a capacity of 2.5 MMTPA (equivalent to 10 MMSCMD of natural gas)

#### **Oil & Natural Gas Research Centres**

##### **The Energy and Resources Institute (TERI)**

The research areas of TERI in ONG include: Connecting additional washing units to 30 MLD CETP at Bithuja in district Barmer. Rajasthan

##### **Problems with Natural Gas**

1. Not a renewable source of energy.
2. India has only limited reserves of natural gas, though further discoveries are
3. being made from recent explorations
4. Owing to the high percentage of methane in natural gas, it is highly combustible
5. The process of extraction of natural gas involves making large cavities in the ground. Natural gas requires highly complex treatment plants and pipelines for its delivery.
6. Natural gas occupies four times the space of gasoline-equivalent energy.

##### **Findings**

1. Natural gas is the only clean and green energy resource available.
2. The production of natural gas has increased many fold since last 10 years ,
3. Increased L N G plants are setting to make natural gas much easy to store and transport.

#### **Conclusion**

During the last four decades petroleum consumption has undergone drastic change. Production of middle distillates, dominating before 1990 has lost its position and light distillates have emerged as major one. As country grow demand for cleaner fuel like LPG shows increasing trend this has result in large imports of light distillates like LPG. As the consumption of Kerosene declined govt reduced its distribution and consumption but consumption of LPG increased as Govt. promotion of LPG as clean in fuel subsidies given by Govt. also help this consumption grow further.

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