Petroleum Federation of India

Impact of Gas on Refining and Marketing

September 2011

A Study by PetroFed in association with Member Company and Knowledge Partner

PRICEWATERHOUSECOOPERS

Contents

1 . Foreword

This study on the 'Impact of New Gas on Refining & Marketing' is released by the Petroleum Federation of India in its continuing initiative to undertake, inter-alia, analytical studies to present insights into the ever-changing landscape in the sector to provide strategic planning inputs. Globally the availability of natural gas and its resultant future is more certain than oil and its share in the energy mix is expected to rise substantially and almost catch-up with coal consumption.

In India, large finds in the East Coast KG basin in 2002 and subsequent commissioning of LNG regasification terminals on the West Coast have transformed the gas sector. It enabled growth in gas transportation infrastructure, provided gas to core sector and lent impetus for development of new gas based industries resulting in helping reduce carbon footprint.

The substitution of liquid fuels like FO, LSHS, Diesel, Petrol, LPG, etc. by new gas, was however, not easily fathomable. There was, thus, a need for assessing the impact of gas on liquid fuels.

During the course of this study collection of details for gas supply projections and location-wise demand of liquid fuels was critical. Similarly, modelling the growth of end use sectors like CGD, fertiliser and power sectors proved to be challenging. Gas market development is a dynamic process. The study team conducted consultations with DGH, PPAC, industry participants and senior industry experts to create a picture of what could emerge in future. The volume of gas production from KG D6 Block of RIL is assumed to be building upto a maximum of 80 MMSCMD and sustain over years as indicated elsewhere in this document. All the analysis carried out is based on that assumption. In reality, however, the sustained production has not reached that level; consequently the projections of gas consumption, including its displacement of oil projected during the XII Plan period ending 2016-17would be affected. The projections are retained with an expectation that when supplies from the field reach the earlier anticipated level in due course, the displacement or consumption would be on the lines of the projections.

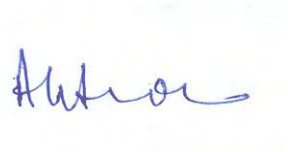
The results of the study are valuable for the gas market and in understanding the intertwined nature of the gas and oil sector. Gas, conventional and non conventional, is said to be the fuel of the 21st century. In an earlier study in 2007 PetroFed had projected demand for natural gas and natural gas equivalent of naphtha to increase to 243 billion cubic metres (BCM) and 405 BCM in 2030, assuming an annual GDP growth of 6 per cent and 8 per cent respectively as compared to a consumption of 42 BCM in 2003-04. Natural Gas is a clean and efficient fuel

as compared to coal and oil and would be the 'natural' fuel of choice for industry if un-hindered by supply and infrastructure constraints.

Our thanks to PricewaterhouseCoopers (p) Limited (PwC) who have been our knowledge partner for this study.

We also sincerely thank DGH, PPAC, all our member companies and the industry experts for their valuable inputs provided during the course of this study.

We are confident that this study will provide significant insights to readers. We will be delighted to receive any comments and views.



September 2011

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2. Executive Summary

Setting the Context

2.1.1 Natural Gas has emerged as the preferred fuel of 21st century. With commercialisation of new gas discoveries and coming up of LNG terminals in India, Natural Gas has come to the fore as a preferred source of energy contributing to the energy security of the country. This enhanced availability of gas from 2009-10 in the country ("Additional Gas") has the potential to displace almost all major liquid fuels across various sectors since gas is competitively priced and is environment friendly. Such displacement of liquid fuels would impact downstream Refining & Marketing industry and evaluating such an impact would help industry plan business accordingly.

2.1.2 Towards this end, PetroFed engaged PwC to analyse the impact of Additional Gas on Refining and Marketing in the country and to undertake a study through research, analysis and consultation.

Findings and Conclusions

2.3.1 The specific gas consuming sectors viz. Fertiliser, Power, City Gas Distribution, Refinery, Steel and Petrochemicals have been identified and accorded priority in the allocation for supply of gas by the Empowered Group of Ministers (EGoM). Therefore, the volume of liquid fuels displaceable by gas has been assessed for these sectors. An aggregate volume of 43.6 MMT (Table 5.7) of liquid fuels have the potential to be displaced by the year 2016-17 in these sectors, if constraints in gas availability are ignored. To support the displacement of this volume, approximately 143.2 MMSCMD of gas (Table 5.9) is required.

2.3.2 For the purpose of analysing if and how much gas is available to support this displacement of 43.6 MMT of liquid fuels estimated as potentially displaceable by gas, the existing and potential sources of supply of gas have been assessed for projected availability of gas till 2016-17. This includes gas supply from APM sources, Pre-NELP, NELP, CBM blocks, projected production profiles of gas discoveries for which the Field Development Plans (FDPs) have been submitted by the operators for approval to Directorate General of Hydrocarbons (DGH) as well as the supply from LNG terminals estimated based on regasification capacities of existing terminals and those which are planned to be commercialised in the period under review. Subsequent to such an assessment, it is estimated that gas supply is estimated to grow from 147.6 MMSCMD in 2009-10 to 252

MMSCMD by 2016-17 (Table 4.7). A part of this gas supply i.e. around 147.6 MMSCMD is being consumed by the existing units in the Fertiliser, Power, City Gas Distribution, Refinery, Steel and Petrochemicals sectors in the current year (2009-10). It is assumed that these existing units will consume gas at the current year's (2009-10) levels which is around 147.6 MMSCMD. After considering this 147.6 MMSCMS of gas supply consumed by the existing units, only 104.4 MMSCMD of gas is left to support the possible displacement of 43.6 MMT of liquid fuels by the year 2016-17 as against requirement of 143.2 MMSCMD out of the aggregate 252 MMSCMD of gas projected to be available by the year 2016-17. Therefore, there exists a gas supply shortfall of 38.8 MMSCMD posing a supply side constraint to support displacement of 43.6 MMT of liquid fuels by the year 2016-17 (Table 5.10).

2.3.3 Thereafter, the remaining 104.4 MMSCMD of gas is allocated amongst the sectors in the same order of priority as set out in the present gas utilisation policy of the Government. Nevertheless, a part of this gas will also be consumed in the expansion and Greenfield projects in the fertiliser and power sectors and thus will not displace any liquid fuel consumption since this gas is consumed in the new plants in the fertiliser and power sectors.

2.3.4 With food security issues being uppermost in the agenda of the Government, it is assumed that Government shall continue to allocate gas to the Fertiliser sector on priority. As per expansion plans of existing urea units and revival of the closed urea units duly approved by the Department of Fertilisers, based on capacity utilization and specific energy consumption, it is estimated that 27 MMSCMD of gas out of remaining 104.4 MMSCMD of Additional Gas will get allocated to these units by the year 2016-17. With regards to the power sector, as per the gas utilisation policy of the Government in vogue, all new power projects will get gas allocation when they are ready to operate. The Working Group on Power for XI Five Year Plan Period (2007-08 to 2011-12) has identified under construction gas based power projects with an Installed Capacity totalling 1,014 MW. These power projects are likely to get commissioned during the period of study and will get allocation of about 8.5 MMSCMD of gas. Thus, an aggregate volume of 35.5 MMSCMD of gas (Table 5.11) is required in the expansion and Greenfield projects in the fertiliser and power sectors. After accounting for this 35.5 MMSCMD of gas, 68.9 MMSCMD of gas is available for displacement of liquid fuels by the year 2016-17. This quantity of 68.9 MMSCMD of gas is allocated amongst the sectors in the same order of priority as set out in the present gas utilisation policy of the Government and is estimated to supplement displacement of 19.8 MMT of liquid fuels in these sectors under constrained gas availability scenario.

2.3.5 To provide insights for planning product movement across the country and its impact on refining and marketing , the year-over-year regional demand of petroleum products have

been projected till 2016-17 assuming that petroleum products shall grow at the historical rate of growth in consumption of petroleum products, based on IPRs for the period 2007-08 to 2009-10. The displacement of liquid fuels will add to the increased availability of displaced liquid fuel viz. LPG, Naphtha, MS, HSD/LDO and FO/LSHS. Therefore, the volume of displaceable liquid fuels has been added to supply.

2.3.6 India is fast emerging as refining hub and the country will be surplus in almost all products except LPG. The economy is continuing to grow at upwards of 7 percent and would therefore need petroleum products to drive as well as sustain the growth in the years to come. The demand of petroleum products accordingly is fast catching up this trend. Although, 19.8 MMT liquid fuels are projected to be displaced by gas by the terminal year of the study i.e. 20016-17, the demand growth of petroleum products would mostly make up for it.

2.3.7 The refineries are well geared up to meet this challenge and oil and gas sector possess required experience in trading of petroleum products quite competitively in the global market. It will therefore, not be difficult for oil and gas sector to handle the required export of surplus petroleum products. However, movement of surplus product from hinterland refineries to the costal terminal is not envisaged in large volume, considering region wise supply demand balance.

2.3.8 To handle export of surplus petroleum products, coupled with substantial import of Crude Oil and LPG in the coming years, oil & gas sector would need to examine availability of required port infrastructure and facilities to handle the same.

2.3.9 Notwithstanding above, and putting it in perspective, the new gas has saved the country of a consumption of about 20 MMT of petroleum products. Consequently, the gas would cause to the country saving of foreign exchange for crude imports, save the environmental externalities caused due to liquid fuels' combustion and in better planning for creating additional refining capacity as well as expansion of capacity of existing refineries including corresponding capital infusion.

2.3.10 The study also infers that the pipeline infrastructure would not be made redundant due to potential displacement since the country remains strong on demand despite the displacement. The retail petroleum sector may, however, feel the effect in terms of reduction in growth because of city gas distribution network development. The Oil Marketing Companies may therefore be impacted to that extent.

2.3.11 In this context, it is pertinent to mention that the gas infrastructure proposed by 2016-17 is largely influenced by the source of gas and the existing pipeline infrastructure like HBJ

pipelines. Although this is obvious, the section of analysts observe that a more holistic planning for development of gas distribution network in years and decades to come could be (and have been) made so as to maximise benefit of gas availability to the nation.

3. Introduction

3.1 Background

3.1.1 Natural gas, termed as Fuel of the 21st Century, has emerged as the preferred fuel due to its inherent environmentally benign nature, greater combustion efficiency and cost effectiveness. The trade driven supply and hence consumption of natural gas has sharply increased in the last decade at the global level. In India too, the natural gas sector has gained importance owing to domestic gas discoveries and LNG regasification terminals having been set-up.

3.1.2 The gas market in India is at an inflection point. The increase in gas supplies due to production from KG D6 block, the expected production from other discoveries of ONGC, GSPC, etc., as well as gas imported through LNG route, would meet part of the existing demand, but also promote setting up of brown field and green field gas fuelled projects on the pipeline routes. Gas infrastructure is being developed rapidly. The East West Pipeline and the connected HBJ pipeline would take the KG D6 gas to major demand centres in India. With increase in gas supplies and development of pipeline infrastructure, the gas markets would develop further, thereby benefiting the customers and the country.

3.1.3 The Additional Gas is to be used in many segments like fertilizer, power, industrial, commercial, domestic and transport sectors. In most applications, gas is an alternative option and has the potential to displace liquid and solid fuels. The displacement of fuels like MS, HSD, Kerosene and Naphtha will immediately impact the consumption of these fuels. Elsewhere, owing to the economic growth and improvement in standard of living, demand for liquid fuels will grow. The net effect of these counter developments is expected to be altered pattern of utilization of petroleum refineries, storage & marketing set-ups, the existing infrastructure of delivering transport fuels to end users. Analysis of these displacement effects has been undertaken with the objective of providing scenarios to the refining, pipeline and marketing companies to be able to plan their businesses well.

3.1.4 Toward this end, PetroFed engaged PricewaterhouseCoopers (PwC) to undertake a study. This report elaborates the findings of the study.

3.2 Scope of this Study

The study covers the following:-

3.2.1 Assess Additional Gas sources, volumes and expected availability period for various confirmed sources of gas, including CBM, discovered or established as on date.

3.2.2 Assess available and planned infrastructure for gas transportation and distribution and governing regulations like utilization policy.

3.2.3 Assess in the identified destination geographies sectors the part of liquid fuel consumption which is expected to be displaced with gas.

3.2.4 Analyse and estimate volume and timelines of any reduction in refined fuels consumption in the following three categories:

3.2.4.1 Regions

3.2.4.2 Fuel types

3.2.4.3 Plan periods (Eleventh and Twelfth)

3.2.5 Evaluate consequent effect on the refineries' production plan and utilization of pipeline infrastructure, storage terminals (including Shore Terminals) and retail outlets.

3.2.6 Suggest how the refinery, pipeline and marketing industry can respond to the situation.

3.3 Approach and Methodology

3.3.1 The fuel displacement analysis is carried out by individually analysing the industry sectors. Their demand is estimated – either project by project, or on the basis of other factors like constituent consumers and capacities – to evaluate the potential of displacement by gas. Thereafter gas availability, gas infrastructure and such other constraints were applied to estimate the volume of displacement. The data regarding gas availability was estimated by interaction with DGH and from annual reports of LNG terminals. The industry sectors related data was sourced from reliable sources. The desk based analysis was carried out of potential of displacement.

3.3.2 The approach for analysing impact of projected liquid fuel displacement was consultative. Impact of such displacement was discussed with the industry members. Specific conclusions were drawn on the basis of results of analysis and views of industry members.

3.3.3 The methodologies followed for undertaking analysis through different tracks of scope of work are described below.

Step 1: Assessment of the existing and potential sources of gas

3.3.4 DGH was approached for obtaining outlook on gas till 2016-17. The data sourced from DGH was pertaining to discovered blocks for which Field Development Plans (FDP) are approved. As regards other discoveries which may commercialise in the forward period being covered in this study, but whose FDPs are not approved, have also been considered for estimating year on year gas supply volumes. The gas supply estimates of such cases were based on industry reports relating to FDPs under review by DGH. Gas supply from LNG terminals was estimated based on capacities of existing terminals and those which are planned to be commercialised in the forward period being covered in this study.

Step 2: Identification of existing and planned gas transmission infrastructure for connectivity of source of supply of Natural Gas with end-user segments

3.3.5 In order to assess which projects, regions and cities will get gas in the forward period being covered in this study, the existing and planned/proposed gas transmission pipelines were taken into consideration. Information like capacities, completion timelines, etc. about planned/proposed pipelines was obtained from reliable sources viz. annual reports of the gas pipeline companies and report of the Working Group on Petroleum and Natural Gas Sector for XI Five Year Plan period (2007-12).

Step 3: Sector wise assessment of volumes of liquid fuels displaceable by Natural Gas in different regions and sectors of India

3.3.6 An Empowered Group of Ministers (EGoM) has been identifying and prioritizing specific sectors for supply of gas. Subsequent to this, the EGoM also allocates specific gas volume to these priority sectors. The volume of liquid fuels displaceable by gas was assessed for in these sectors viz. Fertiliser, Power, CGD, Refinery, Steel and Petrochemicals.

3.3.7 The liquid fuels analysed are petrol, diesel (including LDO), LPG, Naphtha and FO/LSHS. Information/data available from sources such as Petroleum Statistics (by MoPNG), various

reports of MoPNG and Planning Commission on the sector wise sales/consumption of these liquid fuels have been used to estimate displaceable volume of liquid fuel in various sectors.

3.3.8 The displacement of liquid fuels is sensitive to the time from when gas will become available at the projects in the sectors identified or cities under consideration. Hence, the reach of pipeline infrastructure and its capacity are mapped across the country along with the projected time-period within which the gas would be made available to the specific projects, regions or cities. First the year on year volume of liquid fuels consumption in these sectors was estimated using, various assumptions of economic factors, feasibility factors, efficiencies, plant load factors, technology bottlenecks etc. Consequently potential liquid fuels displacement was estimated.

3.3.9 The methodology followed for estimating the volumes of liquid fuels displaceable by gas in an unconstrained gas supply scenario for each of the aforementioned sectors is explained hereunder:

Fertilizer: In the fertilizer (Urea) industry, potential of displacement of liquid fuels exists if Naphtha and FO /LSHS based units can get gas supplies. Additionally, some units are gas based but they use Naphtha owing to the shortage of gas. Such projects also hold potential of liquid fuel displacement when gas supplies are established. In fertiliser sector, the volume of Naphtha and FO/LSHS displaceable by gas have been projected with due sensitivity to the time-frame for conversion of the existing Naphtha and FO/LSHS based urea units to gas, which in turn are determined by

a. The schedule of pipeline connectivity of these units,

b. Availability of gas, and

c. Government's policy(ies).

d. Conversion projects schedules

A comprehensive analysis covering all existing and proposed fertiliser units in India has been carried out to estimate the year wise displaceable volumes of Naphtha and FO/LSHS in the fertiliser sector. Suitable assumptions listed in chapter 4 have been made for this estimation.

Power: In the power sector, different methodologies were used for estimating the quantities of liquid fuels displaceable by gas for IPP/Merchant power plants and Captive Power Plants (CPP).

Estimates of displacement of Naphtha, FO/LSHS and Light Diesel Oil (LDO) are made for the Independent or Merchant power plants, based on inputs on quantity of the liquid fuels consumed and Plant Load Factor (PLF) related information gathered from various reports and industry interactions.

A list of CPPs which covers names/capacities of projects and quantity of liquid fuels used has been obtained from CEA. Such projects are then considered and analysed for potential displacement of liquid fuels, subject to assumptions listed in the Power section of Chapter 4 of the report.

City Gas Distribution: The volume of liquid fuels displaceable by gas was estimated separately for four sub-segments within City Gas Distribution (CGD), viz. domestic, industrial, commercial and transport for 323 cities. These include:-

(a) 68 cities for which the entities had submitted Expression of Interest EoI to PNGRB for CGD licence;

(b) 243 cities suo-moto identified by PNGRB for seeking EoI from investors for developing CGD network; and

(c) 12 cities en-route gas trunk/Spur pipelines and which are yet to attract investment interest from any entity(ies)interested in laying, building, operating or expanding gas transmission pipelines and/or PNGRB for developing CGD network.

Suitable assumptions made to estimate the volumes of liquid fuels displaceable by gas in these identified cities are cited in the CGD section in Chapter 4 of this report.

Refinery: All refineries in India which are already connected by gas transmission pipelines and those which are expected to be connected by pipelines are analysed for estimating the volume of liquid fuels consumed within refining process displaceable by gas. Suitable assumptions made to estimate this volume are detailed in the Refinery section in Chapter 4 of this report.

Steel: In the steel sector, gas is expected to displace liquid fuels in Sponge Iron plants. The potential three such projects which hold potential for gas supply are analysed in the Steel section in Chapter 4 of this report.

Petrochemicals: A list of all petrochemical complexes in India covering their names, capacity and feedstock usage was obtained from secondary sources. Of these, the Naphtha-based cracker complexes were analysed for possibility of Naphtha displacement by gas. The

gas availability and pipeline connectivity is not a constraint in the regions where most of these Naphtha-based cracker complexes are located. Gas is not a perfect substitute of Naphtha as it is not economical to produce many downstream petrochemical products using gas as feedstock. Hence, the potentially displaceable volume of liquid fuels by gas is Nil as analysed in the petrochemical segment in Chapter 4 of this report.

3.3.10 Step 4: Impact analysis of liquid fuel displacement

An analysis was carried out to assess the impact of displacement of liquid fuels by gas on regional demand-supply balance of petroleum products in order to assess the impact on refining capacity and marketing infrastructure. The data/information regarding refinery capacities, product slate, consumption of products etc. was researched using secondary sources. The region wise and product wise impact of displacement of liquid fuels by gas have also been analysed as a part of this study.

4. Gas Supply and TransmissionThe big change

4.1 The big change

4.1.1 The year 2009-10 can be referred to as the turning point in the development of gas market in India. The supply of Additional Natural Gas from RIL's KG-D6 field in April 2009 supplemented by augmented LNG supply and already existing domestic sources of supply such as APM, Pre-NELP, NELP and CBM has significantly altered the landscape of gas availability in India**.**

4.2 Current Gas Supply

4.2.1 The current gas supply is summarized in Table 4.1 below:-

Table 4.1 Natural Gas Supply in India in 2009-10 (MMSCMD)

SI.	Sources of Gas Supply	2009-10
1	**Total Domestic Gas Production (1.1+1.2+1.3+1.4)**	**115.3**
1.1	APM (ONGC, OIL)	55.1
1.2	Pre-NELP(Panna-Mukta + Tapti, Ravva + Ravva Satellite)	15.9
1.3	NELP (RIL)	41.4
1.4	Others	2.98
2	**Regasified Liquified Natural Gas(R- LNG) Supply**	32.3
3	**Total (rounded off)**	**147.6**

Source: PPAC

4.2.2 The volume gas production from KG D6 block of RIL is assumed to be building upto a maximum of 80 MMSCMD and sustain over years as indicated elsewhere in this document. All the analysis carried out is based on that assumption. In reality, however, the sustained production has not reached that level; consequently the projections of various gas consumptions would be affected including that of oil displaceable by gas. The projections are retained as it is with an expectation that if and when the supply from the field reaches the earlier anticipated level, the displacement or consumption would be on the lines of projections

4.3 Gas Supply Projections

4.3.1 Supply projections from existing nominated fields of both ONGC and OIL under Administered Pricing Mechanism (APM) are projected to decline from 51.89 MMSCMD in 2010-11 to 24.71 MMSCMD by 2016-17. (Table 4.2)

Table 4.2: APM Gas Supply Projections

MMSCMD	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
APM Gas (ONGC, OIL)	51.89	54.85	48.59	41.54	37.05	31.15	24.71

Source: Gas Pricing in India 2008, Industry sources

4.3.1The production profiles of existing gas fields and projected production profiles from new gas discoveries, for which the Field Development Plans (FDPs) are submitted by the operators and approved by the Directorate General of Hydrocarbons (DGH) have been considered for projecting the domestic gas production in years to come (Annexure 1 and Annexure 2).

4.3.2 The data obtained from DGH indicates a gradual decline in the gas production from Pre-NELP fields from 21.53 MMSCMD in 2010-11 to reach a level of 11.14 MMSCMD by 2016- 17. This includes gas production from Panna-Mukta and Tapti fields located in South of Gujarat along the Western coast of India; Ravva fields located off the Eastern Coast of India along the Coast of Orissa, Hazira field located in Southern Gujarat and Lakshmi and Gauri fields in Western Gujarat. On the other hand, domestic production of gas from NELP fields is projected to go up from 70.58 MMSCMD in 2010-11 to 81.24 MMSCMD by 2016-17. (Table 4.3)

4.3.3 Although, the gas production from CBM blocks of Great Eastern Energy, Essar and ONGC-CIL in Asansol-Durgapur region in West Bengal and in Jharia are expected to add on to the country's gas supply base, their contribution to aggregate gas supply is small (Table 4.3)

Table 4.3 Projections of Gas Supply from Pre-NELP, NELP & CBM blocks (MMSCMD)

Block	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Pre-NELP	21.53	19.18	16.79	14.34	12.58	11.86	11.14
NELP	70.58	88.50	86.72	86.92	86.50	84.33	81.24
CBM	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total	**92.11**	**107.68**	**103.51**	**101.26**	**99.08**	**96.19**	**92.38**

Source: DGH

4.3.4 There are some other discoveries which may commercialise in the forward period covered by this study but their FDPs are not yet approved by DGH. Production profiles of such new discoveries, awaiting declaration of commerciality from DGH or for which either the FDP is under preparation or under review by DGH were estimated to find the possible upside potential (Table 4.4).

Table 4.4: Gas Supply Projections (Estimated Addition) (MMSCMD)

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Estimated Addition	0.00	0.00	8.26	24.10	30.18	32.25	32.28	32.30

Source: PwC Analysis, Industry Reports.

Note: This includes an estimate of production from fields/blocks for which FDPs are under approval or are under preparation (KG-OSN-2001/3 block of GSPC, NEC-25 of RIL, RJ-ON-90/6 of Focus Energy, Cauvery Bain Landfall and Cairn's block in Rajasthan).This estimate is as indicated in industry reports and may not necessarily be indicative of actual production potential, which will meet Government approval.

4.3.5 Taking into consideration the APM gas supply from existing nominated fields of both ONGC and OIL (Table 4.2); gas production from Pre-NELP, NELP, CBM blocks (Table 4.3) and estimated addition from yet to be approved developments (Table 4.4), the gas production is projected to increase from 115.3 MMSCMD in 2009-10 (Table 4.1) to 149.39 MMSCMD by 2016-17 (Table 4.5).

Table 4.5: Domestic Gas Supply Projections

SI.	MMSCMD	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
1.	APM Gas (ONGC, OIL)	55.1	51.89	54.85	48.59	41.54	37.05	31.15	24.71
2.	Pre-NELP including Others	18.88	21.53	19.18	16.79	14.34	12.58	11.86	11.14
3.	NELP	41.4	70.58	88.50	86.72	86.92	86.50	84.33	81.24
4.	CBM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.	Estimated Addition	0.00	0.00	8.26	24.10	30.18	32.25	32.28	32.30
6.	**Domestic Production (1-5)**	**115.3**	**144.00**	**170.79**	**176.21**	**172.97**	**168.39**	**159.63**	**149.39**

Source: PPAC, Gas Pricing in India 2008, Industry sources

4.3.6 Gas supply from LNG terminals is estimated based on capacities of existing terminals and of those which are planned to be commercialised within the period of study. By 2016-17, Dahej

and Hazira LNG import terminals are projected to have an operational capacity of 17.5 MMTPA. Another 10 MMTPA capacity will get added with the commissioning of Dabhol and Kochi LNG terminals by 2012. It is expected that with the commissioning of new LNG re-gasification terminals and expansion of existing terminals, R-LNG supply is projected to increase from 32.3 MMSCMD in 2009-10 to 102.47 MMSCMD by 2016-2017. This increase in R-LNG supply is estimated by assuming 100% capacity utilization of the existing and proposed/under construction LNG terminals (Table 4.6).

Table 4.6: Year-on-Year LNG Regasification capacity build-up and supply projections

Sl	LNG Terminal Name	Company Name	09-10 Actual	10-11	11-12	12-13	13-14	14-15	15-16	16-17
1	Dahej	Petronet LNG	10	10	12.5	12.5	12.5	12.5	12.5	12.5
2	Hazira	Shell/ Total	3.6	3.6	3.6	3.6	3.6	5	5	5
3	Dabhol	RGPPL	0	2.5	2.5	5	5	5	5	5
4	Kochi	BPCL	0	0	0	2.5	2.5	2.5	5	5
5	Mundra	Adani	0	0	0	0	0	0	0	0
6	Mangalore	MRPL	0	0	0	0	0	0	0	0
7	Ennore	IndianOil	0	0	0	0	0	0	0	0
	Total LNG Regas Capacity (MMTPA)		**13.6**	**16.1**	**18.6**	**23.6**	**23.6**	**25**	**27.5**	**27.5**
	Total R-LNG Supply (MMSCMD)		**32.3**	**59.99***	**69.30***	**87.93***	**87.93***	**93.15***	**102.47***	**102.47***

Source: Company Presentations; Annual Reports of Companies; Interactions with IndianOil and RGPPL
**Note: R-LNG supply considered assuming 100% capacity utilization of LNG terminals*

4.3.7 The aggregate gas supply in India during the forward period covered under the study is expected to witness an increase from 147.6 MMSCMD in 2009-10 to 252 MMSCMD by 2016-17 (Table 4.7).

Table 4.7: Gas Supply Projection (MMSCMD)

SI.	Source	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
1.	Domestic Production	115.3	144	171	176	173	168	160	149
2.	R-LNG Supply	32.3	60	69	88	88	93	103	103
3.	**Total supply of gas**	**147.6**	**204**	**240**	**264**	**261**	**261**	**263**	**252**

4.3.8 The estimates of total gas supply presented in Table 4.7 above suggest that total gas production after reaching its peak of 264 MMSCMD by 2012-13 shall gradually decline to 252 MMSCMD by the year 2016-17.

4.3.9 How this Additional Gas will be utilized was examined next. It is considered reasonable that in the foreseeable future, gas produced from NELP blocks will continue to be allocated under the Gas Utilization Policy announced by the Government (Annexure 3a and Annexure 3b) from time to time, whereas the APM and other Pre-NELP gas will be supplied on commercially negotiated terms to end-users nominated by the Government. With R-LNG being costlier than the domestic gas, it is expected that it will be sold to consumers at market determined prices.

4.3.10 Overriding the gas availability and allocation, the existing/proposed gas transmission infrastructure will be important in monetizing the Additional Gas. Therefore, for assessing the existing and proposed gas transmission infrastructure in the country, the information on capacity of pipelines, year of commissioning, pipeline route, etc were obtained and compiled from reliable sources viz. annual reports of the gas pipeline companies and report of XI Five Year Plan document of Working Group on the subject (Annexure 4 and Annexure 5)

4.3.11 At present, there exists 9895 km of domestic gas pipeline network with a transmission capacity of 299.89 MMSCMD. It is expected that 11936.4 km of gas pipeline network with transmission capacity of 326.39 MMSCMD shall be commissioned by the year 2016-17 as per the current plans of the gas transmission companies to build and construct gas transmission pipelines spanning the length and breadth of the country.

4.3.12 Elsewhere in the study it is clarified how this information has been used to estimate the gas availability to end-users, and thereby the possible displacement of liquid fuels by gas calculated.

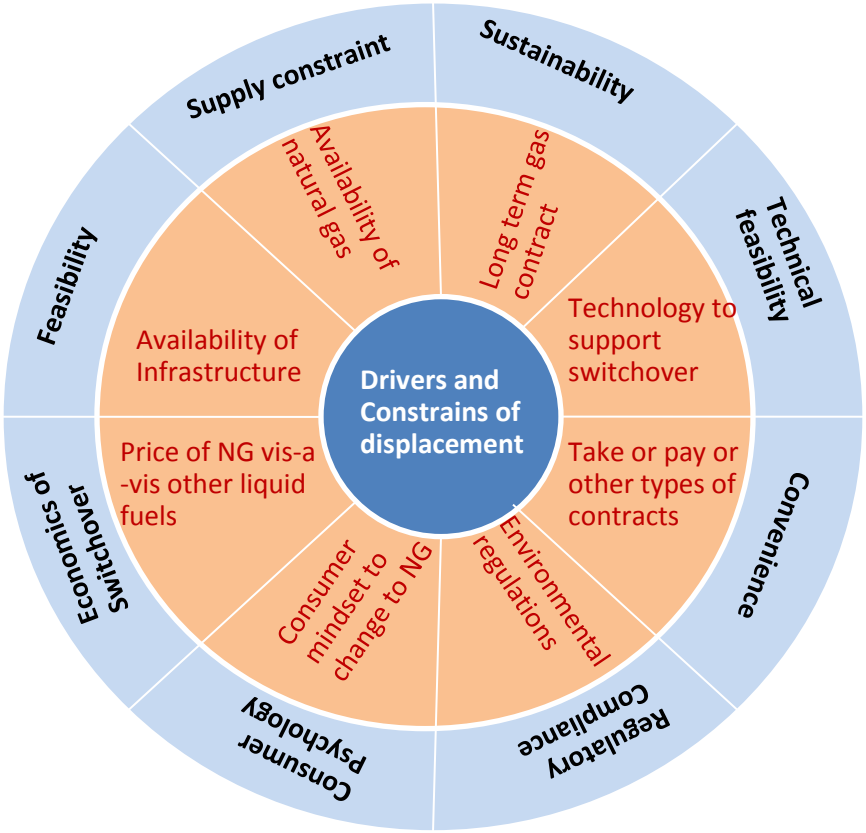
5. Displacement Analysis

5.1 Drivers & Constraints

5.1.1 Natural gas end use in India is still not completely driven by the market forces like supply demand imbalance or price points. EGoM is deciding upon the allocation of gas in priority sectors. In most of end user segments where displacement of liquid fuel is possible, usage of natural gas is an option and not a mandate. Therefore, this displacement analysis is an estimate based on a set of assumptions.

5.1.1 The displacement of liquid fuels by gas also depends on the decision of switchover from liquid fuels to gas by the end-user. Each end-user segment has set of different decision variables to evaluate switchover to natural gas. The decision wheel presented below illustrates various drivers and constraints of switchover by end users (Figure 5.1).

Figure 5.1: Drivers and Constraints of displacement



5.2 Sector wise Analysis of Displacement of Liquid Fuels by Natural Gas

5.2.1 Major gas consuming sectors viz. Fertiliser, Power (including captive power plants), City Gas Distribution, Refinery, Steel and Petrochemicals have been analyzed with regards to estimating the volume of liquid fuel(s) displaced by gas. The first and foremost rationale for analysing these six consumer segments is the priority these segments have been accorded for gas allocation by the Empowered Group of Ministers (EGoM) over the years. The gas usage in these sectors/segments would account for a sizeable percentage of the national gas consumption.

5.2.2 The analysis of fuel consumption mix for projects and sub-segments within each of these prioritised sectors indicates a substantial consumption of liquid fuels in these sectors. This essentially implies a potentially larger scope for displacement of liquid fuels in these application areas.

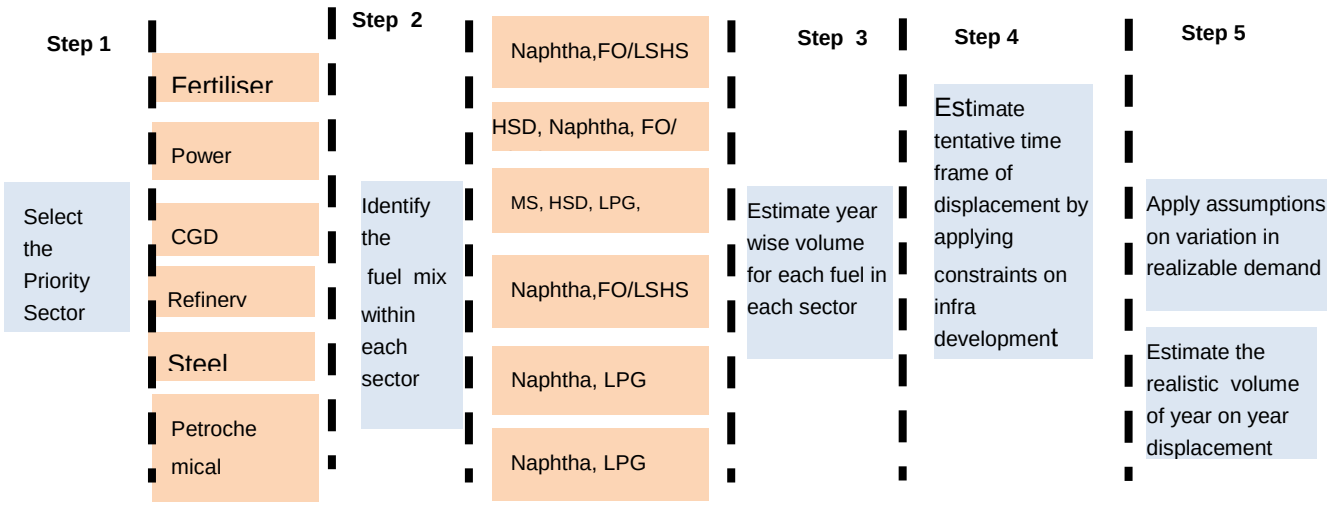
5.2.3 Besides Fertiliser, Power, CGD, Refinery, Steel and Petrochemicals, gas is widely used as fuel in cement, ceramics, glass, chemical, process aluminium and such other industrial applications. These sectors however, do not form part of core sectors for prioritisation of gas allocation by the government. Hence the bulk domestic gas which is price controlled would not be consumed in these industries and hence do not form a part of analysis. However, since these sectors can buy RLNG, consumption by this industry is factored in while analysing liquid fuel displacement in constrained gas scenario.

5.2.4 To start with, the volume of liquid fuel(s) which gas can potentially displace in identified priority sectors by the year 2016-17 is estimated assuming an unconstrained gas supply and infrastructure development as per plan. This scenario assumes that the quantum of gas required in these sectors to displace liquids is available unconstrained despite inter-alia competing requirements of gas by other sectors.

5.2.5 The possibility of displacement of liquid fuels by gas upto its full potential is limited by various practical constraints such as availability of gas, delay in construction of proposed grid infrastructure resulting from delays in execution of pipeline projects, acquisition of land etc. These constraints on infrastructure development have been factored in by building suitable assumptions with regards to the commissioning of pipelines. Other qualitative factors constraining the switch over, such as acceptability of gas over liquid fuel by consumers, limited market penetration of gas marketing companies etc. are addressed by the way of assumption building for variations in realizable demand. Duly factoring in these assumptions, the year-on-year volume of liquid fuels displaced in the end-user segments is projected.

5.2.6 A schematic representation of approach and methodology including the assumptions used for estimating the volume of liquid fuels displaced by gas are presented in Figure 5.2 below:-

Figure 5.2: Overall Approach and Methodology for Displacement Analysis



Assumption

Sector Selection

Priority sectors are selected as per the gas allocation priority accorded for KGD6

Drivers

Natural gas is price competitive.

NG is more environment friendly

Supply of Gas

Unconstrained

Infrastructure

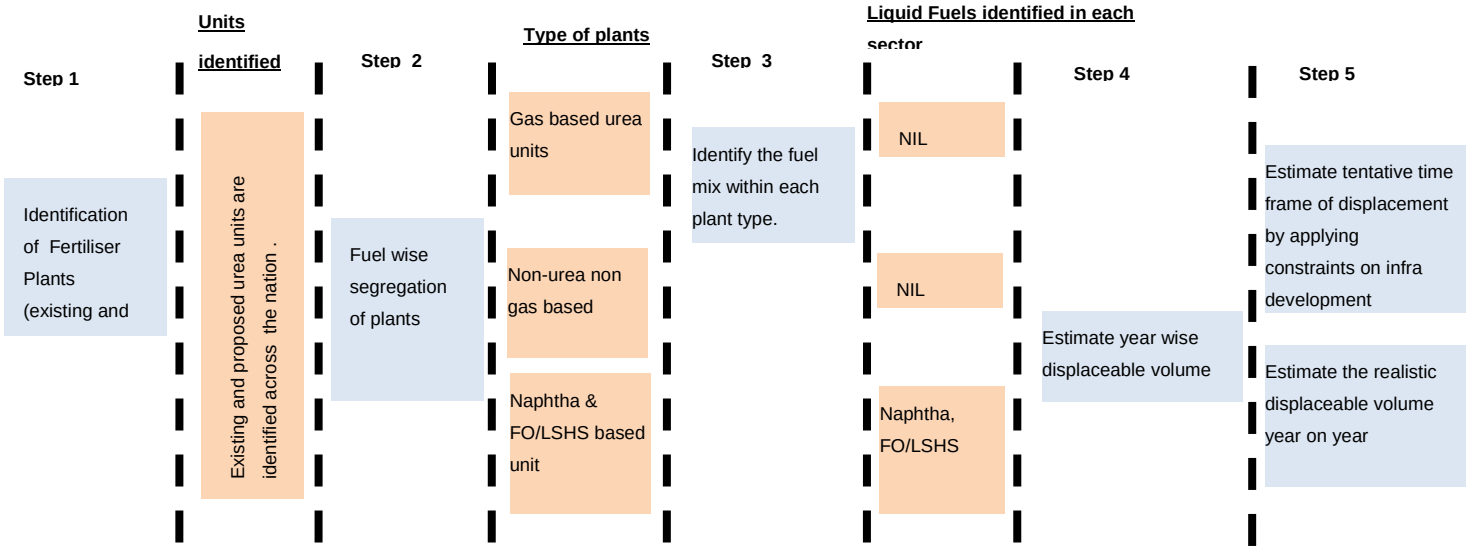
All proposed pipeline s as per company plans

5.3 Fertiliser

5.3.1 Displacement of liquid fuels by gas is preferred by government and not an option for the fertilizer (urea) industry. Under the New Pricing Scheme announced by the Government, all existing projects were directed to switch over to natural gas within a stipulated time frame. The substitution of liquid fuels by gas in the fertiliser sector is thus inevitable.

5.3.2 The approach and methodology, and assumptions used for estimating the volume of liquid fuels displaced by gas in the fertiliser sector are presented in Figure 5.3 below.

Figure 5.3: Approach & Methodology for Displacement Analysis- Fertilizer Sector



Assumptions

Identification of fertiliser units

All existing and proposed fertiliser units will changeover to gas.

Consumer segment

Urea and non-urea units have been classified into four categories based on the type of feedstock used for manufacturing the final product

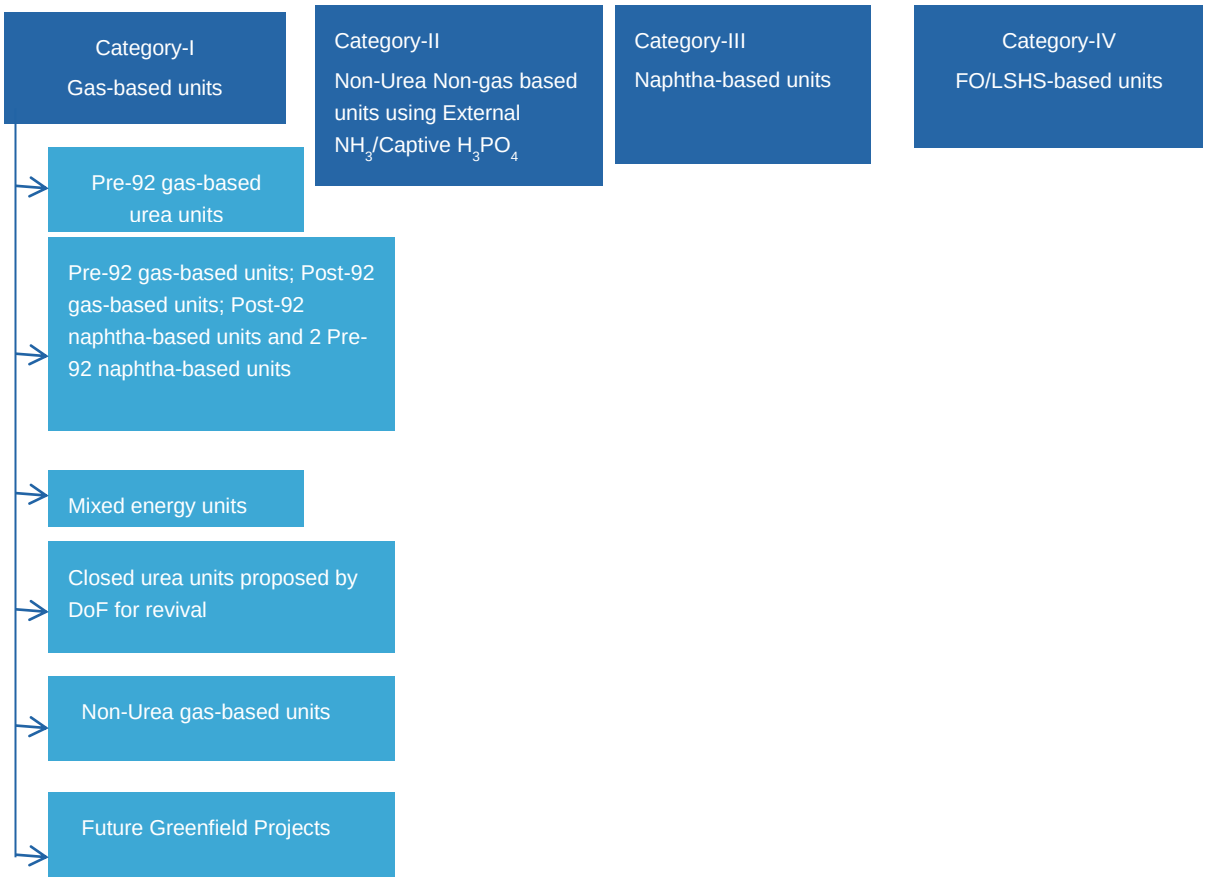
Supply of Gas

Unconstrained

5.3.3 A comprehensive analysis was carried out covering all existing and proposed fertilizer units in India. These units have been divided into four categories based on the type of feedstock

used for manufacturing the final product. Figure 5.4 given below illustrates this categorization.

Figure 5.4: Categorization of fertilizer units for displacement analysis



5.3.4 The Category-I gas-based units are further disaggregated into the following:-

a. Operational gas-based units including all the urea units grouped as Pre-92 gas-based units (Annexure 6),

b. Post-92 gas-based units, Post-92 Naphtha-based units and two Pre-92 Naphtha-based units according to the New Pricing Scheme (NPS) announced by the Department of Fertilizers in the year 2003 (Annexure 7),

c. Mixed energy urea units which include gas-based units that use alternative feedstock/fuel to the extent of more than 25% (Annexure 8),

d. Non-urea gas-based units (Annexure 9),

e. Closed urea units proposed to be revived by Department of Fertilizers (Annexure 10),

f. Future Greenfield projects (Annexure 11)

5.3.5 Category-II comprise of the non-urea non-gas-based units (Annexure 12).

5.3.6 Category-III comprises of all the fertiliser units grouped as Pre-92 Naphtha based units under the NPS except Shriram Fertilizers and Chemicals (SFC), Kota and IFFCO, Phulpur I (Annexure 13). SFC, Kota and IFFCO, Phulpur-I were Pre-92 Naphtha based units. Switchover from Naphtha to Natural Gas was completed in the year 2006-07 as per the NPS provisions according to which all the urea units are mandatorily required to convert to natural gas.

5.3.7 Category-IV comprises of all the FO/LSHS based fertiliser units (Annexure 14).

5.3.8 Analysis of the historical fuel mix for the year 2007-08 indicates that some of the units in sub-category (a) and (b) under Category-I (Annexure 15) continue use small quantities of Naphtha for the continuous upkeep of the plant. The 2007-08 data on the fuel mix for these units reveals this consumption to be in the negligibly low range of around 2%-8% in the fuel mix. This volume remains as non-displaceable part of the liquid fuels consumption in the fertiliser sector.

5.3.9 Further, although some units were gas based (Annexure 16), they were using Naphtha owing to shortage of gas. Such projects also hold potential of liquid displacement. One such unit is Shriram Fertilizers and Chemicals, Kota which had to rely on liquid fuels such as Naphtha and FO/LSHS to meet their feedstock requirements due to the constrained supply of natural gas. In such units, the liquid fuels consumed presently are expected to be displaced with additional gas supplies being made available 2009 onwards.

5.3.10 Three mixed energy urea units use mix of Naphtha and natural gas in addition to negligible quantities of FO/LSHS. Notwithstanding the fact that these mixed-energy units have the flexibility to optimize their fuel mix (mix of Naphtha/FO/LSHS and Natural Gas) based on the prevailing feedstock prices in order to enhance their profitability, it can be safely assumed that the quantity of liquid fuels consumed by these units constitutes the component of liquid fuels that gas can potentially displace.

5.3.11 No displacement of liquid fuels is expected in the closed urea units which the Department of Fertilizers proposes to revive within a time span of 2-3 years as gas-based greenfield projects. Similar is the case with any future greenfield projects; no displacement of liquid fuels is expected in these units which will all be gas-based.

5.3.12 There is no displacement of liquid fuels in the Category-II units comprising of all the non-urea, non-gas-based units as they consume external Ammonia and/or Captive H_3PO_4 for manufacturing their products. Currently only Deepak Fertilizer in Taloja Maharashtra is using gas in its ammonia plant for the manufacture of Ammonium Nitro Phosphate. All other Non-urea units such as Paradip Phosphates, IFFCO Paradip, Godavari Fertilizer and Chemicals etc. do not have a captive ammonia production unit and therefore source external (domestic and/or imports) ammonia for production of non-urea fertiliser products. Non-urea fertiliser units such as Paradip Phosphates, IFFCO Paradip and Godavari Fertilizer & Chemicals have been identified by pipelines companies as potential customers on their proposed pipeline routes. However, while their fuel requirement may be displaced by gas, using gas as a feedstock would depend on the willingness and ability of these units to set up captive ammonia plants.

5.3.13 In the fertilizer industry, potential of displacement of liquid fuels exists only where Naphtha and FO/LSHS based units are expected to get gas (Annexure 17). Hence, there is considerable scope of displacement by gas in the Category-III and Category-IV units.

5.3.14 For a typical unit exhibiting potential for displacement, the potentially displaceable volume of liquid fuel(s) is estimated using the 2007-08 fuel mix of unit as the base. The total energy consumption of each unit is computed as the product of the actual production achieved by the units in the year 2007-08 (MT) and the actual specific energy consumption (GCal/MT) attained by the unit in this year. Applying the percentage of the fuel mix to this figure of aggregate energy consumption divided by the calorific value of liquid fuel(s), the quantity of liquid fuels displaced by gas is computed in an unconstrained gas supply and infrastructure scenario. This quantity of fuels to be displaced is then projected with due sensitivity to the time-frame for conversion of the existing Naphtha and FO/LSHS based urea units to natural gas, which in turn are determined by the schedule of pipeline connectivity of these units (Annexure 17). The cumulative figures for liquid fuels displaceable in the fertilizer sector are provided in Table 5.1 below.

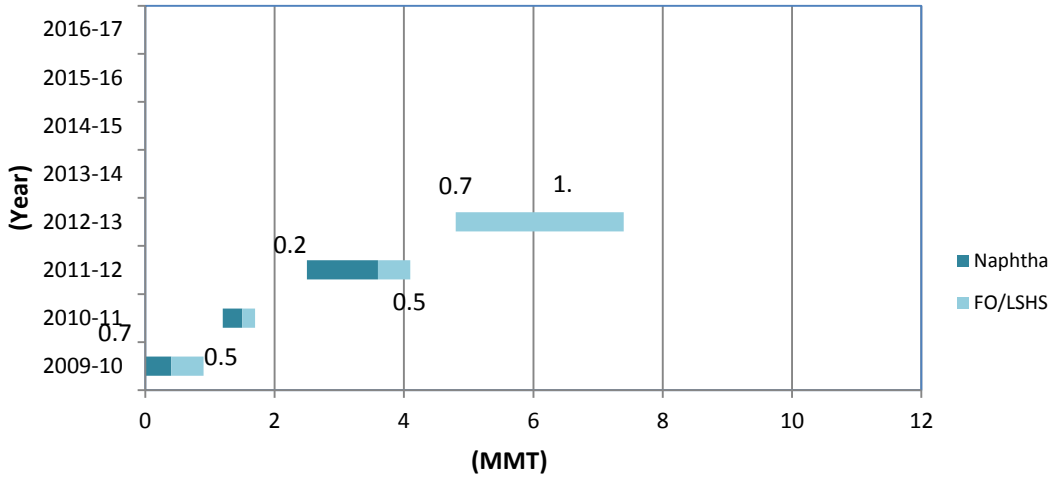
Table 5.1: Cumulative volume of liquid fuels displaceable by gas in Fertiliser Sector (MMT)

Year	Naphtha	FO/LSHS	Total
2009-10	0.7	0.01	0.71
2010-11	0.7	0.01	0.71
2011-12	0.9	0.4	1.3
2012-13	1.6	1.4	3.0
2013-14	1.6	1.4	3.0

2014-15	1.6	1.4	3.0
2015-16	1.6	1.4	3.0
2016-17	1.6	1.4	3.0

5.3.15 The year-over-year volume of liquid fuels displaceable by gas in the fertiliser sector is depicted in Figure 5.5 below.

Figure 5.5: Year-over-Year volume of liquid fuels displaceable by gas in Fertiliser sector



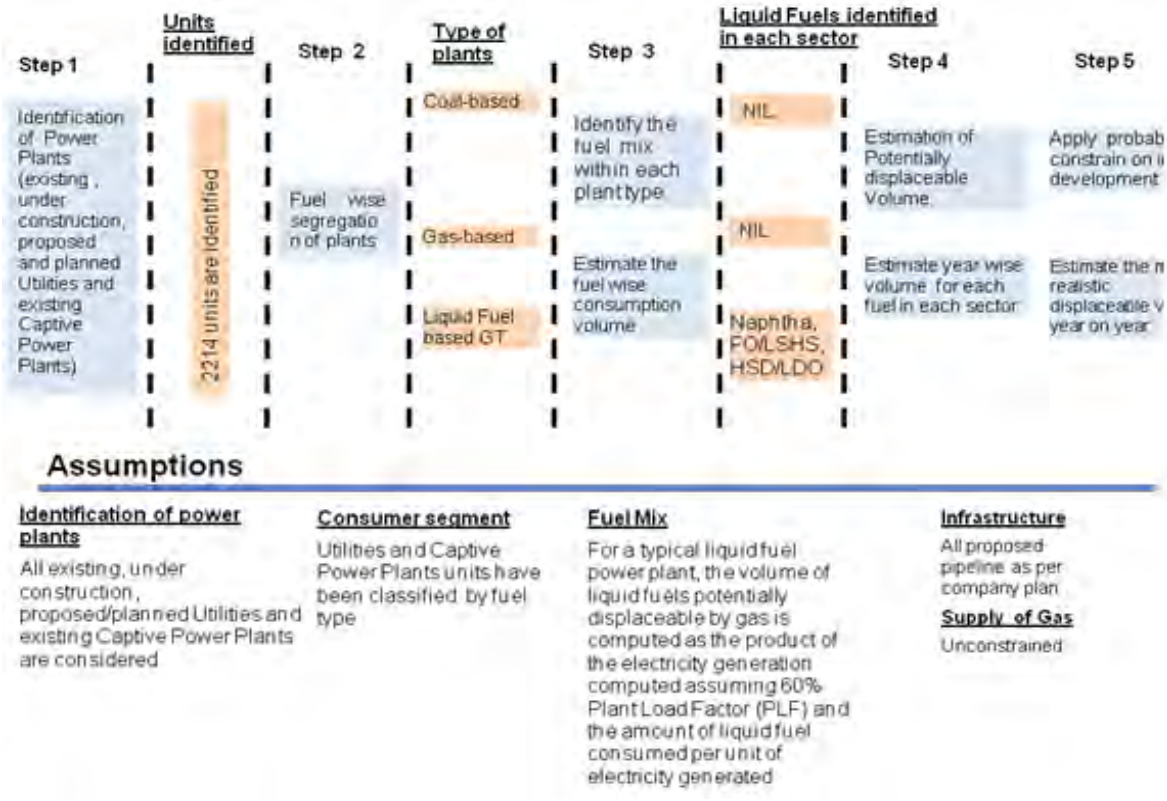
5.4 Power

5.4.1 Estimates of displacement of Naphtha, FO/LSHS and Light Diesel Oil (LDO) were made for the Independent or Merchant and Captive Power Plants (CPPs), based on inputs on quantity of liquid fuel currently consumed and PLF information received from various sector reports and industry interactions. Each of such plants operating on liquid fuels (full or partial) was analyzed.

A schematic representation of approach and methodology including the assumptions

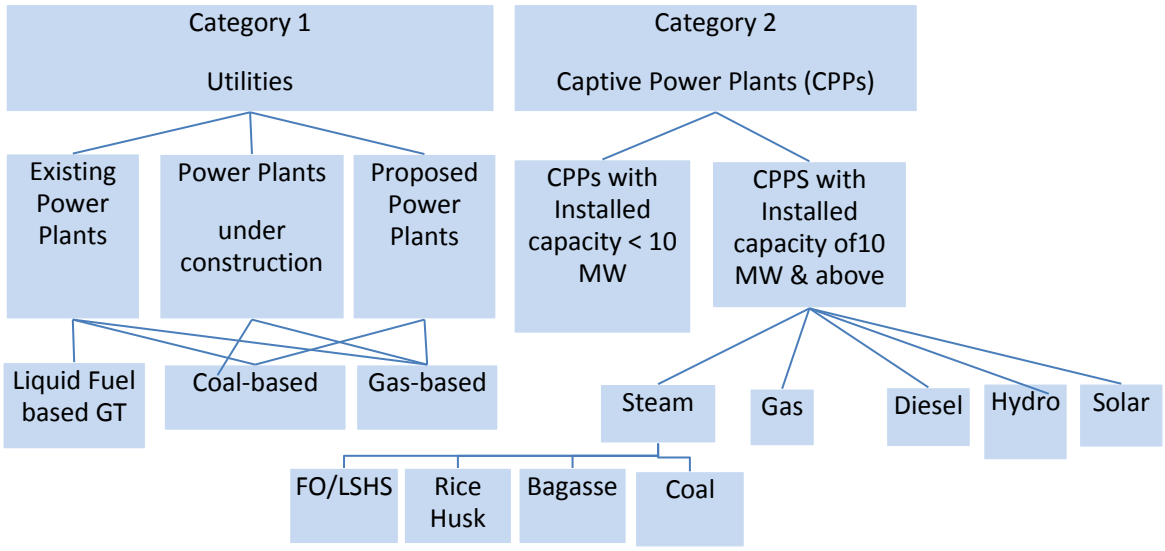
used for estimating the volume of liquid fuels displaced by gas in the power sector is presented in Figure 5.6 below:-

Figure 5.6: Approach & Methodology for Displacement Analysis- Power Sector



5.4.2 A comprehensive analysis was carried out covering all existing and proposed power plants in India (Annexure 18). Figure 5.7 below illustrates the categorization of power plants for displacement analysis.

Figure 5.7: Categorization of power plants for displacement analysis



5.4.3 Utilities are further sub-divided into the following:-

a. Existing Coal-based, Gas-based and Liquid fuel based GT power stations

b. Coal-based and Gas-based Power Plants under construction

c. Proposed Coal-based and Gas-based Power Plants

5.4.4 The historical trends in the off take of liquid fuels by the existing coal-based power plants reveal the usage/consumption of Light Diesel Oil (LDO) in negligible quantities as a start-up fuel for power generation. This quantity of LDO is as such non-displaceable by gas. Similar is the case in proposed coal-based power plants and those which are under construction.

5.4.5 There shall be no displacement of liquid fuels in case of Gas-based utilities as the fuel usage in gas-based utilities for the year 2007-08 clearly indicates that barring a couple of gas-based plants, the consumption of Naphtha (the alternative fuel used in these plants) is negligible.

5.4.6 The power stations also experience temporary fuel shortages resulting in these plants using alternative fuels. As this is variable, subjective and specific to a plant, this dynamics has not been factored while calculating the maximum volume of liquid fuels displaceable by gas.

5.4.7 The liquid-fuel based GT power plants exhibit high potential of displacement of liquid fuels by gas. The volume of liquid fuels potentially displaceable by gas in these power plants is

computed as the product of electricity generated assuming 60% Plant Load Factor (PLF) and the quantity of liquid fuel consumed per unit of electricity generated.

5.4.8 Captive Power Plants (CPPs) in category II with potential to displace liquid fuels were segregated under categories of 'less than' and 'more than' 50,000 M3 per day gas consumption, since this is threshold level of gas supply from CGD projects. This threshold level is as per the Clause 3(2) of the Petroleum and Natural Gas Regulatory Board (Authorizing Entities to Lay, Build, Operate or Expand City or Local Natural Gas Distribution Networks) Regulations, 2008 which reads as follows:-

> *"A CGD network shall be designed to operate at a pressure as specified in the relevant regulations for technical standards and specifications, including safety standards for maintaining the volumes of supply of natural gas on a sustained basis to meet the following requirements, namely:-*

a. Customers having requirement of natural gas upto 50,000 SCMD shall be supplied through the CGD network;

b. Customers having requirement of natural gas more than 50,000 SCMD and upto 100,000 SCMD shall be supplied through the CGD network; or through a pipeline not forming part of the CGD network;

c. Customers having requirement of natural gas more than 100,000 SCMD shall be supplied through a pipeline not forming part of the CGD network."

5.4.9 In accordance with this clause, the captive power plants with gas requirements greater than 50,000 scmd are analyzed as part of the Power Sector whereas those with gas requirements less than 50,000 scmd are analyzed as a part of CGD sector. These plants are further disaggregated by fuel type into Steam, Diesel, Gas, Wind, Solar and Hydro. The plants currently running on liquid fuels have been considered for the calculation of displacement.

5.4.10 Displacement of liquid fuels in Captive Power Plants based on Wind, Solar and Hydro is not envisaged.

5.4.11 The captive power plants categorized by steam as fuel type are further disaggregated into those using Naphtha, FO/LSHS, Coal, Bagasse and Rice-husk. Displacement in case of coal, Bagasse and Rice-husk based CPPs is considered nil since these fuels will continue to be price competitive. Also such plants will need complete change in technology and hence cannot be termed as displacing fuel. The volume of Naphtha, FO/LSHS and Light Diesel Oil (LDO)

displaceable by gas in the CPPs is computed as the product of electricity generated assuming 60% Plant Load Factor (PLF) quantity of liquid fuel consumed per unit of electricity generated.

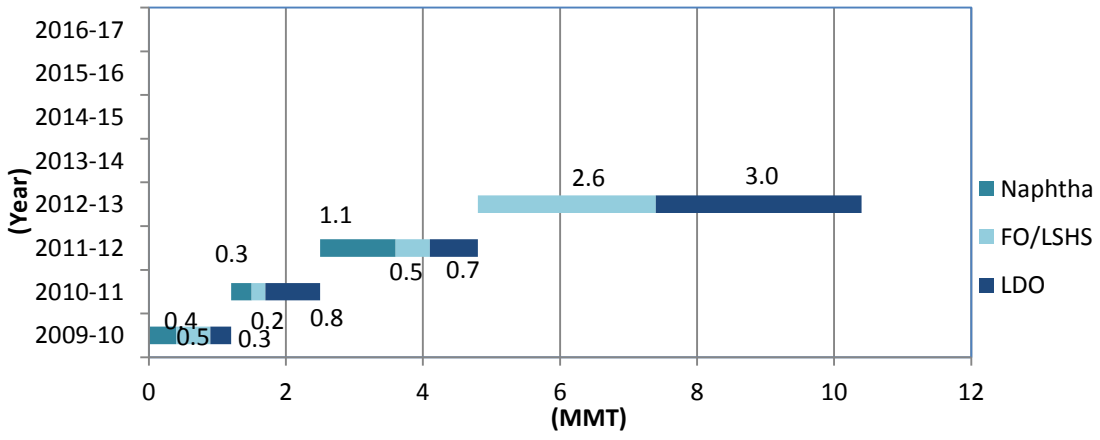
5.4.12 This potentially displaceable volumes of Naphtha, FO/LSHS and LDO in Liquid fuel based GT power plants and CPPs is projected with due sensitivity to the time-frame which in turn are determined by the schedule of connectivity of these units to gas transmission pipelines as well as technology and fuel switchover which is further dictated by techno-economic feasibility favouring the conversion of these units to gas, The probabilistic constraints of transmission pipeline availability are applied assuming the variation 60%-80% in the probability of transmission pipelines being commissioned on the basis of expert interactions. With these variations, the cumulative figures for liquid fuels displaced in the power sector are provided in Table 5.2 below.

Table 5.2: Cumulative volume of liquid fuels displaceable by gas in Power Sector (MMT)

Year	Naphtha	FO/LSHS	LDO	Total
2009-10	0.4	0.5	0.3	1.2
2010-11	0.7	0.7	1.1	2.5
2011-12	1.8	1.2	1.8	4.8
2012-13	1.8	3.8	4.8	10.4
2013-14	1.8	3.8	4.8	10.4
2014-15	1.8	3.8	4.8	10.4
2015-16	1.8	3.8	4.8	10.4
2016-17	1.8	3.8	4.8	10.4

5.4.13 The year-over-year volume of liquid fuels displaceable by gas in the power sector are presented in Figure 5.8 below

Figure 5.8: Year-over-Year volume of liquid fuels displaceable by gas in Power sector

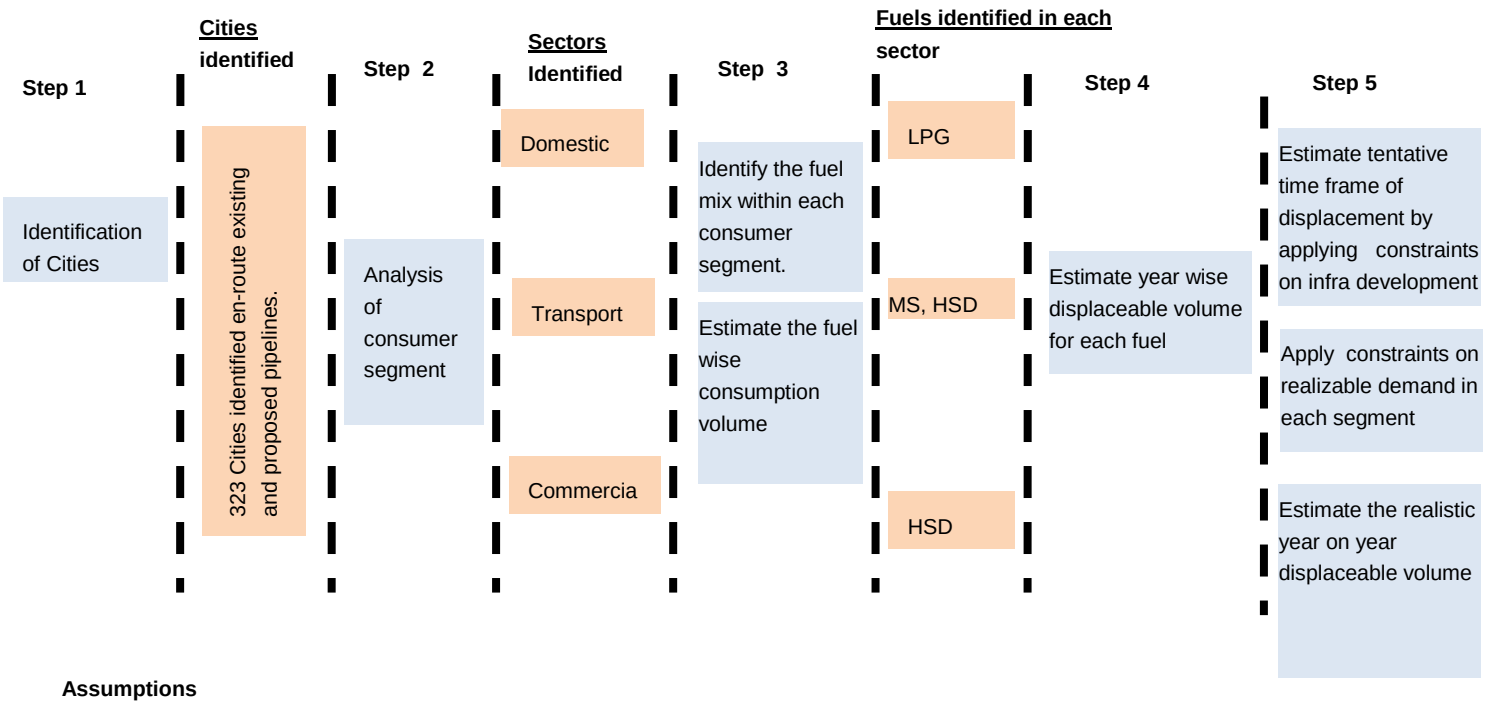


5.5 City Gas Distribution

5.5.1 Analysis has been undertaken for four consumer sub-categories viz. Domestic, Transport, Commercial and Industrial for the identified cities (323) with existing/ proposed CGD network.

5.5.2 A schematic representation of approach and methodology including the assumptions used for estimating the volume of liquid fuels displaceable by gas in the CGD segment is presented in the Figure 5.9 below:-

Figure 5.9: Approach & Methodology for Displacement Analysis- CGD Segment



Assumptions

Identification of cities

Cities will have developed CGD network as and when main/trunk gas pipeline connectivity is present

Consumer segment

Industrial and commercial segment has been clubbed together due to unavailability of segregated data.

Supply of Gas

Unconstrained

Infrastructure

All proposed pipelines as per company plans

5.5.3 323 cities with existing/proposed CGD network (Annexure 19) were identified as follows:-

1. 68 cities for which the entities had submitted EoIs to PNGRB for CGD licence;

2. 243 cities suo-moto identified by PNGRB for seeking EoI from investors for developing CGD network; and

3. 12 cities en-route gas trunk/spur pipelines and which are yet to attract investment interest from any entity(ies)interested in laying, building, operating or expanding gas transmission pipelines and/or PNGRB for developing CGD network.

5.5.4 Segment wise (domestic, transport, commercial and industrial) gas demand of 68 cities for which EoIs have been submitted by the interested entities has been collated from their EoI documents publicly available on PNGRB website (Annexure 20).

5.5.5 In case of 243 cities for which gas demand has not been estimated by companies/PNGRB, it has been assumed that those cities will have similar demands as the city (for which gas demand has been estimated by an entity) falling in the same region and tier as defined by Ministry of Urban Development (Annexure 20).

5.5.6 For a given city, the gas demands, thus obtained for each of the four consumer categories have been translated in to energy requirements of specific consumer segments. For the consumer categories consuming more than one fuel, volume of each fuel has been estimated. Considering the different fuels consumed by states during 2007-08 and assuming that, the consumption pattern of states follow national consumption pattern (e.g. transport sector consumes 49.04% of total diesel consumption and 100% petrol is consumed by transport sector as per petroleum statistics 2007-08) the different fuels currently consumed by a given consumer category within the state has been estimated. For a state, these estimates have been used to calculate the ratio of energy requirements fulfilled by different fuels within a specific consumer segment. All the cities have been assumed to have same consumption pattern within each consumer segment as the state they belong.

5.5.7 Further, on the basis of energy requirements of a given consumer segment and ratio of energy requirements fulfilled by different liquid fuels, consumption of different fuels within given consumer segment have been estimated for each city. Following the above said approach, volume of different fuels currently consumed by the specific consumer category within a given city has been arrived at. Sample illustration for estimating the volume of liquid fuels displaceable by gas in CGD is provided in Annexure 21. The calorific value of different fuels (Annexure 22) has also been taken into consideration for estimating the volume of liquid fuels displaceable by gas in CGD.

5.5.8 These estimates have further been validated using population of the city and per capita consumption of liquid fuel in India during the year 2007-08. The aggregate consumption of all the cities for different fuels estimated as per the approach explained in 5.5.7 was divided by the consumption estimated using per capita consumption to calculate a correction factor.

5.5.9 The correction factor has been applied to avoid the over estimations or under estimations. On the basis of estimated consumption and correction factor the potentially displaceable volume of liquid fuel has been estimated for base year (2007-08) in an unconstrained supply scenario. The fact is that all CGD projects will not come up and develop at the same time. Therefore, cities have been assumed to get CGD network only in the year when trunk transmission pipeline is to be commissioned. Implicitly any delay in CGD licensing or project execution is ignored at this stage of the study. For the forward period considered in the study, a linear growth in consumption has been assumed. The growth rate has been calculated on the basis of demand projections given by entities while submitting their EoIs to PNGRB.

5.5.10 In the domestic segment, the potential volume of LPG displaceable by Piped Natural Gas (PNG) is estimated. Along similar lines, in the transport and industrial commercial sector, the volume of diesel and petrol displaceable by CNG and the volume of diesel displaceable by gas respectively have been estimated.

5.5.11 It is understood that total potential volume of liquid fuels (LPG, Petrol and Diesel) will not be displaced due to practical constraints of supply of gas, availability of infrastructure, marketability of CGD company, economics of technology change over, consumer psychology etc. To factor in these aspects in the study a discussion with industry experts was held with the help of PetroFed. This discussion and the trends of the displacement of liquid fuels in those cities with developed CGD network suggest that due to certain practical constraints, consumption of liquid fuels can potentially be displaced by 5% to 35% in domestic segment, 15% to 30% in transport segment and 40% to 80% in the industrial/commercial segment. The displacement is assumed to follow logistic growth curve (s-curve) from minimum to maximum during the period of the study.

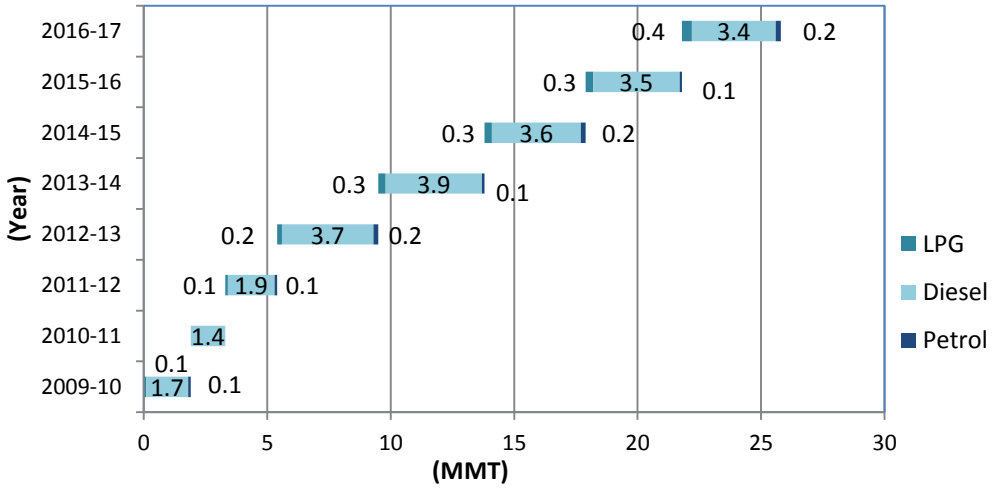
5.5.12 Furthermore, to factor in constraints of infrastructure, it has been assumed that 60% of the total proposed transmission pipelines will be commissioned within the committed time. With all above assumptions, it is projected that liquid fuels will be displaced to the extent indicated in Table 5.3 below.

Table 5.3:Cumulative volume of liquid fuels displaceable by gas in City Gas Distribution segment (MMT)

Year	LPG	Diesel	Petrol	Total
2009-	0.1	1.7	0.1	1.9
2010-	0.1	3.1	0.1	3.3
2011-	0.2	5	0.2	5.4
2012-	0.4	8.7	0.4	9.5
2013-	0.7	12.6	0.5	13.8
2014-	1	16.2	0.7	17.9
2015-	1.3	19.7	0.8	21.8
2016-	1.7	23.1	1	25.8

5.5.13 The year-over-year volume of liquid fuels projected to be displaced by gas in CGD are presented in Figure 5.10 below

Figure 5.10: Year-over-Year volume of liquid fuels displacement proejcted by gas in CGD



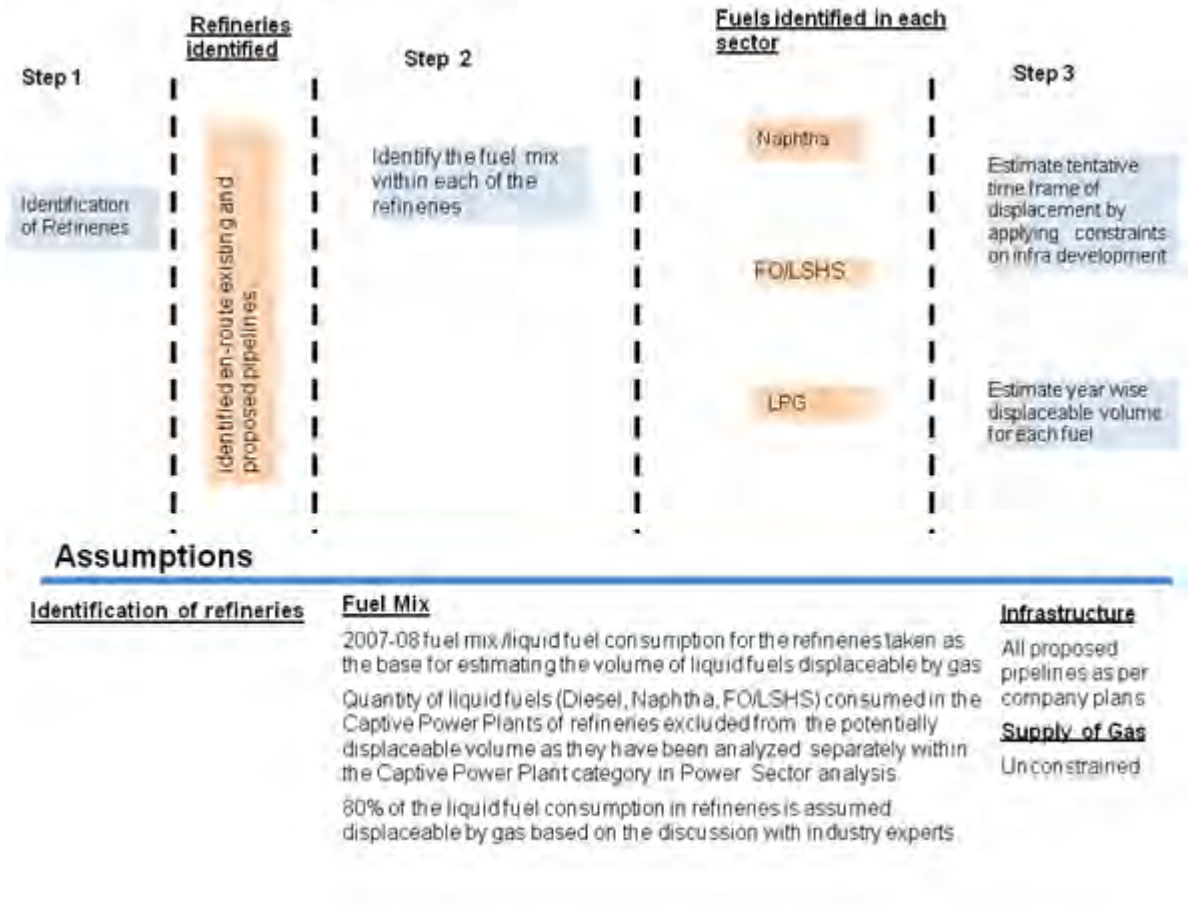
5.6 Refinery

5.6.1 Most of the liquid fuel used in refineries is fuel oil. However, Naphtha is also used in refineries for production of Hydrogen and for power generation.

5.6.2 All refineries in India expected to be connected by pipelines, and those which are already, were analysed for potential displacement.

5.6.3 A schematic representation of approach and methodology including the assumptions used for estimating the volume of liquid fuels displaced by gas in Refinery segment is presented in the Figure 5.11 below:-

Figure 5.11: Approach & Methodology for Displacement Analysis- Refinery



5.6.4 The 2007-08 liquid fuel consumption for the refineries of Indian Oil Corporation Ltd., Hindustan Petroleum Corporation Ltd. (Visakh refinery and Mumbai refinery), Bharat Petroleum Corporation Ltd. (Mumbai refinery and Kochi refinery), Reliance Industries Limited (Jamnagar refinery), Essar Oil Ltd. (Vadinar refinery), Numaligarh Refinery

Limited, Mangalore Refinery Private Limited (MRPL), Chennai Petroleum Corporation Ltd. (Manali refinery), BRPL (Bongaigaon) and ONGC (Tatipaka refinery) [Annexure 23] have been collated from the Annual Reports of the companies.

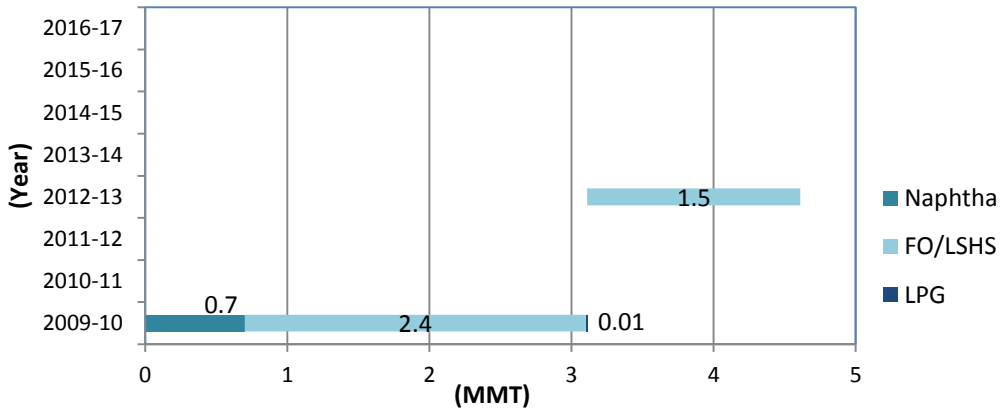
5.6.5 Based on expert interaction, the entire quantity of liquid fuels is not displaceable by gas as there is a requirement of process and start up fuels. Considering upto 80% of the liquid fuel displaceable by gas and the schedule of pipeline connectivity of these refineries, volume of Liquid fuels estimated to be displaced by gas is shown in Table 5.4 below.

Table 5.4: Cumulative volume of liquid fuels displaced by gas in Refinery (MMT)

Year	Naphtha	FO/LSHS	LPG	Total
2009-10	0.7	2.4	0.01	3.11
2010-11	0.7	2.4	0.01	3.11
2011-12	0.7	2.4	0.01	3.11
2012-13	0.7	3.9	0.01	4.61
2013-14	0.7	3.9	0.01	4.61
2014-15	0.7	3.9	0.01	4.61
2015-16	0.7	3.9	0.01	4.61
2016-17	0.7	3.9	0.01	4.61

5.6.6 The year-over-year volume of liquid fuels displaceable by gas in Refinery are presented in Figure 5.12 below

Figure 5.12: Year-over-Year volume of liquid fuels displaceable by gas in Refinery



5.7 Steel

5.7.1 The displacement of liquid fuels by gas is likely in three sponge iron unit in the country using Natural Gas as fuel and feedstock- Essar Steel, Vikram Ispat and Ispat Industries with most of the sponge iron units using coal as a feedstock and fuel (Annexure 24).

5.7.2 Prior to the commercial production and allocation of gas, the gas supply to sponge iron units was constrained. Faced with gas supply constraints, these units relied on Naphtha and LPG for meeting their fuel and feedstock requirements. With the allocation of RIL's KG D6 gas to the sponge iron units by EGoM and signing of the Gas Supply and Purchase Agreement (GSPA) and Gas Transmission Agreements (GTA) subsequent to this allocation, the entire quantity of liquid fuel consumption is projected to be displaced by gas in the year 2009-10.

5.7.3 The 2007-08 liquid fuel consumption for the three aforementioned sponge iron units used as a base for estimating the volumes of Naphtha and LPG have been collated from the annual reports of the companies. These units already have gas transmission pipeline connectivity. Thus in the unconstrained gas supply scenario, the entire volume of liquid fuels is displaceable by gas. With all these assumptions, the volume of different fuels have been estimated and provided in Table 5.5 below.

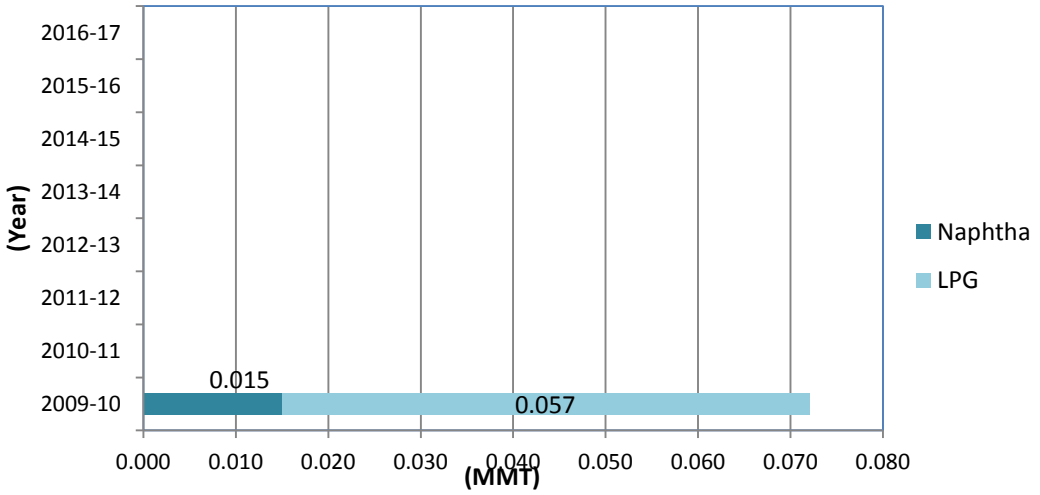
Table 5.5: Cumulative volume of liquid fuels displaceable by gas in Steel sector (MMT)

Year	Naphtha	LPG	Total
2009-10	0.015	0.057	0.072
2010-11	0.015	0.057	0.072
2011-12	0.015	0.057	0.072

Year	Naphtha	LPG	Total
2012-13	0.015	0.057	0.072
2013-14	0.015	0.057	0.072
2014-15	0.015	0.057	0.072
2015-16	0.015	0.057	0.072
2016-17	0.015	0.057	0.072

5.7.4 The year-over-year volume of liquid fuels displaceable by gas in Sponge Iron Plants in Steel sector are presented in Figure 5.13 below

Figure 5.13: Year-over-Year volume of liquid fuels displaceable by gas in Sponge Iron plants in Steel sector



5.8 Petrochemicals

5.8.1 Natural gas is not a perfect substitute of Naphtha as it is not economical to produce many downstream petrochemical products using gas as feedstock. Thus it has been assumed that in petrochemical segment potential for displacement of liquid fuels by gas is NIL (Annexure 25).

5.8.2 Although the quantity of liquid fuels (Diesel, Naphtha, FO/LSHS) consumed in the Captive Power Plants of Petrochemicals is potentially displaceable by gas, the figures for the same are excluded from liquid fuels potentially displaceable by natural gas as they have been analyzed within the Captive Power Plant category.

5.9 Consolidated Analysis

5.9.1 The sector wise projected volumes of liquid fuels displaceable by gas in an unconstrained gas supply scenario is presented in the Table 5.6 below:

Table 5.6 Sector-wise projected volumes of liquid fuels displaceable by gas in an unconstrained gas availability scenario (in MMT)

Sector	Existing Feedstock/Fuel type	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
Fertiliser	Naphtha	0.7	0.7	0.9	1.6	1.6	1.6	1.6	1.6
	FO/LSHS	0.01	0.01	0.4	1.4	1.4	1.4	1.4	1.4
	Total (Fertiliser)	0.71	0.71	1.3	3.0	3.0	3.0	3.0	3.0
Power	Naphtha	0.4	0.7	1.8	1.8	1.8	1.8	1.8	1.8
	FO/LSHS	0.5	0.7	1.2	3.8	3.8	3.8	3.8	3.8
	LDO	0.3	1.1	1.8	4.8	4.8	4.8	4.8	4.8
	Total (Power)	1.2	2.5	4.8	10.4	10.4	10.4	10.4	10.4
CGD	LPG	0.1	0.1	0.2	0.4	0.7	1	1.3	1.7
	Diesel	1.7	3.1	5	8.7	12.6	16.2	19.7	23.1
	Petrol	0.1	0.1	0.2	0.4	0.5	0.7	0.8	1
	Total (CGD)	1.9	3.3	5.4	9.5	13.8	17.9	21.8	25.8
Refinery	Naphtha	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	FO/LSHS	2.4	2.4	2.4	3.9	3.9	3.9	3.9	3.9
	LPG	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Total (Refinery)	3.11	3.11	3.11	4.61	4.61	4.61	4.61	4.61
Steel	Naphtha	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	LPG	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
	Total (Steel)	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072
Petchem	Naphtha	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	FO/LSHS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total (Petrochemicals)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5.9.2 Taking into consideration the volume of liquid fuels displaceable by gas in the six identified sectors viz. Fertiliser, Power, CGD, Refinery, Steel and Petrochemicals, the year wise cumulative volume of liquid fuels displaceable by gas for the period of study is given in Table 5.7 below:

Table 5.7 : Year on Year cumulative volume of liquid fuels displaceable by gas in an unconstrained gas availability scenario (MMT)

Year	Naphtha	FO/LSHS	Diesel	Petrol	LPG	Total
2009-10	1.8	2.9	2.1	0.1	0.1	**6.9**
2010-11	1.9	2.9	3.6	0.1	0.2	**8.7**
2011-12	2.0	3.1	5.8	0.2	0.3	**11.5**
2012-13	2.6	5.6	10.5	0.4	0.5	**19.5**
2013-14	3.5	7.6	16.2	0.5	0.7	**28.6**
2014-15	3.7	8.0	20.3	0.7	1.0	**33.8**
2015-16	3.9	8.5	24.2	0.8	1.4	**38.8**
2016-17	4.1	8.9	27.9	1.0	1.7	**43.6**

5.9.3 Table 5.7 indicates that 43.6 MMT of liquid fuels can potentially be displaced by gas by year 2016-17 if any constraints in supply of gas other than infrastructure are ignored.

5.9.4 Taking into consideration the volume of liquid fuels displaceable by gas as mentioned in Table 5.7, the corresponding quantities of gas required to displace these volumes for the period of the study are given in Table 5.8.

Table 5.8 Sector wise projected volumes of gas required to displace liquid fuels in unconstrained gas availability scenario (MMSCMD)

Sector	Existing Feedstock/Fuel type	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
Fertiliser	Naphtha	2.4	2.4	2.5	3.3	4.6	4.9	5.2	5.5
	FO/LSHS	0.04	0.04	0.3	1.6	3.4	3.9	4.4	4.7
	Total (Fertiliser)	2.44	2.44	2.8	4.9	8	8.8	9.6	10.2
Power	Naphtha	1.4	1.6	2.1	2.9	4.8	5.2	5.6	5.9
	FO/LSHS	1.6	1.7	2.0	4.0	9.1	10.1	11.1	12.1
	HSD/LDO	1.0	1.6	2.7	5.8	11.6	13.1	14.3	15.5
	Total (Power)	4	4.9	6.8	12.7	25.5	28.4	31	33.5
CGD	LPG	0.2	0.4	0.8	1.4	2.3	3.3	4.5	5.8
	HSD	5.6	10.0	16.1	28.0	40.6	52.3	63.6	74.5
	Petrol	0.2	0.5	0.8	1.3	1.9	2.5	3.0	3.5
	Total (CGD)	6	10.9	17.7	30.7	44.8	58.1	71.1	83.8
Refinery	Naphtha	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4
	FO/LSHS	8.0	8.0	8.0	13.0	13.0	13.0	13.0	13.0
	LPG	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Total (Refinery)	10.34	10.34	10.34	15.44	15.44	15.44	15.44	15.44
Steel	Naphtha	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	LPG	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
	Total (Steel)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Sector	Existing Feedstock/Fuel type	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
Petchem	Naphtha	0	0	0	0	0	0	0	0
	FO/LSHS	0	0	0	0	0	0	0	0
	Total (Petrochemicals)	0	0	0	0	0	0	0	0

5.9.5 The year wise corresponding cumulative volume of gas (in MMSCMD) required to displace the above mentioned volume of liquid fuels (Table 5.7), in an unconstrained gas supply situation, are presented in Table 5..9 below.

Table 5.9: Volume of gas required to support displacement of liquid fuels in an unconstrained gas availability scenario (MMSCMD)

Year	Naphtha	FO/LSHS	Diesel	Petrol	LPG	Total
2009-10	6.1	9.6	6.7	0.2	0.5	23.0
2010-11	6.3	9.7	11.6	0.5	0.7	28.8
2011-12	6.9	10.3	18.8	0.8	1.0	37.8
2012-13	8.8	18.7	33.9	1.3	1.7	64.2
2013-14	11.9	25.5	52.3	1.9	2.5	94.0
2014-15	12.6	27.0	65.4	2.5	3.6	111.0
2015-16	13.3	28.5	77.9	3.0	4.7	127.4
2016-17	13.9	29.8	90.0	3.5	6.0	143.2

5.9.6 Approximately 143.2 MMSCMD of additional gas will be required to displace 43.6 MMT of liquid fuels by the year 2016-17.

Step 4: Impact analysis of liquid fuel displacement

5.9.7 Gas consumed by the existing units in the current year (2009-10) is 147.6 MMSCMD. After backing out 147.6 MMSCMD out of the total projected gas supply volume of 252 MMSCMD in the year 2016-17, 104.4 MMSCMD of gas is left to support the possible displacement of 43.6 MMT of liquid fuels by the year 2016-17 as against requirement of 143.2 MMSCMD. Therefore, there exists a gas supply shortfall of 38.8 MMSCMD posing a supply side constraint to support displacement of 43.6 MMT of liquid fuels by the year 2016-17 (Table 5.10).

Table 5.10 Availability of Gas to support the displacement of liquid fuels

Sl.	Year	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
1	Quantity of Natural Gas equivalent of volume of liquid fuels displaceable by gas	**23**	**28.8**	**37.8**	**64.2**	**94**	**111**	**127.4**	**143.2**
2	Total Supply of Gas (2.1+2.2)	**147.6**	**204**	**240**	**264**	**261**	**262**	**262**	**252**
2.1	Domestic production	115.3	144	171	176	173	168	160	149
2.2	R-LNG Supply	32.3	60	69	88	88	94	102	103
3	Gas Supply to existing units	147.6	147.6	147.6	147.6	147.6	147.6	147.6	147.6
4	Actual volume available for displacement (2-3)	**0**	**56.4**	**92.4**	**116.4**	**113.4**	**114.4**	**114.4**	**104.4**
5	Shortfall in gas supply to support displacement of liquid fuels (1-4)	**23**	**-27.6**	**-54.6**	**-52.2**	**-19.4**	**-3.4**	**13**	**38.8**

5.9.8 This study now analyses how the remaining 104.4 MMSCMD Additional Gas will impact the displacement of liquid fuels in the terminal year of the study. The further analysis leverages on the trends in various sectors of the effect of gas on displacement of liquid fuel analysed earlier in this study.

5.9.9 The above essentially means that out of the 104.4 MMSCMD gas available to support displacement of liquid fuels in the terminal year of the study, sectoral allocation of gas as assumed in the study may be influenced by the affordability aspect.

5.9.10 With food security issues being uppermost in the agenda of the Government, it is assumed that Government shall continue to allocate gas to the Fertiliser sector on priority. As per expansion plans of existing urea units and revival of the closed urea units duly approved by the Department of Fertilisers, based on capacity utilization and specific energy consumption, it is estimated that 27 MMSCMD (Annexure 26) of gas out of remaining 104.4 MMSCMD of Additional Gas will get allocated to these units by the year 2016-17.

5.9.11 The Power sector will continue to seek allocation of domestic gas on priority. As per the gas utilisation policy of the government in vogue, all new power projects will get gas allocation when they are ready to operate. The Working Group on Power for XI Five Year Plan Period (2007-08 to 2011-12) has identified under construction gas based power projects with

Installed Capacity totaling 1,014 MW. These power projects are likely to get commissioned during the period of study and will get allocation of about 8.5 MMSCMD of gas.

5.9.12 The total requirements of gas mentioned in Paras 5.9.10 and 5.9.11 above comes to around 35.5 MMSCMD as presented in Table 5.11 below. This deployment of gas is not expected to displace any liquid fuels since these are new applications.

Table 5.11 Gas requirements of brownfield and greenfield projects

SI	Priority Sectors Identified	Gas Requirement (MMSCMD)
1.	Fertiliser Sector (expansion of existing units and revival of closed urea units)	**27**
2.	Power Sector (Under construction gas based power projects)	**8.5**
3.	**Total Gas requirement (1+2)**	**35.5**

5.9.13 After accounting for 35.5 MMSCMD of gas allocation priority as mentioned in Table 5.11 above, the remaining gas available for displacement of liquid fuels shall be 68.9 MMSCMD by the year 2016-17. The following paragraphs analyses how this 68.9 MMSCMD may get allocated to various sectors.

5.9.14 An aggregate volume of 10.2 MMSCMD of gas is required to displace 3 MMT Of liquid fuels viz. 1.6 MMT of Naphtha and 1.4 MMT of FO/LSHS in the fertilizer sector (excluding expansion of existing units and revival of closed urea units) by the year 2016-17 (**Table 5.1**). Fertilizer sector, being the priority of the government, has been assumed to get the gas as much as it needs, subject to availability of infrastructure. Hence, it is assumed that 10.2 MMSCMD of gas required to displace 3 MMT of Naphtha and FO/LSHS shall be made available to the fertiliser sector. The Year over Year volume of Gas required for the displacement of Naphtha and FO/LSHS in fertiliser sector are presented in Table 5.12 below.

Table 5.12 :Year over Year volume of Gas required to support the displacement of liquid fuels in fertiliser sector (MMSCMD)

Year	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
Cumulative volume of gas required to support displacement of liquid fuels	2.44	2.44	2.8	4.9	8	8.8	9.6	10.2
Year-on-Year volume of Gas required to support	2	0	0.4	2.1	3.1	0.8	0.8	0.6

displacement of liquid fuels*								

*Figures rounded off

Note: For a given year, the volume of gas required to support displacement of liquid fuels is computed as difference between the cumulative volume of gas required to support displacement of liquid fuels upto the given year and the cumulative volume of gas required to support displacement of liquid fuels upto the preceding year.

5.9.15 An aggregate volume of 33.5 MMSCMD of gas is required to displace 10.4 MMT Of liquid fuels viz. 1.8 MMT of Naphtha, 3.8 MMT of FO/LSHS and 4.8 MMT of HSD/LDO in power sector by the year 2016-17 (Table 5.2). Power sector, has been accorded the priority second to fertiliser. Therefore, it has been assumed that power sector will also get the required volume of gas to support the displacement. Hence, it is assumed that 33.5 MMSCMD of gas required for displacing Naphtha, FO/LSHS and HSD/LDO in the power sector shall be made available to support the displacement of estimated volume of liquid fuels. The Year over Year volume of Gas required to support the displacement of liquid fuels in the power sector may be seen in Table 5.13 below.

Table 5.13 :Year over Year volume of Gas required to support the displacement of liquid fuels in power sector (MMSCMD)

	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
Cumulative volume of gas required to support displacement of liquid fuels	4	4.9	6.8	12.7	25.5	28.4	31	33.5
Year-on-Year volume of Gas required to support displacement of liquid fuels*	4	1	2	6	13	3	3	3

*Figures rounded off

Note: For a given year, the volume of gas required to support displacement of liquid fuels is computed as difference between the cumulative volume of gas required to support displacement of liquid fuels upto the given year and the cumulative volume of gas required to support displacement of liquid fuels upto the preceding year.

5.9.16 Assuming 323 cities get CGD network by 2016-17, an aggregate volume of 83.8 MMSCMD of gas is required to displace 25.8 MMT of liquid fuel viz. 1.7 MMT of LPG, 23.1 MMSCMD of HSD, and 1 MMT of Petrol in the CGD sector by the year 2016-17 (Table 5.3).

5.9.17 CGD has been allocated priority in the Gas Utilisation Policy of Government of India (Annexure 3a & 3b) on account of city gas being regarded as a vital necessity for the urban dwellers being a clean and cheap fuel for domestic purpose. As of now two rounds of bidding have been held by the PNGRB for awarding licences to the successful bidders for developing CGD network in 13 cities. However, the licenses have been awarded to only 6 cities (Sonepat Kakinada, Dewas, Kota, Mathura and Meerut) so far under first round of bidding. The award of licences for remaining 7 cities (Rajahmundry, Yanam, Shahdol, Jhansi, Allahabad, Ghaziabad and Chandigarh) under second round of bidding is held up

as the matter is subjudice. In addition to these cities, Petroleum and Natural Gas Regulatory Board has suo-moto identified 55 cities for granting licences to entities for laying, building and operating CGD network. It is assumed these 68 cities will get gas allocation on priority basis.

5.9.18 Considering therefore, constrained availability of gas, it was decided to estimate the volume of displaceable liquids corresponding to the development of CGD network in 68 cities as mentioned above for the period of the study. Accordingly, gas requirements to support displacement of 3.51 MMT liquid fuels viz. 2.9 MMT of Diesel, 0.41 MMT of LPG and 0.20 MMT of Petrol in these cities comes to around 16.6 MMSCMD. The year over year volume of gas required to support the displacement of 3.51 MMT of liquid fuels in CGD may be seen in the Table 5.14 below.

Table 5.14 :Year over Year volume of Gas required to support the displacement of liquid fuels in CGD (MMSCMD)

Year	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
Cumulative volume of gas required to support displacement of liquid fuels	4.8	6.4	8.6	9.8	11.5	13.1	14.8	16.6
Year-on-Year volume of Gas required to support displacement of liquid fuels*	4.8	1.6	2.1	1.3	1.6	1.7	1.7	1.7

*Figures rounded off

Note: For a given year, the volume of gas required to support displacement of liquid fuels is computed as difference between the cumulative volume of gas required to support displacement of liquid fuels upto the given year and the cumulative volume of gas required to support displacement of liquid fuels upto the preceding year.

5.9.19 An aggregate volume of 15.44 MMSCMD of gas is required to displace 4.61 MMT of liquid fuels viz. 0.7 MMT of Naphtha, 3.9 MMT of FO/LSHS and 0.01 MMT of LPG (Table 5.4) in Refinery by the year 2016-17. However, in view of constrained availability gas and considering that refinery sector has also been accorded priority for allocation of gas in the gas utilisation policy of Government of India (Annexure 3a & 3b), it is estimated to displace 2.83 MMT of liquid fuels viz. 0.63 MMT of Naphtha, 2.19 MMT of FO/LSHS and 0.01 MMT of LPG. The year over year volume of gas required to support the displacement of 2.83 MMT of liquid fuels in refinery may be seen in Table 5.15 below.

Table 5.15 Year over Year volume of Gas required to support the displacement of liquid fuels in Refinery (MMSCMD)

	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
Cumulative volume of gas required to support displacement of liquid fuels	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
Year-on-Year volume of Gas required to support displacement of liquid fuels*	8.6	-	-	-	-	-	-	-

*Figures rounded off

Note: For a given year, the volume of gas required to support displacement of liquid fuels is computed as difference between the cumulative volume of gas required to support displacement of liquid fuels upto the given year and the cumulative volume of gas required to support displacement of liquid fuels upto the preceding year.

5.9.20 The sponge iron sector does not hold any further potential of displacement of liquid fuels by gas as there are no projects to convert to gas.

5.9.21 The potential of gas displacing liquid fuels does not exist in Petrochemical sector as gas is not ideal feedstock for producing downstream petrochemical products.

5.9.22 The sector wise allocation of gas required to displace liquid fuels is presented in a constrained gas availability scenario is summarised in Table 5.6 below.

Table 5.16 Sector wise allocation of gas required to displace liquid fuels (MMSCMD)

Sector	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
Fertiliser	2.44	0	0.36	2.1	3.1	0.8	0.8	0.6
Power	4	0.9	1.9	5.9	12.8	2.9	2.6	2.5
CGD	4.8	1.6	2.1	1.3	1.6	1.7	1.7	1.7
Refinery	8.6	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0
Petrochemicals	0	0	0	0	0	0	0	0
Total (Y-o-Y)	19.84	2.5	4.36	9.3	17.5	5.4	5.1	4.8
Cumulative	19.84	22.34	26.7	36	53.5	58.9	64	68.9

5.9.23 This quantity of 68.9 MMSCMD of gas can supplement displacement of 19.8 MMT of liquid fuels in various sectors under constrained gas availability scenario as against 43.6 MMT of liquid fuels projected to be displaced by the year 2016-17 in an unconstrained gas supply scenario. The revised year wise volumes of liquid fuels projected to be displaced by gas are presented in Table 5.17 below.

Table 5.17 Sector-wise year wise cumulative volume of liquid fuels displaceable by gas in a constrained gas availability scenario (MMT)

Sectors	Fuels	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Fertiliser	Naphtha	0.7	0.7	0.9	1.6	1.6	1.6	1.6	1.6
	FO/LSHS	0.01	0.01	0.4	1.4	1.4	1.4	1.4	1.4
	Total (Fertiliser)	0.71	0.71	1.3	3.0	3.0	3.0	3.0	3.0
Power	Naphtha	0.4	0.7	1.8	1.8	1.8	1.8	1.8	1.8
	FO/LSHS	0.5	0.7	1.2	3.8	3.8	3.8	3.8	3.8
	HSD	0.3	1.1	1.8	4.8	4.8	4.8	4.8	4.8
	Total (Power)	**1.2**	**2.5**	**4.8**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**
CGD	LPG	0.07	0.10	0.14	0.18	0.24	0.29	0.35	0.41
	HSD	0.9	1.3	1.5	1.9	2.3	2.6	2.6	2.9
	Petrol	0.07	0.09	0.11	0.13	0.14	0.16	0.16	0.20
	Total (CGD)	**1.04**	**1.49**	**1.75**	**2.21**	**2.68**	**3.05**	**3.11**	**3.51**
Refinery	Naphtha	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
	FO/LSHS	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19
	LPG	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Total (Refinery)	**2.83**	**2.83**	**2.83**	**2.83**	**2.83**	**2.83**	**2.83**	**2.83**
Steel	Naphtha	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	LPG	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
	Total (Steel)	**0.072**	**0.072**	**0.072**	**0.072**	**0.072**	**0.072**	**0.072**	**0.072**
Petrochemical	Naphtha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	FO/LSHS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total (Petrochemical)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total of all sectors		**5.9**	**7.6**	**10.8**	**18.5**	**19.0**	**19.4**	**19.4**	**19.8**

5.9.24 The revised year wise volumes of liquid fuels projected to be displaced by gas are presented in Table 5.18 below.

Table 5.18 Year wise cumulative volume of liquid fuels displaceable by gas in a constrained gas availability scenario (MMT)

Year	Naphtha	FO/LSHS	Diesel	Petrol	LPG	Total
2009-10	1.7	2.7	1.2	0.07	0.14	**5.9**
2010-11	2.0	2.9	2.4	0.09	0.17	**7.6**
2011-12	3.3	3.8	3.3	0.11	0.21	**10.8**
2012-13	4.0	7.4	6.7	0.13	0.25	**18.5**
2013-14	4.0	7.4	7.1	0.14	0.31	**19**
2014-15	4.0	7.4	7.4	0.16	0.36	**19.4**
2015-16	4.0	7.4	7.4	0.16	0.42	**19.4**
2016-17	4.0	7.4	7.7	0.20	0.48	**19.8**

5.9.25 Categorizing the fertiliser plants, power plants, CGD network, Refineries and Steel plants and Petrochemical units regionwise, the break-up of region wise product wise volumes of liquid fuels projected to be displaced by 68.9 MMSCMD of gas by 2016-17 have been depicted in Table 5.19 below

Table 5.1 9 Region wise volume of liquid fuels displaceable by gas in a constrained gas availability scenario (MMT)

Region		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Eastern	Naphtha	0.29	0.65	0.59	0.77	0.77	0.77	0.77	0.77
	Diesel/LDO	0.32	0.32	0.00	1.10	1.11	1.12	1.12	1.13
	FO/LSHS	0.32	0.32	0.64	2.71	2.71	2.71	2.71	2.71
	Petrol	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	LPG	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03
	Total (Eastern)	**0.93**	**1.29**	**1.23**	**4.59**	**4.6**	**4.63**	**4.63**	**4.65**
Western	Naphtha	0.95	1.08	2.07	1.25	1.25	1.25	1.25	1.25
	Diesel/LDO	0.63	1.85	3.03	4.00	4.34	4.57	4.57	4.80
	FO/LSHS	1.92	2.07	2.32	1.86	1.86	1.86	1.86	1.86
	Petrol	0.04	0.05	0.07	0.08	0.08	0.08	0.08	0.10
	LPG	0.11	0.12	0.15	0.15	0.18	0.20	0.23	0.24
	Total (Western)	**3.64**	**5.16**	**7.63**	**7.33**	**7.70**	**7.95**	**7.98**	**8.24**
Southern	Naphtha	0.09	0.09	0.27	1.51	1.51	1.51	1.51	1.51
	Diesel/LDO	0.13	0.00	0.00	1.00	1.00	1.00	1.00	1.00
	FO/LSHS	0.00	0.05	0.37	1.70	1.70	1.70	1.70	1.70
	Petrol	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.04
	LPG	0.00	0.01	0.01	0.03	0.04	0.05	0.06	0.08
	Total (Southern)	**0.23**	**0.16**	**0.66**	**4.26**	**4.27**	**4.29**	**4.30**	**4.33**
Northern	Naphtha	0.42	0.23	0.42	0.52	0.52	0.52	0.52	0.52
	Diesel/LDO	0.12	0.23	0.27	0.60	0.65	0.71	0.71	0.77
	FO/LSHS	0.46	0.46	0.46	1.12	1.12	1.12	1.12	1.12
	Petrol	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.05
	LPG	0.03	0.04	0.05	0.06	0.08	0.09	0.11	0.13
	Total (Northern)	**1.05**	**0.99**	**1.23**	**2.33**	**2.41**	**2.48**	**2.50**	**2.59**
Total of all regions		**5.9**	**7.6**	**10.8**	**18.5**	**19**	**19.4**	**19.4**	**19.8**

5.9.26 To understand the impact of displaceable liquid fuel, product wise region wise, demand supply analysis has been carried out. This analysis is intended to insight for planning product movement across the country and its impact on refining and marketing..

5.9.27 To estimate the supply on regional basis all the existing and proposed refineries have been considered (Annexure 27 and Annexure 28). Currently, No statistics is available on the region wise product movement & supply from refineries. Thus, based on discussions with PetroFed, for the purpose of theoretical analysis this report analyses and quantifies the impact of displacement of liquid fuel on regional supply-demand balance assuming that all existing and proposed refineries supply only within the region where the refinery is located.

The availability of products from existing refineries and proposed refineries is projected till 2016-17 based on the product slate of these refineries (Annexure 29).

5.9.28 The year-over-year regional demand of petroleum products have been projected till 2016-17 assuming that petroleum products shall grow at the historical growth registered in consumption of petroleum products during the period 2007-08 and 2009-10 (Annexure 30). The growth rates for the years were obtained from Oil Industry Performance Reviews (IPRs) of respective years. The results obtained were cross checked with the fuel demands projected in PetroFed publication "Fuelling India's Growth Vision 2030" published in year 2005 and that of Planning Commission of India and these have been observed to be comparable (Annexure 31).

5.9.29 Thereafter, regional demand supply balance of petroleum products has been projected till 2016-17 (Annexure 32).

5.9.30 The displacement of liquid fuels will add to the supply of these petroleum products. Thus volume of displaceable liquid fuels has been added to supply. The demand and supply volumes thus obtained has been used to estimate the regional demand supply balance taking into consideration the displaceable volume of liquid fuels i.e LPG, Diesel/LDO, Petrol, naphtha, FO/LSHS till 2016-17 (Annexure 33).

5.9.31 Taking in to consideration the displaceable volume of liquid fuel the region-wise and all India supply demand balance for the year 2016-17 under constrained gas availability are given in Annexure 34.

5.9.32 India is fast emerging as refining hub and the country will be surplus in almost all products except LPG. The economy is continuing to grow at upwards of 7 percent and would therefore need fuel petroleum products to drive as well as sustain the growth in economy in the years to come. The demand of petroleum product accordingly is fast catching up this trend. Although, 19.8 MMT liquid fuels are projected to be displaced by gas by the terminal year of the study i.e 20016-17, the demand growth of petroleum product would make up for it. The refineries are well geared up to meet this challenge and oil and gas sector possess required experience in trading of petroleum product quite competitively in the global market. Hence, it will not be difficult for oil and gas sector to handle the required export of surplus petroleum products. However, the movement of surplus product from hinterland refineries to the costal terminals is not envisaged in large volume, considering region wise supply demand balance during the period of study. However, oil and gas

sector may need to examine available port infrastructure and facilities to handle required export of surplus petroleum products coupled substantial import of crude oil and LPG.

5.9.33 Notwithstanding above, and putting it in perspective, the new gas has saved the country of a consumption (and hence production) of about 20 MMT of petroleum products. Consequently, the gas would cause to the country saving of foreign exchange for crude imports, save the environmental externalities caused due to liquid fuels' combustion and in better planning for creating additional refining capacity as well as expansion of capacity of existing refineries including corresponding capital infusion.

5.9.34 The study also infers that the pipeline infrastructure would not be made redundant due to potential displacement since the country remains strong on demand despite the displacement. The retail petroleum sector would, however, may feel the effect of inadequate use of marketing infrastructure in view of development of city gas distribution network and specifically in the automobile sector in the large and medium cities. The Oil Marketing Companies would therefore be impacted to this extent.

5.9.35 In this context, it is pertinent to mention that the gas infrastructure proposed by 2016-17 is largely influenced by the source of gas and the existing pipeline infrastructure like HBJ pipelines. Although this is obvious, the section of analysts observe that a more holistic planning for development of gas distribution network in years and decades to come could be (and have been) made so as to maximise benefit of gas availability to the nation.

6 Abbreviations

Abbreviation	Expanded form
AGCL	Assam Gas Company Limited
APM	Administered Pricing Mechanism
BPCL	Bharat Petroleum Corporation Limited
BRPL	Bongaigaon Refinery Private Limited
CBM	Coal Bed Methane
CEA	Central Electricity Authority
CGD	City Gas Distribution
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CPP	Captive Power Plant
DGH	Directorate General of Hydrocarbon
DPPL	Dahej Panvel Pipeline
DUPL	Dahej Uran Pipeline
EGOM	Empowered Group of Ministers
EoI	Expression of Interest
FDP	Field Development Program
FO/LSHS	Fuel Oil/Low Sulphur Heavy Stock
GAIL	Gas Authority of India Limited
Gcal	Giga Calorie
GHG	Green House Gas
GoI	Government of India
GSPA	Gas Sale Purchase Agreement
GSPC	Gujarat State Petroleum Corporation
GTA	Gas Transmission Agreement
HVJ	Hazira-Vijaipur-Jagdishpur Pipeline
HSD/FO	High Speed Diesel/ Fuel Oil
IFFCO	Indian Farmers Fertilizer Co-operative Limited
KG basin	Krishna Godavari Basin
LDO	Light Diesel Oil
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MMSCMD	Million Metric Standard Cubic Meter per Day
MMT	Million Metric Tonne
MMTPA	Million Metric Tonne Per Annum
MoPNG	Ministry of Petroleum and Natural Gas
MRPL	Mangalore Refinery Private limited
MS	Motor Sprit

MT	Metric Tonne
NELP	New Exploration Licensing Policy
NPS	New Pricing Scheme
NRL	Numaligarh Refinery Limited
OIL	Oil India Limited
ONGC	Oil and Natural Gas Corporation Limited
PLF	Plant Load Factor
PLL	Petronet LNG Limited
PMT	Panna Mukta Tapti
PNG	Piped Natural Gas
PNGRB	Petroleum & Natural Gas Regulatory Board
RGPPL	Ratnagiri Gas & Power Private Limited
RGTIL	Reliance Gas Transmission Infrastructure Limited
RIL	Reliance Industries Limited
SCMD	Standard Cubic Meter Per Day

Notes: Additional Gas refers to projected availability of incremental Natural Gas in India from all sources (APM, Pre-NELP, NELP, CBM, LNG) during the period 2009-10 to 2016-17.

7 Annexures

Annexure 1 : Long Term Gas Profile in MMSCM (Provisional)

S.No	FIELDS / BLOCKS	OPERATOR	2007-08 (Actual)	2008-09 (Actual)	2009-10 (RE)	2010-11	2011-12
	(A) OFFSHORE						
1	PY-3	Hardy	43.30	29.115	36.364	95.46	85.40
2	PY-1	HOEC			342.672	775.17	775.17
3	RAVVA	Cairn	848.32	757.549	582.581	402.06	285.26
4	KG-DWN-98/3 (MA)	RIL		79.326	18233.750	3174.32	3103.52
5	D-1 & 4	RIL				22586.89	29198.18
	EASTERN TOTAL		**891.62**	**865.99**	**19195.37**	**27033.89**	**33447.54**
6	Lakshmi	Cairn	429.58	416.022	375.364	222.11	143.64
7	Gauri	Cairn				159.81	132.19
8	CB-X	Cairn				0.00	0.00
9	M&S Tapti	BGEPIL	3403.07	4301.124	3328.657	2831.68	1953.86
10	Panna&Mukta	BGEPIL	2136.59	1764.952	1992.941	1877.41	1948.20
	WESTERN TOTAL		**5969.24**	**6482.10**	**5696.96**	**5091.01**	**4177.89**
	TOTAL OFFSHORE (A)		**6860.86**	**7348.09**	**24892.33**	**32124.89**	**37625.43**
	(B) ONSHORE						
11	Kharsang	GeoEnpro	5.12	7.647	9.099		
	TOTAL ARUN. PRADESH		**5.12**	**7.65**	**9.099**	**0.00**	**0.00**
12	Amguri	Canoro	22.36	59.330	57.839	0.04	0.04
	TOTAL ASSAM		**22.36**	**59.33**	**57.839**	**0.04**	**0.04**
13	Asjol	HOEC					
14	Allora	Heramec					
15	Ambe						307.79
16	Kanwara	Heramec	1.11	2.445	4.091	10.22	10.22
17	Karjisan	Selan				22.67	17.99
18	Dholasan	Heramec	0.14				
19	North Kathana	Heramec					
20	North Balol	HOEC	9.24	15.192	16.128	4.95	
21	Bakrol	Selan	0.31	2.308			
22	Baola	Interlink	0.00			5.47	5.47
23	Bhandut	OILEX-NL					
24	Cambay	OILEX-NL					

25	Dholka	Joshi Tech	10.10	11.350	12.645	40.60	37.50
26	Hazira	Niko	713.56	525.143	304.066	5.37	
27	Indrora	Selan	0.04	0.031			
28	Lohar	Selan	0.08	0.101			
29	Sanganpur	Hydrocarbon Res	0.13	0.147	0.038		
30	Sabarmati	OILEX-NL Holdings					
31	Unnawa	GSPCL					
32	Wavel	Joshi Tech					
33	CB-ON-7 (Promoda-Palej)	HOEC	1.62	1.067	0.954		
34	Ognaj	Selan				0.44	0.68
35	CB-ON-3 (ESU)	Essar	0.36	0.067			
36	SPD	HOEC					
37	CB-ONN-2000/1(INGOLI)	GSPCL	0.35	0.901			
	CB-ONN-2000/2 (NS-BHEEMA)	NIKO	102.01	96.442	80.104		
39	**GUJARAT TOTAL**		**839.05**	**655.19**	**418.03**	**89.73**	**379.66**
	RAJASTHAN						
40	RJ-ON-90/1				0.000		
41	RJ-ON-7	Cairn				332.16	332.16
42	Mangala	Cairn					
43	Aishwaraya	Cairn				4.93	7.83
44	Bhagyam	Cairn				38.26	39.76
45	Saraswati	Cairn				1025.81	912.11
46	Rageshwari	Cairn				3.80	5.36
47	Shakti	Cairn					
48	Kameshwari West	Cairn					
	RAJASTHAN TOTAL		**0.00**	**0.00**	**0.00**	**1404.95**	**1297.22**
49	Ranigunj South (CBM)		49.00	19.79	57.730		
	WEST BENGAL		**49.00**	**19.79**	**57.730**		
	TOTAL ONSHORE (B)		**915.53**	**741.96**	**542.69**	**1494.72**	**1676.92**
	GRANTD TOTAL (A + B)		**7776.390**	**8090.044**	**25435.023**	**33619.611**	**39302.349**

Annexure 2: Long Term Gas Profile in MMSCM (Provisional)

S.No	FIELDS / BLOCKS	Operator	2012-13	2013-14	2014-15	2015-16	2016-17
	(A) OFFSHORE						
1	PY-3	Hardy	76.27	66.92	57.63	49.28	41.86
2	PY-1	Hoec	775.17	775.17	775.17	775.17	775.17
3	Ravva	Cairn	192.24	107.49	24.81	16.54	11.37
4	KG-DWN-98/3 (MA)	Ril	2455.07	2525.86	2375.78	1582.91	455.90
5	D-1 & 4	Ril	29198.18	29198.18	29198.18	29198.18	29198.18
	Eastern Total		**32696.94**	**32673.62**	**32431.57**	**31622.08**	**30482.48**
6	Lakshmi	Cairn	91.77	27.89			
7	Gauri	Cairn	102.93	105.68			
8	CB-X	Cairn	0.00				
9	M&S Tapti	Bgepil	1330.89	934.46	679.60	538.02	339.80
10	Panna&Mukta	Bgepil	1942.53	1936.87	1936.87	1925.54	1922.71
	Western Total		**3468.12**	**3004.89**	**2616.47**	**2463.56**	**2262.51**
	Total Offshore (A)		**36165.06**	**35678.51**	**35048.04**	**34085.64**	**32745.00**
	(B) ONSHORE						
11	Kharsang	Geoenpro					
	Total Arun. Pradesh		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
12	Amguri	Canoro	0.04	0.04	0.04	0.04	0.04
	Total Assam		**0.04**	**0.04**	**0.04**	**0.04**	**0.04**
13	Asjol	HOEC					
14	Allora	Heramec					
15	Ambe		326.90	99.14	16.66		
16	Kanwara	Heramec	10.22	10.22	10.22	10.22	10.22
17	Karjisan	Selan	14.39	11.52	9.00	6.48	4.32
18	Dholasan	Heramec					
19	North Kathana	Heramec					
20	North Balol	HOEC					

21	Bakrol	Selan					
22	Baola	Interlink	5.47	5.47	5.47	5.47	5.47
23	Bhandut	Oilex-NL					
24	Cambay	Oilex-NL					
25	Dholka	Joshi tech	32.66	15.41			
26	Hazira	Niko					
27	Indrora	Selan					
28	Lohar	Selan					
29	Sanganpur	Hydrocarbon res					
30	Sabarmati	Oilex-NL holdings					
31	Unnawa	GSPCL					
32	Wavel	Joshi tech					
33	CB-ON-7(Promoda-Palej)	HOEC					
34	Ognaj	Selan	0.90	0.81	0.73	0.65	0.59
35	CB-ON-3 (ESU)	Essar					
36	SPD	HOEC					
37	CB-ONN-2000/1(INGOLI)	GSPCL					
	CB-ONN-2000/2 (NS-BHEEMA)	Niko					
39	**Gujarat Total**		**390.55**	**142.56**	**42.08**	**22.82**	**20.60**
	Rajasthan						
40	RJ-ON-90/1						
41	RJ-ON-7	Cairn	332.16	332.16	336.12	324.51	329.61
42	Mangala	Cairn					
43	Aishwaraya	Cairn	21.07	13.56	11.35	9.62	8.08
44	Bhagyam	Cairn	43.27	42.58	37.17	26.72	20.96
45	Saraswati	Cairn	821.67	736.41	671.82	622.72	576.22
46	Rageshwari	Cairn	8.73	13.92	18.08	19.37	18.16
47	Shakti	Cairn					
48	Kameshwari West	Cairn					
	Rajasthan Total		**1226.90**	**1138.62**	**1074.54**	**1002.94**	**953.02**
49	Ranigunj south (CBM)						
	WEST BENGAL						
	Total Onshore (B)		**1617.49**	**1281.23**	**1116.65**	**1025.80**	**973.66**
	Grand Total (A + B)		**37782.548**	**36959.744**	**36164.697**	**35111.444**	**33718.662**

Annexure 3 (a): Gas Utilization Policy

In June 2008, the EGoM notified the guidelines to be followed for sale of gas by NELP Contractors as well as the order of priority in which the initial 40 MMSCMD gas from RIL's KG-D6 block was to be distributed amongst different end-use sectors. The Press Note dated June 25, 2008. on Decision regarding sale of natural gas by NELP Contractors and order of priority to supply gas from RIL's KG-D6 field is attached below.

Press Note - Decision regarding sale of Natural Gas by NELP contractors and order of Priority to supply gas from RIL's kg D6 field

Empowered Group of Ministers (EGoM) had been constituted to examine issues relating to pricing and commercial utilization of gas under New Exploration Licensing Policy (NELP). The issues relating to pricing were decided earlier by the EGoM. The EGoM meeting was held on 28.5.2008 to deliberate upon issues pertaining to commercial utilization of natural gas.

2. The following guidelines for sale of natural gas by NELP contractors have been approved:-

i) Contractors would sell gas from NELP to consumers in accordance with the marketing priorities determined by the Government. The sale would be on the basis of formula for determining the price as approved by the Government.

ii) Consumers belonging to any of the priority sectors should be in a position to actually consume gas as and when it becomes available. So the marketing priority does not entail any 'reservation' of gas. It implies that in case consumers in a particular sector, which is higher in priority, are not in a position to take gas when it becomes available, it would go to the sector which is next in order of priority.

iii) In case of default by a consumer under a particular priority sector and further in the event of alternative consumers not being available in the same sector, the gas will be offered by Contractor to other consumers in the next order of priority.

iv) The priority for supply of gas from a particular source would be applicable only amongst those customers who are connected to existing and available pipeline network connected to the source. So if there is a marginal or small field that is not connected to a big pipeline network, then the Contractor would be allowed to sell the gas to customers who are connected or can be connected to the field in a relatively short period (of say three to six months).

v) The priority would not impact the process of price discovery whenever it is undertaken, as all the customers would participate in the price discovery process (as already decided by the EGoM) and would be eligible for utilizing natural gas subject to priority.

vi) Since the supply situation is expected to increase substantially in the near future in view of increased availability from domestic sources and imported gas (LNG/ transnational pipelines), these guidelines would be applicable for the next 5 years after which they would be reviewed.

3. The production of natural gas from RIL's KG D6 field is expected to commence from September 2008 and will initially be about 25 mmscmd. It is further expected that the production would gradually increase to 40 mmscmd by March 2009. The EGoM decided that this gas should be supplied in the following order of priority:

i) Existing gas based urea plants, which are now getting gas below their full requirement, would be supplied gas so as to enable full capacity utilization.

ii. A maximum quantity of 3 mmscmd would be supplied to existing gas based LPG plants.

iii. Up to 18 mmscmd natural gas, being the partial requirement of gas-based power plants lying idle/under-utilized and likely to be commissioned during 2008-09, and

liquid fuel plants, which are now running on liquid fuel and could switch over to natural gas, would be supplied to power plants.

iv. A maximum quantity of 5 mmscmd would be made available to City Gas Distribution projects for supply of Piped Natural Gas (PNG) to households and Compressed Natural Gas (CNG) in transport sector.

v) Any additional gas available, beyond categories i) to iv) above, would be supplied to existing gas-based power plants, as their requirement is more than 18 mmscmd.

4. The marketing freedom given to Contractors under NELP would be subject to the order of priority given in para 3 above and the guidelines given in para 2 above.

5. The decision would benefit 22 natural gas-based urea plants in the country, as natural gas is the ideal feedstock for production of urea and, due to the shortfall in gas availability in the country, these plants have to use costlier alternate fuels like naphtha and fuel oil. Supply of gas for production of LPG would be greatly beneficial as about 25% of our present requirement is met by imports. The LPG requirement in the country is expected to further go up in the coming years because of continuing enrolment. Supply of natural gas to power plants would result in utilization of idle assets and cheaper incremental cost of power on account of better utilization of existing assets. Gas-based power plants handle peak loads very well and they are also preferred for environmental considerations. Supply of city gas as a clean and cheap fuel for use of domestic purpose has become a vital necessity for the urban dwellers. Presently the country has 12 cities with more than 25 lakhs population. It is proposed that all cities with population of more than 25 lakhs will be connected within 3 years. Further, cities with population between 10 to 25 lakhs will be covered in a phased manner.

Ministry of Petroleum & Natural Gas

New Delhi: June 25, 2008 / Ashadha 04 , 1930

Annexure 3(b): Gas Utilization Policy

In October 2009, another EGoM was set up which decided the sector-wise allocation of additional 20 MMSCMD gas from KG-D6. The Press Note dated November 16, 2009 EGoM decision regarding commercial utilization of gas produced under NELP is attached below

Press Note -:EGoM decision regarding commercial utilization of gas produced under NELP
Monday, November 16, 2009

The Empowered Group of Ministers (EGoM) met on 27th October, 2009 to decide on issues pertaining to commercial utilization of gas produced under NELP.

The following decisions were taken:-

(a) In view of the present actual requirement of RGPPL, it was decided that 5.67 mmscmd from KG D-6 should be supplied on firm basis to RGPPL. The additional requirement of RGPPL arising at a later stage could be considered subsequently.
(b) Gas from KG D-6 should be supplied on firm basis to all the existing gas-based power plants connected to KG D-6 (excluding RGPPL and NTPC's plants in Kawas & Gandhar) so as to enable the plants within Andhra Pradesh to operate at 75% PLF and those outside Andhra Pradesh to operate at 70% PLF.
(c) EGoM decided that 2.71 mmscmd of APM/PMT gas should be diverted from NTPC's plants in the Northern part of the country to its Kawas & Gandhar power plants, and an additional quantity of 2.71 mmscmd KG D-6 gas should be supplied on firm basis to NTPC's plants in Northern part of the country.

(d) KG D-6 gas should be supplied on firm basis to power plants to be commissioned in 2009-10, viz., Lanco Kondapalli Extn. (366 MW) - Andhra Pradesh, Tanir Bavi (220 MW) (now GMR Energy Kakinada) - Andhra Pradesh, Rithala 108 MW – Delhi, Bawana 250 MW – Delhi & Utran CCPP 374 MW – Gujarat, so as to enable the plants within Andhra Pradesh to operate at 75% PLF and those outside Andhra Pradesh to operate at 70% PLF.

(e) Government of Andhra Pradesh had requested for allotment of 1.05 mmscmd KG D-6 gas to four gas-based power projects in the State, viz., M/s Sriba Industries Ltd., Chigurukota (30 MW), M/s RVK Energy Pvt. Ltd., Nandigama (32.7 MW), M/s Silkroad Sugar Pvt. Ltd. Vakalapudi (35 MW) and M/s LVS Power Ltd., Pendurthi (55 MW). It was decided that Ministry of Power (MoP) should examine the request & make recommendations and thereafter MoPNG should decide on firm allocation of KG D-6 gas for these power plants for their operation at 75% PLF.

(f) All existing gas-based power plants and those to be commissioned this year could draw gas on fallback basis, up to a maximum of 12 mmscmd, to further increase their PLF.

(g) As regards request of Department of Fertilizers (DoF) for replacement of RLNG contracted by Urea Companies with comparatively cheaper KG D-6 gas, it was decided that Offtakers, viz., GAIL, IOC & BPCL, and Urea Companies should jointly explore the possibility of supplying the said RLNG to customers in other sectors on the same conditions. In case such customers are identified and the Offtakers can execute the necessary GSPAs with them, then the urea plants could be allowed to terminate their RLNG contracts and the urea plants could be allotted KG D-6 gas.

(h) The only existing gas-based plant producing subsidized fertilizers other than urea is Deepak Fertilizers, which should be supplied 0.178 mmscmd KG D-6 gas on firm basis.

(i) It was decided that 0.44 mmscmd KG D-6 gas should be supplied on firm basis to meet the shortfall of existing gas-based steel plants, viz., M/s Essar Steel (Hazira), M/s Ispat Industries (Dolvi) and M/s Vikram Ispat (Salav).

(j) It was decided that 1.918 mmscmd KG D-6 gas should be supplied on firm basis to petrochemicals plants to meet their feedstock requirement, i.e., 1.168 mmscmd to Reliance Industries Ltd., Gandhar, Gujarat and 0.75 mmscmd to Reliance Industries Ltd., Nagothane, Maharashtra. As gas produced from KG D-6 is lean and petrochemicals cannot be extracted from this gas, GAIL & other transporters would undertake a swapping arrangement, whereby rich & semi-rich gas available with them would be supplied to petrochemicals plants and lean gas from KG D6 field will be supplied to other existing customers as a makeup for the shrinkage in rich gas by the petrochemicals plants.

(k) Firm allocation of 5 mmscmd and fallback allocation up to 6 mmscmd was made to partially meet the requirement of refinery sector. The requirement of various units in the sector would be met on a pro rata basis, subject to economic viability and the units being in a position to use the prorated quantity. In case a unit is unable to utilize the gas, it should be prorated among other units which can use it.

(l) Allotment of 10 mmscmd on fallback basis was made to Captive Power Plants. Details of Captive Power Plants and gas supply to these would be decided by MoP&NG in consultation with MoP within a period of one month.

(m) Allocation of 2 mmscmd KG D-6 gas on fallback basis was made to City Gas Distribution (CGD) entities for supply to their industrial and commercial customers, whose total consumption of natural gas (including KG D-6 gas) does not exceed 50,000 scmd. The said quantity would be allotted amongst CGD entities by MoPNG. Price of natural gas sold to industrial and commercial customers by a particular CGD entity should be on the basis of the delivered price of KG D-6 gas to the said entity.

(n) Amongst all fallback customers, the requirement of power sector would be firstly met and, thereafter, all the remaining customers should be supplied gas on pro rata basis.

(o) As regards demand of natural gas for conversion of Naphtha-based & fuel oil-based fertilizers plants, for expansion & revamp of fertilizer plants and revival of closed fertilizers plants, it was decided that they would be supplied natural gas as and when they are ready to utilize the gas. Further, it was decided that trunk natural gas pipelines, which are needed to connect Naphtha-

based, fuel oil-based and closed fertilizers plants to sources of gas, would be constructed expeditiously and MoPNG would involve DoF in reviewing the progress of the same.

(p) MOP&NG would take decisions on the basis of orders of EGoM with which the Contractor would comply. Consultations as and when necessary would be held with the concerned Ministries and other stakeholders.

(q) MoPNG would take decisions regarding supply of natural gas to sectors/individual customers consequent to gas available on account of short offtake, delay and any other unforeseen circumstances.

(r) The requirement of natural gas for plants to be completed beyond 2009-10 would be reviewed from time to time by the EGoM for making firm allotments to such new plants from the fallback quantity available.

II. The above decisions regarding allocations to various priority sectors are summarized as follows:
(in mmscmd)

S.NO.	**Sector**	**Firm allotments**	**Fallback allotments**
	Existing Assets		
1.	Power (including plants to be commissioned in 2009-10) – beyond 18 mmscmd earmarked earlier	12.29 (+ 0.875)*	12.00
2.	Non-Urea subsidized Fertilizers	0.178	--
3.	Steel (only for feedstock)	0.44	--
4.	Petrochemicals (only for feedstock)	1.918	--
5.	Refineries	5.0	6.00
6.	CGD projects (for industrial & commercial sectors)	--	2.00
7.	Captive power plants	--	10.00
	Total	**19.826** **(+ 0.875)***	**30.00**

* For 4 power plants of AP at 75% PLF, subject to verification by MoP.

III. Taking into account the earlier allocations made by the EGoM, the total sector-wise allocations are as follows:-

S.NO.	**Sector**	**Firm allocations**	**Fallback allocations**	**Grand Total**
1.	**Power**	31.165	12	**43.165**
2.	**Fertilizer**	15.508		**15.508**

3.	**CGD**	0.83	2	**2.83**
4.	**Steel**	4.19		**4.19**
5.	**Refineries**	5	6	**11**
6.	**Petrochemicals**	1.918		**1.918**
7.	**LPG**	3		**3**
8.	**Captive Power**		10	**10**
	Total	**61.611**	**30**	**91.611**

M/o Petroleum & Natural Gas, Government of India

New Delhi: November 16, 2009

Annexure 4: Existing Pipeline Network

SI.	Name of the pipeline	Company	Length (in Km)	Capacity (MMSCMD)
1.	HVJ (including GREP spur lines)	GAIL	3397	33.4
2.	Dahej-Vijaipur Pipeline Project	GAIL	770	23.9
3.	Dahej-Panvel -Dabhol Pipeline (DPPL)	GAIL	476	12
4.	Dahej-Uran Pipeline (DUPL)	GAIL	504	12
5.	Assam Region Pipeline Network	GAIL	8.6	2.5
6.	Agartala Region Pipeline Network	GAIL	59.71	2.26
7.	Pipeline Network in North Gujarat	GAIL	145	10
8.	Pipeline Network in South Gujarat	GAIL	257	9.5
9.	Mumbai Network	GAIL	124.7	23.6
10	KG Basin Network	GAIL	728	6.2
11	Cauvery Basin Network	GAIL	266	3
12.	Pipeline Network in Rajasthan	GAIL	66	3.47
13.	East-West Pipeline Project	RGTIL	1385 (1400 approx)	120
14.	Hazira –Ankleshwar	ONGC	73	5.06
15.	GSPL Network in Gujarat	GSPL	1120	35
16.	AGCL/OIL Gas Pipeline Network	AGCL/OIL	500	8
	Total		**9895**	**299.89**

Annexure 5: Proposed Pipeline Network

SI.	Name of the pipeline	Company	Length (in Km)	Capacity (MMSCMD)	Year of Commissioning
1.	Dadri- Bawana-Nangal	GAIL	610	31	2012-13
2.	Chainsa-Gurgaon- Jhajjar-Hissar	GAIL	310	30	2012-13
3.	Jagdishpur-Haldia	GAIL	876	32	2012-13
4.	Dabhol-Bangalore	GAIL	730	16	2012-13
5.	Kochi-Kanjirkkod-Bangalore/Mangalore	GAIL	822	16	2012-13
6.	Vijayawada-Vijaipur	GAIL	1036	31.36	2013-14
7.	Kakinada-Chennai	RGTIL	600	10	2012-13
8.	Chennai-Tuticorin	RGTIL	670	10	2012-13
9.	Chennai-Bangalore-Mangalore	RGTIL	660	10	2012-13
10	Kakinada-Haldia	RGTIL	1,100	20	2013-14
11	Mallavaram-Bhilwara	GSPL	1290	30	2012-13
12.	Mehsana-Bathinda	GSPL	700	30	2012-13
13.	Bathinda-Srinagar	GSPL	447	15	2012-13
14.	Surat-Paradip	GSPL	1600	30	2013-14
15.	Duliajan-Numaligarh	Duliajan Numaligarh Pipeline Limited	194	2	2013-14
16.	Dadri- Panipat	Indian Oil	133	10.5	2012-13
17.	Karanpur-Moradabad-Kashipur-Rudrapur	GAIL	185.40	2.53	2012-13
	Total		**11936.4**	**326.39**	

Annexure 6 : Pre-92 operational Gas based urea units

Sl	Fertiliser units	Location	State	Unit Type
1	Brahmaputra Valley Fertilizer Corporation Limited (BVFCL), Namrup-III	Namrup	Assam	Pre 92-gas based
2	Indian Farmers Fertilizer Cooperative Limited (IFFCO), Aonla-I	Aonla	UP	Pre-92 gas based
3	Indo-Gulf Fertilisers	Jagdishpur	UP	Pre-92 gas based
4	Krishak Bharati Cooperative Limited (KRIBHCO)	Hazira	Gujarat	Pre-92 gas based
5	National Fertilizer Limited (NFL), Vijaipur I	Vijaipur	MP	Pre-92 gas based

Annexure 7: Post-92 Gas based, Post-92 Naphtha-based and two Pre-92 Naphtha based urea units

Sl. No	Fertiliser units	Location	State	Unit Type
1	Nagarjuna Fertilizers & Chemicals Limited (NFCL), Kakinada-I	Kakinada	Andhra Pradesh	Post-92 gas-based
2	Chambal Fertilizers & Chemicals Limited (CFCL), G-I	Gadepan	Rajasthan	Post-92 gas-based
3	Tata Chemicals Limited (TCL)	Babrala	UP	Post-92 gas-based
4	Nagarjuna Fertilizers & Chemicals Limited (NFCL), Kakinada-II	Kakinada	Andhra Pradesh	Post 92 gas-based
5	Indian Farmers Fertilizer Cooperative Limited (IFFCO), Aonla-II	Aonla	UP	Post-92 gas-based
6	National Fertilizer Limited (NFL), Vijaipur II	Vijaipur	MP	Post-92 gas-based
7	KRIBHCO Shyam Fertilisers Limited (KSFL)	Shahjahanpur	UP	Post-92 gas-based
8	Indian Farmers Fertilizer Cooperative Limited (IFFCO), Phulpur-II	Phulpur	UP	Post-92 Naphtha-based
9	Chambal Fertilizers & Chemicals Limited (CFCL)	Gadepan	Rajasthan	Post-92 Naphtha-based
10	Indian Farmers Fertilizer Cooperative Limited (IFFCO), Phulpur-I	Phulpur	UP	Pre-92 Naphtha based
11	Shriram Fertiliser & Chemicals (SFC)	Kota	Rajasthan	Pre-92 Naphtha based

Annexure 8: Mixed energy based urea units

Sl. No	Fertiliser units	Location	State	Unit Type
1	Gujarat State Fertilizers & Chemicals Limited (GSFC)	Vadodara	Gujarat	Mixed energy based
2	Indian Farmers Fertilizer Cooperative Limited (IFFCO), Kalol	Kalol	Gujarat	Mixed energy based
3	Rashtriya Chemicals & Fertilizer Limited (RCFL)	Thal	Maharashtra	Mixed energy based

Annexure 9: Non-urea gas based units

Sl.	Fertiliser units	Location	State	Unit Type
1	Deepak Fertilisers and Chemicals Limited	Navi Mumbai	Maharashtra	Non-urea gas-based

Annexure 10: Closed urea units proposed to be revived by DoF

Sl.	Fertiliser units	Location	State	Unit Type
1	FCI, Gorakhpur	Gorakhpur	UP	Closed urea unit proposed to be revived by DoF
2	HFC, Barauni	Barauni	Bihar	Closed urea unit proposed to be revived by DoF
3	FCI, Sindri	Sindri	Jharkhand	Closed urea unit proposed to be revived by DoF
4	HFC, Durgapur	Durgapur	West Bengal	Closed urea unit proposed to be revived by DoF
5	FCI, Ramagundam	, Ramagundam	Andhra Pradesh	Closed urea unit proposed to be revived by DoF
6	FCI, Talcher	Talcher	Orissa	Closed urea unit proposed to be revived by DoF
7	HFCL- Haldia	Haldia	West Bengal	Closed urea unit proposed to be revived by DoF

Annexure 11: Greenfield Urea Projects

Sl.	Fertiliser units	Location	State	Unit Type
1	IFFCO, Nellore	Nellore	Andhra Pradesh	Greenfield Project
2	Matix Fertilisers and Chemicals	Burdwan	West Bengal	Greenfield Project
3	Reliance Industries Limited	Jamnagar	Gujarat	Greenfield Project
4	Oswal Chemicals and Fertilisers Limited	To be finalized	Andhra Pradesh	Greenfield Project

Annexure 12: Non-urea Non-gas based units

Sl.	Fertiliser units	Location	State	Unit Type
1	IFFCO, Paradip	Paradip	Orissa	Non-urea non gas-based

				unit
2	Paradeep Phosphates Limited	Paradip	Orissa	Non-urea non gas-based unit
3	Godavari Fertilisers and Chemicals	Kakinada	Andhra Pradesh	Non-urea non gas-based unit

Annexure 13: Pre-92 Naphtha-based urea units

Sl.	Fertiliser units	Location	State	Unit Type
1	Mangalore Chemicals & Fertilizers Ltd (MFCL)	Mangalore	Karnataka	Pre 92 naphtha based
2	Madras Fertilisers Limited (MFL)	Manali	Tamil Nadu	Pre 92 naphtha based
3	Zuari Industries Limited (ZIL)	Zuari Nagar	Goa	Pre 92 naphtha based
4	Southern Petrochemicals Industries Corporation Limited (SPIC)	Tuticorin	Tamil Nadu	Pre 92 naphtha based

Annexure 14: FO/LSHS based urea units

Sl.	Fertiliser units	Location	State	Unit Type
1	Gujarat Narmada Valley Fertilizers Co Limited (GNVFC)	Bharuch	Gujarat	FO/LSHS based
2	National Fertilizer Limited (NFL), Nangal	Nangal	Punjab	FO/LSHS based
3	National Fertilizer Limited (NFL), Bathinda	Bathinda	Punjab	FO/LSHS based
4	National Fertilizer Limited (NFL), Panipat	Panipat	Haryana	FO/LSHS based

Annexure 15: List of gas-based units using negligbile quantities of Naphtha

Sl.	Fertiliser units	Location	State	Unit Type
1	Indian Farmers Fertilizer Cooperative Limited (IFFCO), Aonla-I	Aonla	UP	Pre-92 gas based
2	Indo-Gulf Fertilisers	Jagdishpur	UP	Pre-92 gas based
3	Krishak Bharati Cooperative Limited (KRIBHCO)	Hazira	Gujarat	Pre-92 gas based
4	National Fertilizer Limited (NFL), Vijaipur I	Vijaipur	MP	Pre-92 gas based
5	Chambal Fertilizers & Chemicals Limited (CFCL), G-I	Gadepan	Rajasthan	Post-92 gas-based
6	Tata Chemicals Limited (TCL)	Babrala	UP	Post-92 gas-based
7	Nagarjuna Fertilizers & Chemicals Limited (NFCL), Kakinada-II	Kakinada	Andhra Pradesh	Post 92 gas-based
8	Indian Farmers Fertilizer Cooperative Limited (IFFCO), Aonla-II	Aonla	UP	Post 92 gas-based
9	KRIBHCO Shyam Fertilisers Limited	Shahjahanpur	UP	Post 92 gas-based

Annexure 16: List of gas-based urea units using Naphtha owing to shortgae of gas

Sl.	Fertiliser units	Location	State	Unit Type
1	Indian Farmers Fertilizer Cooperative Limited (IFFCO), Phulpur-I	Phulpur	UP	Pre-92 Naphtha based
2	Shriram Fertiliser & Chemicals (SFC)	Kota	Rajasthan	Pre-92 Naphtha based

Annexure 17: Naphtha and FO/LSHS based fertilizer units and connecting pipeline

Sl.	Fertiliser units	Feedstock used	Region	Connecting pipeline
1	MCFL, Mangalore	Naphtha	Southern	Kochi Mangalore Bangalore pipeline, Chennai-Bangalore-Mangalore pipeline
2	National Fertilizers Limited (NFL), Panipat	FO/LSHS	Northern	Dadri-Bawana-Nangal pipeline

3	National Fertilizers Limited (NFL), Bathinda	FO/LSHS	Northern	Dadri-Bawana-Nangal pipeline, Mehsana-Bathinda pipeline
4	National Fertilizers Limited (NFL), Nangal	FO/LSHS	Northern	Dadri-Bawana-Nangal pipeline
5	Zuari Fertilizers Limited	Naphtha		Dabhol-Bangalore pipeline
6	MFL, Chennai	Naphtha	Southern	Kakinada-Chennai pipeline, Chennai-Tutiorin pipeline
7	SPIC, Tuticorin	Naphtha	Southern	Kakinada-Chennai pipeline, Chennai-Tutiorin pipeline
8	GNVFC, BHARUCH	FO/LSHS	Western	Pipeline Network in South Gujarat

Annexure 18: List of Power Plants and Fuel used

Sl.	Power Plants	Region	Fuel used
1	Badarpur	North	Coal
2	I.P. Stn.	North	Coal
3	Rajghat	North	Coal
4	Faridabad	North	Coal
5	Panipat	North	Coal
6	Yamuna Nagar	North	Coal
7	Bathinda	North	Coal
8	Lehra Mahabbat	North	Coal
9	Ropar	North	Coal
10	Kota	West	Coal
11	Suratgarh	West	Coal
12	Anpara	North	Coal
13	Harduaganj	North	Coal
14	Obra	North	Coal
15	Panki	North	Coal
16	Paricha	West	Coal
17	Tanda	North	Coal
18	Unchahar	North	Coal
19	Rihand	North	Coal
20	Singrauli	West	Coal
21	Dadri(NCTPP)	North	Coal
22	Torrent Power	West	Coal
23	Gandhinagar	West	Coal
24	Sikka Repl.	West	Coal
25	Ukai	West	Coal
26	Wanakbori	West	Coal
27	Amarkantak	West	Coal

Sl.	Power Plants	Region	Fuel used
28	Birsingpur	West	Coal
29	Satpura	West	Coal
30	Vindhyachal	West	Coal
31	Korba East	West	Coal
32	KorbaWest	West	Coal
33	Korba STPS	West	Coal
34	Bhusawal	West	Coal
35	Chandrapur	West	Coal
36	Koradi	West	Coal
37	Khaperkheda	West	Coal
38	Nasik	West	Coal
39	Parli	West	Coal
40	Paras	West	Coal
41	Dahanu	West	Coal
42	Trombay*	West	Coal
43	Kathgodam	North	Coal
44	Ramagundam	South	Coal
45	Vijayawada	South	Coal
46	Ramagundam STPS	South	Coal
47	Rayalseema	South	Coal
48	Simhadri	South	Coal
49	Raichur	South	Coal
50	Ennore	South	Coal
51	Mettur	South	Coal
52	Tuticorin	South	Coal
53	North Chennai	South	Coal
54	Barauni	East	Coal
55	Muzaffarpur	East	Coal
56	Kahalgaon	East	Coal
57	Patratu	East	Coal
58	Tenughat	East	Coal
59	Bokaro	East	Coal
60	Chandrapur	West	Coal
61	Durgapur	East	Coal
62	Mejia	East	Coal
63	Bandel	East	Coal
64	Santaldih	East	Coal
65	Kolaghat	East	Coal
66	Bakreshwar	East	Coal
67	New Cossipore	East	Coal
68	Titagarh	East	Coal

Sl.	Power Plants	Region	Fuel used
69	Southern Repl.	South	Coal
70	Budge Budge	East	Coal
71	Durgapur(DPL)	East	Coal
72	Farakka STPS	East	Coal
73	Talcher	East	Coal
74	Talcher STPS	East	Coal
75	Ib Valley	East	Coal
76	Bongaigaon	East	Coal
77	Faridabad CCGT	North	Natural Gas
78	Anta CCGT	West	Natural Gas
79	Auraiya CCGT	North	Natural Gas
80	Dadri CCGT	North	Natural Gas
81	Kawas CCGT	West	Natural Gas
82	Gandhar CCGT	West	N Gas
83	Kathalguri CCGT (AGBPP)	East	Natural Gas
84	Agartala GT	East	Natural Gas
85	Ratnagiri CCGT @	West	Natural Gas
86	I.P. CCGT	North	Natural Gas
87	Pragati CCGT	North	Natural Gas
88	Ramgarh CCGT	West	Natural Gas
89	Dholpur GT#	West	Natural Gas
90	Utran CCGT	West	Natural Gas
91	Hazira CCPP (GSEG)	West	Natural Gas
92	Dhuvaran CCPP (GSECL)	West	Natural Gas
93	Dhuvaran CCPP (GSEL) Extn. $	West	Natural Gas
94	Uran CCGT	West	Natural Gas
95	Vijjeswaram CCGT	South	Natural Gas
96	Karaikal CCGT	South	Natural Gas
97	Narimanam GT	South	Natural Gas
98	Kovilkalappal (Thi'kottai) CCGT	South	Natural Gas
99	Valuthur CCGT	South	Natural Gas
100	Kuttalam CCGT	South	Natural Gas
101	Namrup CCGT	East	Natural Gas
102	Lakwa GT	East	Natural Gas
103	Baramura GT$	East	Natural Gas
104	Rokhia GT	East	Natural Gas
105	Vatwa CCGT (AEC)	East	Natural Gas
106	Trombay CCGT	West	Natural Gas
107	GPEC Puguthan CCGT	West	Natural Gas
108	GIPCL-Stage-II CCGT	West	Natural Gas
109	Essar IMP CCGT	West	Natural Gas

Sl.	Power Plants	Region	Fuel used
110	Godavari CCGT (Spectrum)	West	Natural Gas
111	Kondapalli CCGT	South	Natural Gas
112	Jegurupadu CCGT (GVK)	South	Natural Gas
113	Jegurupadu CCGT (GVK) Ext.	South	Natural Gas
114	Samlkot CCPP/Peddapuram 2	South	Natural Gas
115	Vemagiri CCPP	South	Natural Gas
116	P. Nallur CCGT	South	Natural Gas
117	KaruppurCCGT	South	Natural Gas
118	Valantharavai CCPP	South	Natural Gas
119	DLF Pvt. CCGT	South	Natural Gas
120	Tripura Gas ILFS JV	East	Natural Gas
121	Pragati-III (Bawana)	North	Natural Gas
122	Utran CCPP	West	Natural Gas
123	GSEG Hazira Ext.	West	Natural Gas
124	Pipavav JV CCGT	West	Natural Gas
125	Valuthur Ext.	South	Natural Gas
126	Lakwa WH	East	Natural Gas
127	Sugen Torrent-Block I, II and III	West	Natural Gas
128	Konaseema GT	South	Natural Gas
129	Konaseema ST	South	Natural Gas
130	Gautami	South	Natural Gas
131	Rithala CCPP	North	Natural Gas
132	Kondapalli CCPP Ph-II	South	Natural Gas
133	NTPC Kayamkulam	South	Natural Gas
134	NTPC Kawas-II	West	Natural Gas
135	NTPC Gandhar-II	West	Natural Gas
136	MAHAGENCO Uran	West	Natural Gas
137	Reliance Dadri	North	Natural Gas
138	Pyguthan	West	Natural Gas
139	Essar Hazira	West	Natural Gas
140	Kannur	West	Natural Gas
141	Kayamkulam CCGT (NTPC)	South	Naphtha
142	Maithon GT (DVC)	East	HSD
143	Basin Bridge GT (TNEB)	South	Naphtha
144	Pampore GT (Power Dept. J&K)	North	HSD
145	Kasba GT (WBPDCL)	East	HSD
146	Siliguri GT (WBPDCL)	East	HSD
147	Haldia GT (WBPDCL)	East	HSD
148	Goa Power Station (Reliance Energy Ltd)	West	Naphtha
149	Tanir Bavi CCGT (GMR Energy Ltd.)	South	Naphtha
150	Cochin CCGT (Reliance Energy Ltd)	South	Naphtha

Sl.	Power Plants	Region	Fuel used
151	Hindustan Copper Ltd., Khetri	West	Naphtha
152	Reliance Industries Ltd.	West	Naphtha
153	Chennai Petroleum Corporation Ltd., Manali	South	Naphtha
154	Haldia Petrochemicals Ltd.	East	Naphtha
155	Mangalore Refinery Petrochemicals Ltd.	South	FO/LSHS
156	Apollo Tyres Ltd.	West	FO/LSHS
157	Gujarat Ambuja Cements Ltd.	West	FO/LSHS
158	Indian Petrochemicals Corpn. Ltd.(IPCL)	West	FO/LSHS
159	Saurashtra Cement Ltd.	West	FO/LSHS
160	Jaypee Rewa Cement	West	FO/LSHS
161	National Fertilizers Ltd.	West	FO/LSHS
162	Indo Rama Synthetics(I) Ltd,Nagpur	West	FO/LSHS
163	Mukand Ltd.	West	FO/LSHS
164	Standard Alkali (Chem.Div.)	West	FO/LSHS
165	Mandovi Pellets (A divn of Chowgule & Co. Ltd)	West	FO/LSHS
166	Ambuja Cement Eastern Ltd.	West	FO/LSHS
167	Grasim Cement	West	FO/LSHS
168	Hirmi Cement Limited	West	FO/LSHS
169	Lafarge India Limited,Sonadih Cement Works	East	FO/LSHS
170	Uniworth Ltd.	East	FO/LSHS
171	M/s. Facor Alloys Ltd (Ferro Alloys Corpn)	South	FO/LSHS
172	M/s. UltraTech Cement Limited	South	FO/LSHS
173	Rain Industries Ltd.(Cement factory)	South	FO/LSHS
174	M/s. Sree Rayalaseema Alkalies & Allied	South	FO/LSHS
175	M/s. Hindustan Organic Chemicals Ltd.	South	FO/LSHS
176	Dalmia Cement (Bharat) Ltd, Dalmiapuram	South	FO/LSHS
177	DCW Ltd, Sahupuram	South	FO/LSHS
178	Grasim Industries Ltd (Cement Divn.), Ariyalur	South	FO/LSHS
179	Madras Cements Ltd, Alathiyur	South	FO/LSHS
180	SPIC Pharmaceuticals Division, Cuddalore	South	FO/LSHS
181	Tamil Nadu Petroproducts Ltd, Chennai (LAB Plant)	South	FO/LSHS
182	Tamil Nadu Petroproducts Ltd, Chennai	South	FO/LSHS
183	Indian Oil Corporation Ltd.,Haldia Refinery	East	FO/LSHS
184	Indian Oil Corporation Ltd.,Haldia Refinery	East	FO/LSHS
185	Ferro Alloys Corpn. Ltd.(Charge Chrome Plant)	East	FO/LSHS
186	Balasore Alloys Ltd. (Formerly - Ispat Alloys Ltd.)	East	FO/LSHS
187	NALCO Ltd.,Smelter & Power Plant, Angul	East	FO/LSHS
188	National Aluminium Co. Ltd. (NALCO), Damanjodi	East	FO/LSHS
189	OCL India Ltd.,Rajgangpur	East	FO/LSHS
190	Bongaigaon Refinery & Petrochemicals Ltd.	East	FO/LSHS
191	DCM Engg Product	North	HSD/LDO

Sl.	Power Plants	Region	Fuel used
192	Mahavir Spinning Mill	North	HSD/LDO
193	Sambhag Spl Steel	North	HSD/LDO
194	Elegant Spinners Ltd.	North	HSD/LDO
195	Hero Honda Motors Limited	North	HSD/LDO
196	Sun beam auto Ltd	North	HSD/LDO
197	Sunbeam Casting Ltd.	North	HSD/LDO
198	J K Industries Ltd.	West	HSD/LDO
199	JK Cement Works Ltd.	West	HSD/LDO
200	Lakshmi Cement Ltd. (J K Corp.)	West	HSD/LDO
201	Lords Chloro Alkali Ltd.	West	HSD/LDO
202	Maharaja Shree Umaid Mills Ltd.	West	HSD/LDO
203	Mangalam Cement Ltd.	West	HSD/LDO
204	Shree Rajasthan Syntex Ltd	West	HSD/LDO
205	Shree Cement Ltd.	West	HSD/LDO
206	ACC Company Ltd.	North	HSD/LDO
207	Ambuja Cement	North	HSD/LDO
208	Auro Spinning Mills	North	HSD/LDO
209	Mathura Refinery	North	HSD/LDO
210	Mohan Crystal Glass Ltd.	North	HSD/LDO
211	Recorn Synthetic Ltd.	North	HSD/LDO
212	India Glycols Ltd	North	HSD/LDO
213	Ashima Ltd.	West	HSD/LDO
214	Aurunoday Mills Ltd.	West	HSD/LDO
215	Bharat Vijay Mills	West	HSD/LDO
216	Bilag Industries Ltd.	West	HSD/LDO
217	Gujarat Cement Works (L & T)	West	HSD/LDO
218	Orient Abrasives Ltd.	West	HSD/LDO
219	Rajashree Polyfil	West	HSD/LDO
220	Reliance Ind. Ltd.,Jamnagar	West	HSD/LDO
221	Shah Alloys Ltd.	West	HSD/LDO
222	Shree Digvijay Cement Co.Ltd.	West	HSD/LDO
223	Torrent Gujarat Bio-tech Ltd.	West	HSD/LDO
224	Videocon International Ltd.	West	HSD/LDO
225	Welspun Terrt Towels	West	HSD/LDO
226	Birla Vikas Cement, Khuraj Nagar, Satna	West	HSD/LDO
227	Century Denim	West	HSD/LDO
228	Hind Spinners (A Div of Hind Sintex Ltd.)	West	HSD/LDO
229	HJI Prop. GMMCO Ltd.	West	HSD/LDO
230	Jaypee Bela Plant	West	HSD/LDO
231	L.G. Hotline (CPT) Ltd.	West	HSD/LDO
232	Maihar Cement	West	HSD/LDO

Sl.	Power Plants	Region	Fuel used
233	National Steel & Agro(I) Ltd.Fertilizers Ltd., Indore	West	HSD/LDO
234	Pratibha Yarn	West	HSD/LDO
235	Prism Cement Ltd.	West	HSD/LDO
236	Raymond Limited	West	HSD/LDO
237	S R F Ltd.	West	HSD/LDO
238	Vikram Cement,Unit of Grasim Ind.Ltd.	West	HSD/LDO
239	Vikram Cement,Unit of Grasim Ind. Ltd.	West	HSD/LDO
240	Airport Authority of India,E.MD-5	West	HSD/LDO
241	Century Enka Ltd.	West	HSD/LDO
242	Century Rayon	West	HSD/LDO
243	Ispat Industries Ltd.	West	HSD/LDO
244	National Rayon Ltd NRC Ltd.	West	HSD/LDO
245	Sahara India Commercial Corporation Ltd.	West	HSD/LDO
246	Tata Motors Ltd., Pimpri	West	HSD/LDO
247	Associated Cement Corporation Ltd.	West	HSD/LDO
248	Century Cement	West	HSD/LDO
249	Ultratech Cement Ltd.	West	HSD/LDO
250	M/s. AGI Glaspac	South	HSD/LDO
251	M/s. Cement Corporation of India Ltd.,(CC I Ltd.), Tandur Cement Factory	South	HSD/LDO
252	M/s. Coromandel Fertilizers Ltd.	South	HSD/LDO
253	M/s. Hindustan Zinc Ltd.	South	HSD/LDO
254	M/s. K.C.P. Ltd., Cement Unit ,Macherla	South	HSD/LDO
255	M/s. Madras Cements Ltd.	South	HSD/LDO
256	M/s. Orient Cement	South	HSD/LDO
257	M/s. Panyam Cements & Minerals Ind.Ltd.	South	HSD/LDO
258	M/s. Priyadarshini Cement Ltd.	South	HSD/LDO
259	M/s.Sanghi Polysters Ltd., Sanghi Nagar, Hyd.	South	HSD/LDO
260	M/s. The Andhra Cement Company Ltd.	South	HSD/LDO
261	M/s. The India Cements Limited	South	HSD/LDO
262	M/s. The India Cements Limited	South	HSD/LDO
263	M/s. Vishnu Cement Ltd.	South	HSD/LDO
264	M/s. Zuari Cement Ltd.	South	HSD/LDO
265	Bharat Earth Movers Ltd.	South	HSD/LDO
266	Bilt Chemicals Limited,Karwar	South	HSD/LDO
267	Bharat Electronics Ltd, Jalahally	South	HSD/LDO
268	Gokak Mills	South	HSD/LDO
269	Infosys Technologies Ltd,Electronics City	South	HSD/LDO
270	Kudremukh Iron Ore Co. Ltd, Panambur	South	HSD/LDO
271	Mangalore Chemicals & Fertilizers Ltd	South	HSD/LDO
272	Mysore Cement Ltd.	South	HSD/LDO

Sl.	Power Plants	Region	Fuel used
273	Motor Industries Co Ltd.	West	HSD/LDO
274	Rajashree Cements	South	HSD/LDO
275	The West Coast Paper Mills Ltd.	South	HSD/LDO
276	TVS Motor Co. Ltd	South	HSD/LDO
277	Vasavadatta Cements	South	HSD/LDO
278	Vikrant Tyres Ltd	South	HSD/LDO
279	M/s. Binani Zinc Limited	South	HSD/LDO
280	Chemplast Sanmar Ltd, PVC Divn, Mettur Dam	South	HSD/LDO
281	Chettinad Cement Corporation, Puliyur	South	HSD/LDO
282	HUDCO Chennai	South	HSD/LDO
283	India Cements, Ariyalur	South	HSD/LDO
284	Madras Cements Ltd, Ramasamyraja Nagar	South	HSD/LDO
285	Premier Fine Yarns Private Ltd, Udamalpet	South	HSD/LDO
286	Premier Mills Ltd, Belathur	South	HSD/LDO
287	Sterlite Industries India Ltd, Tuticorin	South	HSD/LDO
288	The India Cements Ltd, Dalavoi	South	HSD/LDO
289	The India Cements Ltd, Sankar Nagar	South	HSD/LDO
290	Tidel Park Ltd, Chennai	South	HSD/LDO
291	TVS Motor Co. Ltd, Hosur (Plant- I, II & III)	South	HSD/LDO
292	Dunlop India Ltd.	East	HSD/LDO
293	Hindustan Fertilizer Corporation Ltd., Haldia	East	HSD/LDO
294	Hindustan Motors Ltd.	East	HSD/LDO
295	Indian Rayon & Industries Ltd. (Jayashree Textiles)	East	HSD/LDO
296	South Asian Petrochem Ltd.	East	HSD/LDO
297	Chittaranjan Locomotive Works	East	HSD/LDO
298	TISCO Ltd., Jamshedpur	East	HSD/LDO
299	Fondry Forged Plant(CPP),Heavy Engineering Corporation Ltd. (HEC)	East	HSD/LDO
300	Ferro Chrome Plant(Unit of IDCOL)	East	HSD/LDO
301	Fertilizer Corporation of India Ltd., Talcher	East	HSD/LDO
302	Orissa Polyfibres Ltd. (Formerly Orissa Synthetics Ltd.)	East	HSD/LDO

Annexure 19: Statewise cities to be covered under CGD and their connectivity details

Sl.	City/Local Area	State/UT	Region	City Tier	Pipeline name
1.	Hyderabad*	AP	South	1	EWPL
2.	Kakinada(1)	AP	South	1	EWPL
3.	Rajahmundry (2)	AP	South	1	EWPL
4.	Tirupati*	AP	South	1	KCPL
5.	Vijayawada*	AP	South	4	EWPL
6.	Vishakhapatnam*	AP	South	1	KHPL
7.	Chandigarh (2)	Punjab/Haryana	North	1	EWPL
8.	Ahmedabad*	Gujarat	West	1	EWPL
9.	Jamnagar*	Gujarat	West	1	EWPL
10.	Rajkot*	Gujarat	West	1	EWPL
11.	Surat*	Gujarat	West	1	EWPL
12.	Vadodara*	Gujarat	West	1	EWPL
13.	Vapi*	Gujarat	West	1	EWPL
14.	Faridabad*	Haryana	North	1	EWPL
15.	Gurgaon*	Haryana	North	1	EWPL & HBJ
16.	Sonipat (1)	Haryana	North	1	EWPL
17.	Bangalore*	Karnataka	South	1	CBMPL
18	Hubli-Dharwad*	Karnataka	South	1	CBMPL
19	Mangalore*	Karnataka	South	1	CBMPL
20.	Mysore*	Karnataka	South	1	CBMPL
21.	Kochi*	Kerala	South	1	KCTPL
22.	Kozhikode*	Kerala	South	1	KCTPL
23.	Thiruvanthapuram*	Kerala	South	1	KCTPL
24.	Ambarnath*	Maharashtra	West	1	EWPL
25	Aurangabad*	Maharashtra	West	1	EWPL
26	Bhiwandi*	Maharashtra	West	1	EWPL
27.	Nagpur*	Maharashtra	West	1	MVPL
28.	Nashik*	Maharashtra	West	1	EWPL
29.	Navi Mumbai*	Maharashtra	West	1	EWPL
30.	Pune*	Maharashtra	West	1	EWPL
31.	Sholapur*	Maharashtra	West	1	EWPL
32.	Thane*	Maharashtra	West	1	EWPL
33.	Bhopal*	MP	West	1	VVPL
34.	Dewas (1)	MP	West	1	JPPL
35.	Gwalior*	MP	West	1	EWPL+HBJ
36.	Indore*	MP	West	1	EWPL
37.	Jabalpur*	MP	West	1	EWPL
38.	Shahdol (2)	MP	West	2	Dedic. PL

Sl.	City/Local Area	State/UT	Region	City Tier	Pipeline name
39.	Amritsar*	Punjab	North	1	EWPL
40.	Jalandhar*	Punjab	North	1	EWPL
41.	Ludhiana*	Punjab	North	1	EWPL
42.	Yanam(2)	Pondicherry	South	3	EWPL
43.	Kota [(1)]	Rajasthan	West	1	HBJ
44	Jaipur*	Rajasthan	West	1	MVPL
45.	Udaipur*	Rajasthan	West	1	MVPL
46.	Chennai*	Tamil Nadu	South	1	KCTPL
47.	Coimbatore*	Tamil Nadu	South	1	KCTPL
48.	Madurai*	Tamil Nadu	South	1	KCTPL
49.	Salem*	Tamil Nadu	South	1	KCTPL
50.	Tuticorin*	Tamil Nadu	South	1	KCTPL
51.	Tiruchirapalli*	Tamil Nadu	South	1	KCTPL
52.	Agra*	UP	North	1	EWPL+HBJ
53.	Allahabad (2)	UP	North	1	EWPL+HBJ
54	Ghaziabad(2)	UP	North	1	EWPL+HBJ
55.	Jhansi (2)	UP	North	1	HBJ
56.	Kanpur*	UP	North	1	EWPL
57.	Lucknow*	UP	North	1	EWPL+HBJ
58.	Mathura(1)	UP	North	1	HBJ
59.	Meerut(1)	UP	North	1	EWPL+HBJ
60.	Noida*	UP	North	1	EWPL+HBJ
61	Varanasi*	UP	North	1	EWPL+ HBJ
62.	Kolkata*	West Bengal	East	1	KHPL
63	Tarapur*	Maharashtra	West	5	EWPL
64	Bhavnagar*	Gujarat	West	1	Dhandhuka-Jafrabad
65	Kachcch*	Gujarat	West	1	Morbi-Mundra
66	Dahej*	Gujarat	West	3	HBJ+EWPL
67	Ankleshwar*	Gujarat	West	1	EWPL
68	Bharuch*	Gujarat	West	1	EWPL
69	Warangal	AP	South	1	VVPL
70	Khammam	AP	South	1	VVPL
71	Chandarpur	Maharashtra	West	1	VVPL
72	Wardha	Maharashtra	West	1	VVPL+MVPL
73	Ferozabad	UP	North	1	VVPL
74	Satara	Maharashtra	West	1	DBPL
75	Kolhapur	Maharashtra	West	1	DBPL
76	Sangli	Maharashtra	West	1	DBPL
77	Karim Nagar	AP	South	1	MVPL
78	Durg	Chattisgarh	West	1	MVPL
79	Ujjain	MP	West	1	MVPL

Sl.	City/Local Area	State/UT	Region	City Tier	Pipeline name
80	Ratlam	MP	West	1	MVPL
81	Chittaurgarh	Rajasthan	North	1	MVPL
82	Bhilwara	Rajasthan	North	1	MVPL
83	Jodhpur	Rajasthan	North	3	Mehsana-Bathinda
84	Ajmer	Rajasthan	North	1	Mehsana-Bathinda
85	Alwar	Rajasthan	North	1	Mehsana-Bathinda
86	Pali	Rajasthan	North	1	Mehsana-Bathinda
87	Sirohi	Rajasthan	North	3	Mehsana-Bathinda
88	Bhiwadi	Rajasthan	North	1	Mehsana-Bathinda
89	Bhiwani	Haryana	North	1	Mehsana-Bathinda
90	Rohtak	Haryana	North	1	Mehsana-Bathinda
91	Sirsa	Haryana	North	1	Mehsana-Bathinda
92	Bathinda	Punjab	North	1	Mehsana-Bathinda
93	Patiala	Punjab	North	1	Mehsana-Bathinda
94	Ambala	Punjab	North	1	Mehsana-Bathinda
95	Kapurthala	Punjab	North	1	Bathinda Srinagar
96	Moga	Punjab	North	1	Bathinda Srinagar
97	Mansa	Punjab	North	1	Bathinda Srinagar
98	Kathua	J & K	North	6	Bathinda Srinagar
99	Samba	J & K	North	1	Bathinda Srinagar
100	Bari Brahamana	J & K	North	3	Bathinda Srinagar
101	Gangyal	J & K	North	6	Bathinda Srinagar
102	Srinagar	J & K	North	1	Bathinda Srinagar
103	Brahamapur	Orissa	East	1	Kakinada-Haldia
104	Bhubaneshwar	Orissa	East	1	Kakinada-Haldia
105	Cuttack	Orissa	East	1	Kakinada-Haldia
106	Kashipur	Uttaranchal	North	6	Moradabad-Rudrapur
107	Rudrapur	Uttaranchal	North	1	Moradabad-Rudrapur
108	Moradabad	Uttaranchal	North	1	Moradabad-Rudrapur
109	Eluru	AP	South	1	EWPL
110	Suriapet	AP	South	2	EWPL
111	Guntur	AP	South	1	EWPL
112	Nalgonda	AP	South	1	EWPL
113	Rangareddy	AP	South	1	EWPL
114	Zahirabad	AP	South	6	EWPL
115	Homnabad	AP	South	6	EWPL
116	Mallavaram	AP	South	6	EWPL+CIPL
117	Nizamabad	AP	South	1	EWPL+CIPL
118	Adilabad	AP	South	1	EWPL+CIPL

Sl.	City/Local Area	State/UT	Region	City Tier	Pipeline name
119	Ramagundam	AP	South	6	EWPL+CIPL
120	Kottaguddem	AP	South	6	EWPL+CIPL
121	Chitoor	AP	South	1	KCBL
122	Vizianagarm	AP	South	1	KBPL
123	Bhimumpatnam	AP	South	6	KBPL
124	Srikakulam	AP	South	1	KBPL
125	Paralakhemundi	AP	South	1	KBPL
126	Nawada	Bihar	East	1	JHPL
127	Gaya	Bihar	East	1	JHPL
128	Sasaram	Bihar	East	1	JHPL
129	Patna	Bihar	East	1	JHPL
130	Jehanabad	Bihar	East	1	JHPL
131	Arrah	Bihar	East	1	JHPL
132	Chhapra	Bihar	East	1	JHPL
133	Siwan	Bihar	East	1	JHPL
134	Gopalganj	Bihar	East	1	JHPL
135	Batiya	Bihar	East	4	JHPL
136	Banswari	Bihar	East	6	JHPL
137	Bhillai	Chattisgarh	North	6	EWPL+CIPL
138	Betul	Chattisgarh	North	6	EWPL+CIPL
139	Chinndwara	Chattisgarh	North	6	EWPL+CIPL
140	RaIpur	Chattisgarh	North	1	SPPL
141	Goa	Goa	West	1	GGPL
142	Umargaon	Gujarat	West	6	EWPL+DUPL
143	Banaskantha	Gujarat	West	4	GAIL+ GUJRAT NET
144	Dahod	Gujarat	West	3	GAIL+ GUJRAT NET
145	Rewari	Haryana	North	1	DJH
146	Hissar	Haryana	North	1	DJH
147	Jind	Haryana	North	1	DJH
148	Panipat	Haryana	North	1	DBN+DP
149	Karnal	Haryana	North	1	DBN+DP
150	YamunaNagar	Haryana	North	1	HVJ+
151	Jagadri	Haryana	North	6	HVJ+
152	Ambala	Haryana	North	1	DNB+DP
153	Debwali	Haryana	North	6	MBPL
154	Nangal	Punjab	North	3	DNB+DP
155	Jammu	J & K	North	1	Bathinda srinagar
156	Katra	J & K	North	5	Bathinda srinagar
157	Udhampur	J & K	East	1	Bathinda srinagar
158	Sindri	Jharkhand	East	5	JHPL
159	Sagardighi	Jharkhand	East	6	JHPL

Sl.	City/Local Area	State/UT	Region	City Tier	Pipeline name
160	Bokaro	Jharkhand	East	1	JHPL
161	Dhanbad	Jharkhand	East	1	JHPL
162	Giridih	Jharkhand	East	1	JHPL
163	Koderma	Jharkhand	East	2	JHPL
164	Deoghar	Jharkhand	East	1	JHPL
165	Hazaribag	Jharkhand	East	1	JHPL
166	Mulbagal	Karnataka	South	3	KCBL
167	Bangarapet	Karnataka	South	3	KCBL
168	Hosur	Karnataka	South	6	KCBL
169	Kanakpura	Karnataka	South	3	KCBL
170	Ramanagaram	Karnataka	South	2	KCBL
171	Krishnagiri	Karnataka	South	6	KCBL
172	Kunigal	Karnataka	South	3	KCBL
173	Sri Rangapatnam	Karnataka	South	6	KCBL
174	Mandya	Karnataka	South	1	KCBL
175	Hassan	Karnataka	South	1	CBMPL
176	Sakleshpur	Karnataka	South	3	CBMPL
177	Chikmangalur	Karnataka	South	1	CBMPL
178	Madikeri	Karnataka	South	6	CBMPL
179	Suratkal	Karnataka	South	6	CBMPL
180	Udupi	Karnataka	South	1	CBMPL
181	Tumkur	Karnataka	South	1	CBMPL
182	Koppal	Karnataka	South	1	CBMPL
183	Hampi	Karnataka	South	6	CBMPL
184	Chitradurg	Karnataka	South	1	CBMPL
185	Davangere	Karnataka	South	1	CBMPL
186	Gadag	Karnataka	South	1	CBMPL
187	Bellary	Karnataka	South	1	CBMPL
188	Shimonga	Karnataka	South	1	CBMPL
189	Chamarajanagar	Karnataka	South	1	KCBL
190	Kollegal	Karnataka	South	2	KCBL
191	Kolar	Karnataka	South	1	KCBL
192	Kasarakod	Kerala	South	1	CBMPL
193	Kannur	Kerala	South	1	CBMPL+KKMPL
194	Mahe	Kerala	South	6	CBMPL+KKMPL
195	Kalpetta	Kerala	South	3	CBMPL+KKMPL
196	Mallapuram	Kerala	South	1	CBMPL+KKMPL
197	Palakad (Palghat)	Kerala	South	1	CBMPL+KKMPL
198	Thrissur	Kerala	South	1	CBMPL+KKMPL
199	Ernakulam	Kerala	South	1	CBMPL+KKMPL
200	Kottayam	Kerala	South	1	CBMPL+KKMPL

Sl.	City/Local Area	State/UT	Region	City Tier	Pipeline name
201	Alappuzha	Kerala	South	1	CBMPL+KKMPL
202	Periyar	Kerala	South	4	CBMPL+KKMPL
203	Kollam	MP	West	1	CBMPL+KKMPL
204	Jhabua	MP	West	1	HVJ+
205	Dhar	MP	West	1	HVJ+
206	Shahjapur	MP	West	1	HVJ+
207	Vijaypur	MP	West	6	HVJ+
208	Guna	MP	West	1	HVJ+
209	Raghogarh	MP	West	6	HVJ+
210	Shivpuri	MP	West	1	HVJ+
211	Datia	MP	West	1	HVJ+
212	Khandwa	MP	West	6	EWPL+CIPL
213	Ratlam	MP	West	1	HVJ+CIPL
214	Mandsaur	MP	West	1	HVJ+CIPL
215	Hosangabad	MP	West	1	MBPL
216	Sehore	MP	West	1	MBPL
217	Raisen	MP	West	1	MBPL
218	Vidisha	MP	West	1	MBPL
219	Chattarpur	MP	West	1	KBPL
220	Ratnagiri	Maharashtra	West	1	DPPL
221	Alibag	Maharashtra	West	4	MUMBAI REG
222	Bidar	Maharashtra	West	1	EWPL
223	Osmanabad	Maharashtra	West	1	EWPL
224	Karmala	Maharashtra	West	3	EWPL
225	Shaund	Maharashtra	West	6	EWPL
226	Latur	Maharashtra	West	1	EWPL
227	Ahmadnagar	Maharashtra	West	1	EWPL
228	Shirdi	Maharashtra	West	3	EWPL
229	Lonavala	Maharashtra	West	1	EWPL+DUPL
230	Khopoli	Maharashtra	West	6	EWPL+DUPL
231	Matheran	Maharashtra	West	3	EWPL+DUPL
232	Wadgaon	Maharashtra	West	3	EWPL+DUPL
233	Panvel	Maharashtra	West	1	EWPL+DUPL
234	Shahpur	Maharashtra	West	4	EWPL
235	Murbad	Maharashtra	West	4	EWPL
236	Gadchiroli	Maharashtra	West	2	EWPL+CIPL
237	Yavatmal	Maharashtra	West	1	EWPL+CIPL
238	Amravati	Maharashtra	West	1	EWPL+CIPL
239	Bhadrak	Orissa	East	1	KBPL
240	Rourkela	Orissa	East	1	KBPL+JHPL
241	Khordha	Orissa	East	1	KBPL

Sl.	City/Local Area	State/UT	Region	City Tier	Pipeline name
242	Jajapur	Orissa	East	2	KBPL
243	Anandpur	Orissa	East	3	KBPL
244	Kamakhyanagar	Orissa	East	4	KBPL
245	Baleshwar	Orissa	East	1	KBPL
246	Baripada	Orissa	East	2	KBPL
247	Karaikal	Pondicherry	South	1	KCPL+CTPL
248	Rajpura	Punjab	North	2	DBN+DP
249	Mandi Govindgarh	Punjab	North	6	DBN+DP
250	Sangrur	Punjab	North	1	DBN+DP
251	Pathankot	Punjab	North	6	Bathinda srinagar
252	Hoshiarpur	Punjab	North	1	Bathinda srinagar
253	Dungarpur	Rajasthan	North	2	HVJ+CIPL
254	Jhunjhunu	Rajasthan	North	1	MBPL
255	Bikaner	Rajasthan	North	1	MBPL
256	Sriganganagar	Rajasthan	North	6	MBPL
257	Badmer	Rajasthan	North	2	MBPL
258	Jaiselmer	Rajasthan	North	2	MBPL
259	Kanchipuram	Tamil Nadu	South	1	KCPL+CTPL
260	Tiruvannamalai	Tamil Nadu	South	1	KCPL+CTPL
261	Kallakkurrichichi	Tamil Nadu	South	3	KCPL+CTPL
262	Dharmapuri	Tamil Nadu	South	1	KCPL+CTPL
263	Cudalore	Tamil Nadu	South	1	KCPL+CTPL
264	Perambalur	Tamil Nadu	South	2	KCPL+CTPL
265	Lalgudi	Tamil Nadu	South	3	KCPL+CTPL
266	Namakkal	Tamil Nadu	South	1	KCPL+CTPL
267	Karur	Tamil Nadu	South	1	KCPL+CTPL
268	Erode	Tamil Nadu	South	1	KCPL+CTPL
269	Thanjavur	Tamil Nadu	South	1	KCPL+CTPL
270	Dindigul	Tamil Nadu	South	1	KCPL+CTPL
271	Pudukkottai	Tamil Nadu	South	1	KCPL+CTPL
272	Virudhunagar	Tamil Nadu	South	1	KCPL+CTPL
273	Aruppukkottai	Tamil Nadu	South	2	KCPL+CTPL
274	Kovilpatti	Tamil Nadu	South	2	KCPL+CTPL
275	Tirublveli	Tamil Nadu	South	1	KCPL+CTPL
276	Udhagammandalam (Ooty)	Tamil Nadu	South	2	KCBL
277	Thiralthani	Tamil Nadu	South	1	KCPL
278	Auraiya	UP	North	1	HVJ+
279	Dibiyapur	UP	North	6	HVJ+
280	Phaphund	UP	North	6	HVJ+
281	Babarpur	UP	North	6	HVJ+

Sl.	City/Local Area	State/UT	Region	City Tier	Pipeline name
282	Mainpuri	UP	North	1	HVJ+
283	Ethawah	UP	North	1	HVJ+
284	Jagdishpur	UP	North	6	HVJ+
285	Badayun	UP	North	6	HVJ+
286	Shahjahanpur	UP	North	1	HVJ+
287	Aligarh	UP	North	1	HVJ+
288	Hathras	UP	North	1	HVJ+
289	Bulandshahr	UP	North	6	HVJ+
290	Dadri	UP	North	1	HVJ+
291	Modinagar	UP	North	6	HVJ+
292	Muzzafarnagar	UP	North	1	HVJ+
293	Ballia	UP	North	1	JHPL
294	Mirzapur	UP	North	1	JHPL
295	Bhadhoi	UP	North	6	JHPL
296	Mau	UP	North	1	JHPL
297	Jaunpur	UP	North	1	JHPL
298	Sultanpur	UP	North	1	JHPL
299	Azamgarh	UP	North	1	JHPL
300	Akbarpur	UP	North	6	JHPL
301	Faizabad	UP	North	6	JHPL
302	Saharnpur	UP	North	1	HVJ+
303	Rampur	UP	North	1	HVJ+
304	Hapur	UP	North	6	HVJ+
305	Garahmukteshwar	UP	North	6	HVJ+
306	Ghazipur	UP	North	1	JHPL
307	Gorakhpur	UP	North	1	JHPL
308	Barali	UP	North	1	JHPL
309	Barabanki	UP	North	1	JHPL
310	Roorkee	Uttaranchal	North	6	HVJ+
311	Haridwar	Uttaranchal	North	1	HVJ+
312	Ramnagar	Uttaranchal	North	3	HVJ+
313	Haldwani	Uttaranchal	North	6	HVJ+
314	Kathgodam	Uttaranchal	North	6	HVJ+
315	Panskura	West Bengal	East	6	JHPL
316	Durgapur	West Bengal	East	1	JHPL
317	Katwa	West Bengal	East	2	JHPL
318	Adra	West Bengal	East	3	JHPL
319	Kharagpur	West Bengal	East	1	KBPL
320	Midnapur	West Bengal	East	1	KBPL
321	Alipur	West Bengal	East	2	KBPL
322	Haldia	West Bengal	East	1	JHPL+KBPL

Sl.	City/Local Area	State/UT	Region	City Tier	Pipeline name
323	Bankura	West Bengal	East	1	JHPL+KBPL

Note: 68 cities for which EOIs have been submitted to PNGRB

a) First round (6 cities) – cities marked as (1)
b) Second (7 Cities) – cities marked as (2)
c) Remaining (55 cities) – marked as *

Annexure 20: Sector wise estimated demand of cities to be covered by CGD

Sl.	City/Local Area	Domestic	Commercial	CNG	Industrial	Total demand in base year (08-09)	Projected demand in 2030
1.	Hyderabad*	0.13	0.1	0.45	1.74	2.42	4.5
2.	Kakinada(1)	0.012	0.006	0.017	0.1	0.135	0.26
3.	Rajahmundry (2)	0.0164	0.0073	0.0176	0.225	0.2663	1.1065
4.	Tirupati*	0.02	0.01	0.02	0.01	0.06	0.1
5.	Vijayawada*	0.042	0.012	0.036	0.11	0.2	0.5
6.	Vishakhapatnam*	0.07	0.04	0.06	0.77	0.94	2
7.	Chandigarh (2)	0.08	0.02	0.09	0.1	0.29	0.75
8.	Ahmedabad*	0.26	0.08	0.22	0.53	1.09	1.95
9.	Jamnagar*	0.007	0.028	0.002	0.129	0.166	0.33
10.	Rajkot*	0.02	0.03	0.05	0.32	0.42	1
11.	Surat*	0.14	0.07	0.13	4.87	5.21	7.1
12.	Vadodara*	0.14	0.06	0.12	2.46	2.78	4.2
13.	Vapi*	0.03	0.08	0.02	2.462	2.592	4.1
14.	Faridabad*	0.08	0.03	0.07	0.1	0.28	0.75
15.	Gurgaon*	0.02	0.04	0.02	0.19	0.27	1.12
16.	Sonipat (1)	0.12	0.06	0.59	0.02	0.79	1.58
17.	Bangalore*	0.132	0.754	0.246	0.434	1.566	6.25
18.	Hubli-Dharwad*	0.05	0.02	0.07	0.1	0.24	0.44
19.	Mangalore*	0.2	0.02	0.02	0.74	0.98	1.75
20.	Mysore*	0.04	0.02	0.06	0.2	0.32	0.7
21.	Kochi*	0.04	0.03	0.03	0.5	0.6	1.2
22.	Kozhikode*	0.03	0.03	0.03	0.11	0.2	0.45
23.	Thiruvanthapuram*	0.07	0.02	0.01	0.05	0.15	0.3
24.	Ambarnath*	0.009	0.005	0.06	0.1	0.174	0.5
25.	Aurangabad*	0.1	0.03	0.09	0.13	0.35	0.8
26.	Bhiwandi*	0.14	0.03	0.42	0.4	0.99	1.5
27.	Nagpur*	0.2	0.06	0.17	0.38	0.81	1.7

Sl.	City/Local Area	Domestic	Commercial	CNG	Industrial	Total demand in base year (08-09)	Projected demand in 2030
28.	Nashik*	0.08	0.04	0.1	0.18	0.4	1
29.	Navi Mumbai*	0.05	0.04	0.08	0.05	0.22	0.75
30.	Pune*	0.17	0.07	0.3	0.65	1.19	3.5
31.	Sholapur*	0.02	0.03	0.04	0.15	0.24	0.5
32.	Thane*	0.07	0.03	0.12	0.25	0.47	1.12
33.	Bhopal*	0.08	0.02	0.07	0.08	0.25	0.6
34.	Dewas (1)	0.17	0.25	0.1	0.51	1.03	2.06
35.	Gwalior*	0.04	0.01	0.03	0.08	0.16	0.3
36.	Indore*	0.09	0.02	0.07	0.18	0.36	0.75
37.	Jabalpur*	0.05	0.02	0.04	0.01	0.12	0.2
38.	Shahdol (2)	0.01	0.01	0.03	0.15	0.2	0.45
39.	Amritsar*	0.01	0.06	0.03	0.04	0.14	0.53
40.	Jalandhar*	0.03	0.05	0.09	0.15	0.32	1
41.	Ludhiana*	0.017	0.064	0.027	0.24	0.348	1.57
42.	Yanam(2)	0.0016	0.001	0.005	0.31	0.3176	0.6
43.	Kota (1)	0.26	0.037	0.72	0.24	1.257	
44.	Jaipur*	0.2	0.04	0.004	0.485	0.729	1.3
45.	Udaipur*	0.02	0.02	0.03	0.13	0.2	0.45
46.	Chennai*	0.06	0.32	0.06	0.35	0.79	3.15
47.	Coimbatore*	0.18	0.03	0.02	0.1	0.33	0.83
48.	Madurai*	0.01	0.05	0.01	0.04	0.11	0.42
49.	Salem*	0.04	0.05	0.06	0.2	0.35	0.6
50.	Tuticorin*	0.02	0.01	0.03	1	1.06	2
51.	Tiruchirapalli*	0.05	0.03	0.04	0.28	0.4	0.6
52.	Agra*	0.06	0.03	0.11	0.25	0.45	0.9
53.	Allahabad (2)	0.06	0.02	0.07	0.1	0.25	0.55
54.	Ghaziabad(2)	0.05	0.02	0.07	0.36	0.5	0.94
55.	Jhansi (2)	0.2	0.009	0.23		0.439	
56.	Kanpur*	0.2	0.05	0.05	0.86	1.16	2.7
57.	Lucknow*	0.17	0.04	0.14	0.2	0.55	0.95
58.	Mathura(1)	0.19	0.009	0.26	0.22	0.679	
59.	Meerut(1)	0.05	0.02	0.07	0.36	0.5	1.4
60.	Noida*	0.03	0.01	0.05	0.05	0.14	0.35
61.	Varanasi*	0.06	0.02	0.08	0.1	0.26	0.52
62.	Kolkata*	0.47	0.14	0.39	0.92	1.92	3.75
63	Tarapur*	0.0003	0.0042	0.0038	0.56	0.5683	1.53
64	Bhavnagar*	0.01	0.001	0.01	0.1	0.121	0.34
65	Kachcch*	0.003	0.001	0.01	0.24	0.254	1.16

Sl.	City/Local Area	Domestic	Commercial	CNG	Industrial	Total demand in base year (08-09)	Projected demand in 2030
66	Dahej*	0.005	0.001	0.008	0.25	0.264	
67	Ankleshwar*	0.0112	0.002	0.008	0.9	0.9212	1.5
68	Bharuch*	0.0186	0.0074	0.0027	0.141	0.1697	0.24
69	Warangal	0.13	0.1	0.45	1.74	2.42	4.5
70	Khammam	0.04	0.03	0.03	0.5	0.6	1.2
71	Chandarpur	0.2	0.06	0.17	0.38	0.81	1.7
72	Wardha	0.07	0.03	0.12	0.25	0.47	1.12
73	Ferozabad	0.12	0.06	0.59	0.02	0.79	
74	Satara	0.03	0.08	0.02	2.462	2.592	4.1
75	Kolhapur	0.14	0.03	0.42	0.4	0.99	1.5
76	Sangli	0.14	0.07	0.13	4.87	5.21	7.1
77	Karim Nagar	0.13	0.1	0.45	1.74	2.42	4.5
78	Durg	0.17	0.25	0.1	0.51	1.03	
79	Ujjain	0.09	0.02	0.07	0.18	0.36	0.75
80	Ratlam	0.14	0.03	0.42	0.4	0.99	1.5
81	Chittaurgarh	0.08	0.03	0.07	0.1	0.28	0.75
82	Bhilwara	0.17	0.04	0.14	0.2	0.55	0.95
83	Jodhpur	0.03	0.05	0.09	0.15	0.32	1
84	Ajmer	0.2	0.009	0.23		0.439	
85	Alwar	0.03	0.01	0.05	0.05	0.14	0.35
86	Pali	0.06	0.03	0.11	0.25	0.45	0.9
87	Sirohi	0.03	0.01	0.05	0.05	0.14	0.35
88	Bhiwadi	0.03	0.01	0.05	0.05	0.14	0.35
89	Bhiwani	0.12	0.06	0.59	0.02	0.79	
90	Rohtak	0.05	0.02	0.07	0.36	0.5	0.94
91	Sirsa	0.05	0.02	0.07	0.36	0.5	1.4
92	Bathinda	0.12	0.06	0.59	0.02	0.79	
93	Patiala	0.19	0.009	0.26	0.22	0.679	
94	Ambala	0.01	0.06	0.03	0.04	0.14	0.53
95	Kapurthala	0.03	0.05	0.09	0.15	0.32	1
96	Moga	0.08	0.02	0.09	0.1	0.29	0.75
97	Mansa	0.03	0.05	0.09	0.15	0.32	1
98	Kathua						
99	Samba	0.12	0.06	0.59	0.02	0.79	
100	Bari Brahamana	0.03	0.01	0.05	0.05	0.14	0.35
101	Gangyal						
102	Srinagar	0.08	0.02	0.09	0.1	0.29	0.75
103	Brahamapur	0.0164	0.0073	0.0176	0.225	0.2663	1.1065

Sl.	City/Local Area	Domestic	Commercial	CNG	Industrial	Total demand in base year (08-09)	Projected demand in 2030
104	Bhubaneshwar	0.05	0.02	0.07	0.1	0.24	0.44
105	Cuttack	0.2	0.02	0.02	0.74	0.98	1.75
106	Kashipur						
107	Rudrapur	0.2	0.009	0.23		0.439	
108	Moradabad	0.2	0.05	0.05	0.86	1.16	2.7
109	Eluru	0.0164	0.0073	0.0176	0.225	0.2663	1.1065
110	Suriapet	0.02	0.01	0.02	0.01	0.06	0.1
111	Guntur	0.07	0.04	0.06	0.77	0.94	2
112	Nalgonda	0.2	0.02	0.02	0.74	0.98	1.75
113	Rangareddy	0.18	0.03	0.02	0.1	0.33	0.83
114	Zahirabad						
115	Homnabad						
116	Mallavaram						
117	Nizamabad	0.012	0.006	0.017	0.1	0.135	0.26
118	Adilabad	0.04	0.02	0.06	0.2	0.32	0.7
119	Ramagundam						
120	Kottaguddem						
121	Chitoor	0.03	0.03	0.03	0.11	0.2	0.45
122	Vizianagarm	0.012	0.006	0.017	0.1	0.135	0.26
123	Bhimumpatnam						
124	Srikakulam	0.02	0.01	0.03	1	1.06	2
125	Paralakhemundi	0.2	0.02	0.02	0.74	0.98	1.75
126	Nawada	0.1	0.03	0.09	0.13	0.35	0.8
127	Gaya	0.02	0.02	0.03	0.13	0.2	0.45
128	Sasaram	0.03	0.08	0.02	2.462	2.592	4.1
129	Patna	0.17	0.04	0.14	0.2	0.55	0.95
130	Jehanabad	0.03	0.08	0.02	2.462	2.592	4.1
131	Arrah	0.02	0.01	0.02	0.01	0.06	0.1
132	Chhapra	0.08	0.02	0.09	0.1	0.29	0.75
133	Siwan	0.0186	0.0074	0.0027	0.141	0.1697	0.24
134	Gopalganj	0.0186	0.0074	0.0027	0.141	0.1697	0.24
135	Batiya	0.0016	0.001	0.005	0.31	0.3176	0.6
136	Banswari						
137	Bhillai						
138	Betul						
139	Chinndwara						
140	RaIpur	0.05	0.02	0.07	0.36	0.5	0.94
141	Goa	0.26	0.037	0.72	0.24	1.257	

Sl.	City/Local Area	Domestic	Commercial	CNG	Industrial	Total demand in base year (08-09)	Projected demand in 2030
142	Umargaon	0.0003	0.0042	0.0038	0.56	0.5683	1.53
143	Banaskantha	0.01	0.01	0.03	0.15	0.2	0.45
144	Dahod	0.01	0.01	0.03	0.15	0.2	0.45
145	Rewari	0.19	0.009	0.26	0.22	0.679	1.358
146	Hissar	0.19	0.009	0.26	0.22	0.679	1.358
147	Jind	0.19	0.009	0.26	0.22	0.679	1.358
148	Panipat	0.02	0.04	0.02	0.19	0.27	1.12
149	Karnal	0.19	0.009	0.26	0.22	0.679	1.358
150	YamunaNagar	0.19	0.009	0.26	0.22	0.679	1.358
151	Jagadri						
152	Ambala	0.19	0.009	0.26	0.22	0.679	1.358
153	Debwali						
154	Nangal	0.005	0.001	0.008	0.25	0.264	
155	Jammu	0.04	0.05	0.06	0.2	0.35	0.6
156	Katra	0.0003	0.0042	0.0038	0.56	0.5683	1.53
157	Udhampur	0.03	0.08	0.02	2.462	2.592	4.1
158	Sindri	0.0003	0.0042	0.0038	0.56	0.5683	1.53
159	Sagardighi						
160	Bokaro	0.05	0.03	0.04	0.28	0.4	0.6
161	Dhanbad	0.06	0.03	0.11	0.25	0.45	0.9
162	Giridih	0.06	0.02	0.07	0.1	0.25	0.55
163	Koderma	0.01	0.01	0.03	0.15	0.2	0.45
164	Deoghar	0.17	0.25	0.1	0.51	1.03	
165	Hazaribag	0.17	0.04	0.14	0.2	0.55	0.95
166	Mulbagal	0.0016	0.001	0.005	0.31	0.3176	0.6
167	Bangarapet	0.0016	0.001	0.005	0.31	0.3176	0.6
168	Hosur						
169	Kanakpura	0.0016	0.001	0.005	0.31	0.3176	0.6
170	Ramanagaram	0.02	0.01	0.02	0.01	0.06	0.1
171	Krishnagiri						
172	Kunigal	0.0016	0.001	0.005	0.31	0.3176	0.6
173	Sri Rangapatnam						
174	Mandya	0.02	0.01	0.02	0.01	0.06	0.1
175	Hassan	0.012	0.006	0.017	0.1	0.135	0.26
176	Sakleshpur	0.042	0.012	0.036	0.11	0.2	0.5
177	Chikmangalur	0.02	0.01	0.02	0.01	0.06	0.1
178	Madikeri						
179	Suratkal						

Sl.	City/Local Area	Domestic	Commercial	CNG	Industrial	Total demand in base year (08-09)	Projected demand in 2030
180	Udupi	0.02	0.01	0.03	1	1.06	2
181	Tumkur	0.2	0.02	0.02	0.74	0.98	1.75
182	Koppal	0.02	0.01	0.02	0.01	0.06	0.1
183	Hampi						
184	Chitradurg	0.02	0.01	0.02	0.01	0.06	0.1
185	Davangere	0.2	0.02	0.02	0.74	0.98	1.75
186	Gadag	0.2	0.02	0.02	0.74	0.98	1.75
187	Bellary	0.05	0.02	0.07	0.1	0.24	0.44
188	Shimonga	0.2	0.02	0.02	0.74	0.98	1.75
189	Chamarajanagar	0.02	0.01	0.03	1	1.06	2
190	Kollegal	0.0016	0.001	0.005	0.31	0.3176	0.6
191	Kolar	0.05	0.02	0.07	0.1	0.24	0.44
192	Kasarakod	0.02	0.01	0.02	0.01	0.06	0.1
193	Kannur	0.07	0.04	0.06	0.77	0.94	2
194	Mahe						
195	Kalpetta	0.042	0.012	0.036	0.11	0.2	0.5
196	Mallapuram	0.012	0.006	0.017	0.1	0.135	0.26
197	Palakad (Palghat)	0.012	0.006	0.017	0.1	0.135	0.26
198	Thrissur	0.03	0.03	0.03	0.11	0.2	0.45
199	Ernakulam	0.07	0.04	0.06	0.77	0.94	2
200	Kottayam	0.0164	0.0073	0.0176	0.225	0.2663	1.1065
201	Alappuzha	0.05	0.02	0.07	0.1	0.24	0.44
202	Periyar	0.042	0.012	0.036	0.11	0.2	0.5
203	Kollam	0.007	0.028	0.002	0.129	0.166	0.33
204	Jhabua	0.009	0.005	0.06	0.1	0.174	0.5
205	Dhar	0.009	0.005	0.06	0.1	0.174	0.5
206	Shahjapur	0.17	0.25	0.1	0.51	1.03	
207	Vijaypur						
208	Guna	0.007	0.028	0.002	0.129	0.166	0.33
209	Raghogarh						
210	Shivpuri	0.17	0.25	0.1	0.51	1.03	
211	Datia	0.009	0.005	0.06	0.1	0.174	0.5
212	Khandwa						
213	Ratlam	0.007	0.028	0.002	0.129	0.166	0.33
214	Mandsaur	0.17	0.25	0.1	0.51	1.03	
215	Hosangabad	0.007	0.028	0.002	0.129	0.166	0.33
216	Sehore	0.005	0.06	0.1	0.165	0.5	12%
217	Raisen	0.02	0.03	0.05	0.32	0.42	1

Sl.	City/Local Area	Domestic	Commercial	CNG	Industrial	Total demand in base year (08-09)	Projected demand in 2030
218	Vidisha	0.17	0.25	0.1	0.51	1.03	
219	Chattarpur	0.003	0.001	0.01	0.24	0.254	1.16
220	Ratnagiri	0.009	0.005	0.06	0.1	0.174	0.5
221	Alibag	0.005	0.001	0.008	0.25	0.264	
222	Bidar	0.007	0.028	0.002	0.129	0.166	0.33
223	Osmanabad	0.17	0.25	0.1	0.51	1.03	
224	Karmala	0.01	0.01	0.03	0.15	0.2	0.45
225	Shaund						
226	Latur	0.007	0.028	0.002	0.129	0.166	0.33
227	Ahmadnagar	0.02	0.03	0.04	0.15	0.24	0.5
228	Shirdi	0.01	0.01	0.03	0.15	0.2	0.45
229	Lonavala	0.0112	0.002	0.008	0.9	0.9212	1.5
230	Khopoli						
231	Matheran	0.005	0.001	0.008	0.25	0.264	
232	Wadgaon	0.005	0.001	0.008	0.25	0.264	
233	Panvel	0.03	0.08	0.02	2.462	2.592	4.1
234	Shahpur	0.0003	0.0042	0.0038	0.56	0.5683	1.53
235	Murbad	0.0003	0.0042	0.0038	0.56	0.5683	1.53
236	Gadchiroli	0.01	0.01	0.03	0.15	0.2	0.45
237	Yavatmal	0.007	0.028	0.002	0.129	0.166	0.33
238	Amravati	0.1	0.03	0.09	0.13	0.35	0.8
239	Bhadrak	0.009	0.005	0.06	0.1	0.174	0.5
240	Rourkela	0.003	0.001	0.01	0.24	0.254	1.16
241	Khordha	0.03	0.03	0.03	0.11	0.2	0.45
242	Jajapur	0.03	0.08	0.02	2.462	2.592	4.1
243	Anandpur	0.005	0.001	0.008	0.25	0.264	
244	Kamakhyanagar	0.042	0.012	0.036	0.11	0.2	0.5
245	Baleshwar	0.02	0.01	0.02	0.01	0.06	0.1
246	Baripada	0.03	0.08	0.02	2.462	2.592	4.1
247	Karaikal	0.02	0.01	0.02	0.01	0.06	0.1
248	Rajpura	0.03	0.01	0.05	0.05	0.14	0.35
249	Mandi Govindgarh						
250	Sangrur	0.03	0.05	0.09	0.15	0.32	1
251	Pathankot						
252	Hoshiarpur	0.12	0.06	0.59	0.02	0.79	
253	Dungarpur	0.19	0.009	0.26	0.22	0.679	
254	Jhunjhunu	0.02	0.04	0.02	0.19	0.27	1.12
255	Bikaner	0.02	0.04	0.02	0.19	0.27	1.12

Sl.	City/Local Area	Domestic	Commercial	CNG	Industrial	Total demand in base year (08-09)	Projected demand in 2030
256	Sriganganagar						
257	Badmer	0.03	0.01	0.05	0.05	0.14	0.35
258	Jaiselmer	0.03	0.01	0.05	0.05	0.14	0.35
259	Kanchipuram	0.07	0.04	0.06	0.77	0.94	2
260	Tiruvannamalai	0.2	0.02	0.02	0.74	0.98	1.75
261	Kallakkurrichichi	0.0016	0.001	0.005	0.31	0.3176	0.6
262	Dharmapuri	0.2	0.02	0.02	0.74	0.98	1.75
263	Cudalore	0.04	0.02	0.06	0.2	0.32	0.7
264	Perambalur	0.0016	0.001	0.005	0.31	0.3176	0.6
265	Lalgudi	0.0016	0.001	0.005	0.31	0.3176	0.6
266	Namakkal	0.2	0.02	0.02	0.74	0.98	1.75
267	Karur	0.012	0.006	0.017	0.1	0.135	0.26
268	Erode	0.04	0.03	0.03	0.5	0.6	1.2
269	Thanjavur	0.05	0.02	0.07	0.1	0.24	0.44
270	Dindigul	0.04	0.02	0.06	0.2	0.32	0.7
271	Pudukkottai	0.04	0.03	0.03	0.5	0.6	1.2
272	Virudhunagar	0.04	0.02	0.06	0.2	0.32	0.7
273	Aruppukkottai	0.02	0.01	0.03	1	1.06	2
274	Kovilpatti	0.02	0.01	0.03	1	1.06	2
275	Tirublveli	0.07	0.04	0.06	0.77	0.94	2
276	Udhagammandalam (Ooty)	0.02	0.01	0.02	0.01	0.06	0.1
277	Thiralthani	0.04	0.02	0.06	0.2	0.32	0.7
278	Auraiya	0.12	0.06	0.59	0.02	0.79	
279	Dibiyapur						
280	Phaphund						
281	Babarpur						
282	Mainpuri	0.12	0.06	0.59	0.02	0.79	
283	Ethawah	0.03	0.01	0.05	0.05	0.14	0.35
284	Jagdishpur						
285	Badayun						
286	Shahjahanpur	0.2	0.009	0.23		0.439	
287	Aligarh	0.08	0.02	0.09	0.1	0.29	0.75
288	Hathras	0.12	0.06	0.59	0.02	0.79	
289	Bulandshahr						
290	Dadri	0.03	0.05	0.09	0.15	0.32	1
291	Modinagar						
292	Muzzafarnagar	0.04	0.01	0.03	0.08	0.16	0.3

Sl.	City/Local Area	Domestic	Commercial	CNG	Industrial	Total demand in base year (08-09)	Projected demand in 2030
293	Ballia	0.02	0.01	0.02	0.01	0.06	0.1
294	Mirzapur	0.04	0.03	0.03	0.5	0.6	1.2
295	Bhadhoi						
296	Mau	0.19	0.009	0.26	0.22	0.679	
297	Jaunpur	0.01	0.05	0.01	0.04	0.11	0.42
298	Sultanpur	0.0112	0.002	0.008	0.9	0.9212	1.5
299	Azamgarh	0.0164	0.0073	0.0176	0.225	0.2663	1.1065
300	Akbarpur						
301	Faizabad						
302	Saharnpur	0.02	0.03	0.05	0.32	0.42	1
303	Rampur	0.2	0.02	0.02	0.74	0.98	1.75
304	Hapur						
305	Garahmukteshwar						
306	Ghazipur	0.12	0.06	0.59	0.02	0.79	
307	Gorakhpur	0.08	0.02	0.09	0.1	0.29	0.75
308	Barali						
309	Barabanki	0.06	0.03	0.11	0.25	0.45	0.9
310	Roorkee						
311	Haridwar	0.2	0.009	0.23		0.439	
312	Ramnagar	0.03	0.01	0.05	0.05	0.14	0.35
313	Haldwani						
314	Kathgodam						
315	Panskura						
316	Durgapur	0.2	0.009	0.23		0.439	
317	Katwa	0.01	0.01	0.03	0.15	0.2	0.45
318	Adra	0.0186	0.0074	0.0027	0.141	0.1697	0.24
319	Kharagpur	0.06	0.02	0.08	0.1	0.26	0.5
320	Midnapur	0.0112	0.002	0.008	0.9	0.9212	1.5
321	Alipur	0.01	0.01	0.03	0.15	0.2	0.45
322	Haldia	0.03	0.05	0.09	0.15	0.32	1
323	Bankura	0.17	0.25	0.1	0.51	1.03	

Note : 68 cities for which EOIs have been submitted to PNGRB

a) First round (6 cities) – cities marked as (1)
b) Second (7 Cities) – cities marked as (2)
c) Remaining (55 cities) – marked as *

Annexure 21 : Sample illustration for CGD

Objective: To estimate the volume of liquid fuel displaceable for a selected city by the new gas in City Gas Distribution through secondary data analysis and without any primary survey.

Sample City For Analysis: Allahabad

Data Required	Data Available/Data Used
Year on year Volumes of various liquid fuels consumed in Allahabad (City) which can get displaced if and when and in whatever volume, the natural gas arrives in Allahabad.	A private sector company interested in developing CGD network in Allahabad has submitted the estimation of gas demand for various segments of Allahabad to PNGRB. These demands are as mentioned below.

Segments	2007-20008	2020
Domestic:	0.06 MMSCMD	
Commercial:	0.02 MMSCMD	
CNG:	0.07 MMSCMD	
Industrial:	0.10 MMSCMD	
Total	0.25 MMSCMD	0.55 MMSCMD

Methodology Followed

Steps	Assumption	Sample Calculation	Outputs
Step 1: Estimate year on year data for gas demand/consumption till 2017 through extrapolation	The growth of aggregate demand of gas volume is equal. The proportion of gas consumed will remain same y-o-y.	Demand for 2017 is ((0.55-0.25)/(2020-2008))*(2017-2008) **Domestic Segment**: Consumption in 07-08 was (0.06/0.25)=24%. Consumption for year 2020 is (0.55*24%)=0.132 MMSCMD.	Year on year data of gas demand/Consumption of Allahabad for 2009 through 2017
Step 2: Identify various liquid fuels in various segments within Allahabad what the above estimated gas will dispalce.	In **domestic segment** gas will displace **LPG.** In **Transport** segment gas will displace **HSD and MS.** In commercial and Industrial it will displace HSD.	NA	NA

Steps	Assumption	Sample Calculation	Outputs
Step 3: Transfer the gas volume consumption into in **domestic segment** respective liquid fuel (i.e. LPG) volume.	The gas demand for **domestic sector** is transformed into caloricfic value terms and equivalent amount of LPG is calculated based on the same calorific value. Calorific value of gas= 8500 kCal/SCM LPG = 10800 kCal/ KG	Demand of natural gas in 2008-09= 0.06 MMSCMD or 0.06*106 SCM. This is equivalent to 0.06*106*8500 Kcal of energy. To generate this energy we need = (0.06*106*8500*365)/10800 = 17 TMT of LPG	17 TMT LPG can get displaced if natural gas is available in the city without any infra constrain in that year and it will grow @10% y-o-y as gas volume.
Step 4: Transfer the gas volume consumption **transport segment** into respective liquid fuels (i.e. MS, HSD) volume.	Consumption pattern in city will follow the same of the state and for Allahabad It is UP. At National Level 49% of total HSD consumed goes to transport sector and 100% of total MS consumed goes to transport sector. States follows the fuels consumption trend as national the trend. Calorific Value- MS 11000kCal/Kg HSD 10000 kCal/Kg	In UP MS consumption is 830T MT and HSD consumption for 07-08 is 4597 TMT. So form the assumption in UP 830 TMT MS goes to transport sector and (4597*49%)= 2270.9 TMT. Thus energy from HSD= 2270*106*10000 Kcal Energy from MS= 830*106*11000 **Energy from diesel as % of total energy consumed= 72%** **Energy from petrol as % of total energy consumed= 28%**	In 08-09 Gas required to fuel the vehicle operating on diesel: 72%*0.07 = 0.0504 MMSCMD = 15.6 TMT of HSD Gas required to fuel the vehicle operating on petrol: 28%*0.07 = 0.0196 MMSCMD= 5.5 MT of MS
Step 5: Transfer the gas volume consumption **Industrial/Commercial segment** into respective liquid fuels (i.e. MS, HSD) volume	Industrial and commercial segments are clubbed together. 3% of total diesel consumption goes to the industrial/ commercial units	Uttar Pradesh consumed 4597 TMT of diesel during the year 2008-09. Gas requirement of industrial/Commercial segment of Allahabad is 0.10 MMSCMD = 31TMT of diesel	HSd volume displaceable in Industrial and commercial segment in Allahabad is 31TMT
Step 5: Aggregation of liquid fuel consumption which may get displaced	No infrastructure constrain scenario these volume can get displaced	NA	NA

Steps	Assumption	Sample Calculation	Outputs
Step 6: Correction Factor	The data provided by the company are not exact thus needs correction. The actual consumption of these liquid fuels are already available with us as the year of consideration is 2008-09. The correction factor is nothing but the ratio of the derived data and actual fule consumption data.	NA	All across the segment this ratio is applied to arrive at a more correct displaced fuel volume.

Annexure 22: Calorific values of Different Fuels

Fuels	Unit	Values (Kcal/Kg)	Specific Gravity (tonnes/KL)
Commercial fuels			
LPG	Kcal/Kg	10800	0.82
Diesel	Kcal/Ltr	8263	0.8263
Petrol	Kcal/Ltr	7810	0.71
SKO	Kcal/Ltr	8190	0.78
Natural gas (8000-9480)	Kcal/Kg	8500	0.78

Source: Indian institute of science

Annexure 23: List of Refineries and Fuel used

Sl.	Refineries	Fuel used
1	IOC (Panipat, Mathura, Koyali, Haldia, Barauni, Guwahati, Digboi)	Naphtha/FO/LSHS
2	BPCL, Mumbai refinery	FO/LSHS
3	HPCL, Mumbai Refinery, Visakha	Naphtha/FO/LSHS
4	RIL (Non EOU, SEZ)	Naphtha
5	Essar Oil, Vadinar Refinery	FO/LSHS
6	BRPL, Bongaigaon	FO/LSHS
7	MRPL	FO/LSHS
8	NRL	Naphtha/FO/LPG
9	CPCL (Norimanam)	FO/LSHS
10	KRL, Kochi	Naphtha/FO/LSHS
11	ONGC, Tatipaka	FO/LSHS

Annexure 24: List of Sponge Iron plants

Sl.	Sponge Iron Units	Region	Feedstock
1	Essar Steel, Hazira	Western Region	Gas
2	Vikram Ispat	Western Region	Naphtha
3	Ispat industries	Western Region	Naphtha

Annexure 25: List of Petrochemical units and Feedstock used

Sl.	Units	Feedstock used
1	GAIL, Auraiya, Uttar Pradesh	Gas
2	Haldia Petrochemicals	Naphtha
3	RIL (Baroda)[formerly IPCL]	Naphtha
4	RIL (Gandhar) [formerly IPCL]	Natural gas (Ethane [C2]/Propane[C3])
5	RIL (Nagothane) [formerly IPCL]	Natural gas (Ethane [C2]/Propane[C3])
6	RIL (Hazira)	Naphtha/NGL
7	RIL (Jamnagar)	Naphtha
8	IOC (Panipat)	Naphtha
9	IOC (Mathura)	Naphtha
10	IOC (Koyali)	Naphtha
11	Kochi Refinery	Naphtha
12	HPCL, Vizag	Naphtha
13	HPCL, Mumbai	Naphtha
14	Chennai Petroleum Corp Ltd	Naphtha
15	BPCL, Mumbai	Naphtha
16	NOCIL	Naphtha
17	Andhra Petrochemicals	Naphtha
18	BRPL, Bongaigaon	Naphtha

Annexure 26: Fertilizer units awaiting expansion or revival & their gas requirements (MMSCMD)

Expansion plans	Name of the unit	Gas Requirements (MMSCMD)
1	RCF, Thal	1.80
2	IFFCO, Kalol	1.94
3	IGFL, Jagdishpur	1.91
4	KRIBHCO, Hazira	1.77

5	Tata Chemicals	1.77
6	Chambal Ferilisers	1.77
Revival of closed units		
7	BVFCL, Namrup-II	1.93
8	FACT, Cochin	0.55
9	RCF, Trombay	0.55
10	FCI-Sindri	1.94
11	FCI -Gorakhpur	1.94
12	FCI - Ramagundam	1.94
13	FCI - Talcher* (Coal Gas/NG)	1.94
14	HFCL -Barauni	1.94
15	HFCL - Durgapur	1.94
16	HFCL-Haldia	1.94
Total		27.5

Annexure 27: List of existing and proposed refineries

East	West	South	North
NRL, Numaligarh	HPC-MUMBAI	HPC-VISAKH	IOC-MATHURA
IOC-HALDIA	BPC-Mumbai	KRL, KOCHI	IOC-PANIPAT
IOC-BARAUNI	IOC-KOYALI	CPCL-MANALI	
IOC-GUWAHATI	RIL (non-EOU)	CPCL-CBR	
IOC-DIGBOI	RIL (SEZ)	ONGC-TATIPAKA	
IOC-BRPL	ESSAR	ONGC-MRPL	

Annexure 28: Expected time of comissioning and product slate of proposed refineries (MMT)

Refinery Name		Total Capacity (MMTPA)	Projected Year of Commisssioning	Petrol	HSD	Naphtha	LPG	FO/LSHS
IOCL, Paradip	East	15	2012-13	3.351	5.991	0.162	0.519	0
BPCL , Bina	West	6	2011-12	0.785	2.871	0.272	0.234	0
HPCL , Bhatinda	North	9	2011-12	1	3.7	0.3	0.73	0
Spice, Haldia (Phase I)	East	4.878	2016-17	-	0.973	0.059	0.195	

Nagarjuna, Cuddalore TN	South	6	16-17	-	2.37	0.2	0.556	
Note: Project Status and DOC of Spice and Nagarjuna are not confirmed yet.								

Annexure 29: Projections of availability/production of products from all the existing and proposed refineries : 2009-10 to 2016-17

	South					North				
Yr/Prod	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS
2009-10	1,374.08	2,400.74	3,693.60	14,897.14	5,842.14	808.09	1,215.83	2,061.89	8,516.12	1,287.45
2010-11	1,374.08	2,400.74	3,693.60	14,897.14	5,842.14	808.09	1,215.83	2,061.89	8,516.12	1,287.45
2011-12	1,374.08	2,400.74	3,693.60	14,897.14	5,842.14	1,538.09	1,515.83	3,061.89	12,216.12	1,287.45
2012-13	1,374.08	2,400.74	3,693.60	14,897.14	5,842.14	1,538.09	1,515.83	3,061.89	12,216.12	1,287.45
2013-14	1,374.08	2,400.74	3,693.60	14,897.14	5,842.14	1,538.09	1,515.83	3,061.89	12,216.12	1,287.45
2014-15	1,374.08	2,400.74	3,693.60	14,897.14	5,842.14	1,538.09	1,515.83	3,061.89	12,216.12	1,287.45
2015-16	1,374.08	2,400.74	3,693.60	14,897.14	5,842.14	1,538.09	1,515.83	3,061.89	12,216.12	1,287.45
2016-17	1,930.08	2,600.74	3,693.60	17,267.14	5,842.14	1,538.09	1,515.83	3,061.89	12,216.12	1,287.45
	East					**West**				
Yr/Prod	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS
2009-10	592.07	709.41	1,966.59	8,820.81	1,025.11	5,027.32	11,441.17	13,412.49	35,108.58	9,589.46
2010-11	592.07	709.41	1,966.59	8,820.81	1,025.11	5,027.32	11,441.17	13,412.49	35,108.58	9,589.46
2011-12	592.07	709.41	1,966.59	8,820.81	1,025.11	5,261.32	11,713.17	14,197.49	37,979.58	9,589.46
2012-13	934.07	995.41	4,570.59	13,753.81	1,025.11	5,261.32	11,713.17	14,197.49	37,979.58	9,589.46
2013-14	934.07	995.41	4,570.59	13,753.81	1,025.11	5,261.32	11,713.17	14,197.49	37,979.58	9,589.46
2014-15	934.07	995.41	4,570.59	13,753.81	1,025.11	5,261.32	11,713.17	14,197.49	37,979.58	9,589.46
2015-16	934.07	995.41	4,570.59	13,753.81	1,025.11	5,261.32	11,713.17	14,197.49	37,979.58	9,589.46
2016-17	1,129.07	1,054.41	4,570.59	14,726.81	1,025.11	5,261.32	11,713.17	14,197.49	37,979.58	9,589.46

All the figures are in '000 tonnes

Annexure 30: Year-on-Year regional demand projections of petroleum products for the period 2009-10 to 2016-17 based on IPRs historical growth rate for the year 2007-08 and 2009-10

	South					North				
Yr/Prod	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS
2009-10	3804.4	1436.2	3800.3	16035.1	3275.5	4064.1	720.8	4126.3	19185.6	2736.4
2010-11	4078.1	1435.2	4261.6	17384.6	3373.4	4293.4	592.4	4568.7	20750.3	2766.3
2011-12	4371.5	1434.2	4779.0	18847.8	3474.2	4535.6	486.9	5058.6	22442.6	2796.6
2012-13	4686.1	1433.2	5359.1	20434.0	3578.1	4791.6	400.1	5601.0	24272.8	2827.2
2013-14	5023.2	1432.3	6009.7	22153.8	3685.0	5061.9	328.8	6201.5	26252.4	2858.2
2014-15	5384.7	1431.3	6739.2	24018.3	3795.2	5347.5	270.3	6866.5	28393.4	2889.4
2015-16	5772.1	1430.3	7557.3	26039.7	3908.6	5649.2	222.1	7602.7	30709.0	2921.1
2016-17	6187.4	1429.3	8474.7	28231.3	4025.4	5968.0	182.5	8417.9	33213.5	2953.0

All the figures are in '000 tonnes

	East					West				
Yr/Prod	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS
2009-10	1583.1	316.9	1341.7	8045.7	1068.5	3276.2	6539.8	3549.7	12881.7	4007.7
2010-11	1702.3	252.4	1537.3	9010.6	1142.0	3420.7	6900.8	3916.6	13828.2	3543.1
2011-12	1830.5	201.0	1761.5	10091.3	1220.5	3571.5	7281.7	4321.4	14844.1	3132.4
2012-13	1968.4	160.0	2018.4	11301.5	1304.4	3729.0	7683.7	4768.0	15934.8	2769.3
2013-14	2116.6	127.4	2312.7	12656.9	1394.0	3893.4	8107.8	5260.9	17105.6	2448.3
2014-15	2276.0	101.5	2650.0	14174.9	1489.9	4065.1	8555.4	5804.6	18362.3	2164.5
2015-16	2447.4	80.8	3036.4	15874.9	1592.3	4244.3	9027.7	6404.6	19711.5	1913.5
2016-17	2631.7	64.4	3479.1	17778.8	1701.7	4431.5	9526.0	7066.5	21159.7	1691.7

All the figures are in '000 tonnes

Annexure 31 : Comparison of demand projections of liquid fuels (LPG, Naphtha, Petrol, Diesel, FO/LSHS) based on IPRs historical growth rates for the period 2007-08 to 2009-10 Vs. Proejction in PetroFed publication "Fuelling India's growth 2030" and that of Planning Commission of India for the year 2016-17.

(MMT)

Product	PetroFed publication on fuelling India's Growth vision 2030		Projection by Planning Commission		Projection based on historical growth rate of IPRs 2007-08,2008-09, 2009-10 Base year 2009-10
	BAU	HOG	BCS	UCS	
LPG	24.4	-	18.9	24.4	19.21
Naphtha	-	-	-	-	11.20
MS	17.4	22.4	16.4	21.6	27.43
HSD/LDO	74.9	87.7	85.1	114.2	100.38
FO/LSHS	23.8	28.9	18.0	24	10.37

Annexure 32: Year-over-projections of regional demand-supply balance of petroleum products without considering displacement of liquid fuels with gas

	South					North				
Yr/Prod	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS
2009-10	-2430.32	964.54	-106.70	-1137.96	2566.64	-3256.02	495.03	-2064.41	-10669.48	-1448.95
2010-11	-2704.05	965.53	-568.03	-2487.50	2468.74	-3485.32	623.44	-2506.84	-12234.15	-1478.90
2011-12	-2997.47	966.52	-1085.37	-3950.63	2367.91	-2997.56	1028.97	-1996.71	-10226.43	-1509.17
2012-13	-3312.00	967.50	-1665.50	-5536.90	2264.06	-3253.47	1115.71	-2539.10	-12056.72	-1539.77
2013-14	-3649.16	968.49	-2316.06	-7256.66	2157.12	-3523.83	1186.99	-3139.65	-14036.28	-1570.71
2014-15	-4010.59	969.47	-3045.59	-9121.17	2046.97	-3809.43	1245.57	-3804.59	-16177.29	-1601.99
2015-16	-4398.01	970.46	-3863.69	-11142.60	1933.54	-4111.15	1293.72	-4540.82	-18492.90	-1633.61
2016-17	-4257.31	1171.44	-4781.09	-10964.16	1816.71	-4429.89	1333.29	-5356.00	-20997.35	-1665.57

All the figures are in '000 tonnes. –ve volumes show the deficit of the product.

	East					West				
Yr/Prod	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS
2009-10	-991.03	392.51	624.89	775.11	-43.39	1751.12	4901.37	9862.79	22226.88	5581.76
2010-11	-1110.25	457.05	429.24	-189.82	-116.84	1606.66	4540.37	9495.90	21280.43	6046.34
2011-12	-1238.46	508.45	205.06	-1270.47	-195.34	1689.83	4431.44	9876.09	23135.43	6457.06
2012-13	-1034.31	835.38	2552.19	2452.28	-279.25	1532.34	4029.47	9429.45	22044.80	6820.17
2013-14	-1182.55	867.97	2257.87	1096.88	-368.91	1367.91	3605.32	8936.63	20874.02	7141.20
2014-15	-1341.95	893.93	1920.63	-421.08	-464.75	1196.23	3157.76	8392.88	19617.23	7425.00
2015-16	-1513.36	914.60	1534.21	-2121.08	-567.17	1016.98	2685.49	7792.94	18268.10	7675.91
2016-17	-1502.67	990.05	1091.44	-3051.97	-676.63	829.83	2187.15	7130.98	16819.85	7897.73

All the figures are in '000 tonnes. –ve volumes show the deficit of the product.

Annexure 33 : Year-over-Year projections of regional demand-supply balance of petroleum products after considering displacement of liquid fuels by you

	South					North				
	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS
09-10	-2430.3	1054.54	-96.70	-1007.96	2566.64	-3226.02	915.03	-2044.41	-10549.48	-988.95
10-11	-2694.0	1055.53	-558.03	-2487.50	2518.74	-3445.32	853.44	-2476.84	-12004.15	-1018.90
11-12	-2987.4	1236.52	-1075.37	-3950.63	2737.91	-2947.56	1448.97	-1966.71	-9956.43	-1049.17
12-13	-3282.0	2477.50	-1645.50	-4536.90	3964.06	-3193.47	1635.71	-2509.10	-11456.72	-419.77
13-14	-3609.1	2478.49	-2296.06	-6256.66	3857.12	-3443.83	1706.99	-3099.65	-13386.28	-450.71
14-15	-3960.5	2479.47	-3015.59	-8121.17	3746.97	-3719.43	1765.57	-3764.59	-15467.29	-481.99
15-16	-4338.0	2480.46	-3833.69	-10142.60	3633.54	-4001.15	1813.72	-4500.82	-17782.90	-513.61
16-17	-4177.3	2681.44	-4741.09	-9964.16	3516.71	-4299.89	1853.29	-5306.00	-20227.35	-545.57

	East					West				
	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS	LPG	Naphtha	Petrol	HSD/LDO	FO/LSHS
09-10	-991.03	682.51	624.89	1095.11	276.61	1861.12	5851.37	9902.79	22856.88	7501.76
10-11	-1110.25	1107.05	429.24	130.18	203.16	1726.66	5620.37	9545.90	23130.43	8116.34
11-12	-1238.46	1098.45	205.06	-1270.47	444.66	1839.83	6501.44	9946.09	26165.43	8777.06
12-13	-1024.31	1605.38	2552.19	3552.28	2430.75	1682.34	5279.47	9509.45	26044.80	8680.17
13-14	-1172.55	1637.97	2257.87	2206.88	2341.09	1547.91	4855.32	9016.63	25214.02	9001.20
14-15	-1321.95	1663.93	1930.63	698.92	2245.25	1396.23	4407.76	8472.88	24187.23	9285.00
15-16	-1493.36	1684.60	1544.21	-1001.08	2142.83	1246.98	3935.49	7872.94	22838.10	9535.91
16-17	-1472.67	1760.05	1101.44	-1921.97	2033.37	1069.83	3437.15	7230.98	21619.85	9757.73

All the figures are in '000 tonnes. –ve volumes show the deficit of the product.

Annexure 34 : Region wise and all India supply demand balance of petroleum product by gas for the 2016-17 under constrained gas avaialability scenario (MMT)

Region		2016-17
Eastern	LPG	-1.47
	Naphtha	1.76
	Petrol	-1.10
	HSD/LDO	-1.92
	FO/LSHS	2.03
Western	LPG	1.06
	Naphtha	3.43
	Petrol	7.23
	HSD/LDO	21.61
	FO/LSHS	9.75
Southern	LPG	-4.17
	Naphtha	2.68
	Petrol	-4.74
	HSD/LDO	-9.96
	FO/LSHS	3.51
Northern	LPG	-4.29
	Naphtha	1.85
	Petrol	-5.3
	HSD/LDO	-20.22
	FO/LSHS	-0.54
All India	LPG	-8.88
	Naphtha	9.73
	Petrol	-1.71
	HSD/LDO	-10.4
	FO/LSHS	14.7

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