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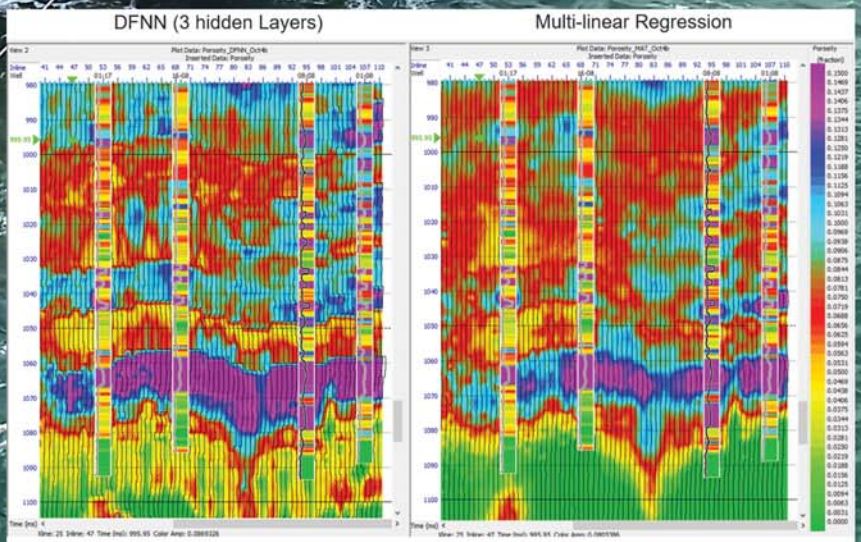
INDIA FOR GAS BASED ECONOMY

Opportunities and Challenges reviewed

A REPORT

MEGA FIELD DEVELOPMENT OFFSHORE MALAYSIA

Derrick Barge 30 pressed in operation



Innovative cloud-ready machine learning capabilities for better understanding of reservoir properties

Amidst challenges, India on path to be a gas based economy

Mr. Ashutosh Bharadwaj

Indo-US experts study current status and future growth opportunities and challenges for the Indian gas industry, a report by DEW Journal

The Indian economy presently is believed to have established itself on a healthy growth path and this would increase going forward the energy consumption in the country. This increase in consumption expected to be supplemented by an alteration in the primary energy mix of India on account of the substitution of oil by natural gas. The share of natural gas in the energy mix of India is expected to increase to 20% in 2025. However, given that all the plans for expansion in natural gas supply in the country with the help of additional RLNG terminals, nation wide transmission pipeline network and transnational pipelines are expected to materialize by 2025, it is envisaged that the share of natural gas in the primary energy mix would reach 20% till 2030 if not more.

Today, the natural gas sector is at the threshold of rapid growth in India supported by ever increasing demand for natural gas in the country, increased exploration efforts, commissioning of the LNG import terminals and the Government's initiatives in the direction of development of a nation wide natural gas pipeline grid.

Indian policymakers have stressed the role and relevance of natural gas in India's overall energy mix in the 21st century. This is, indeed, a welcome development from the point of both cost of energy and betterment of the environment. Natural gas, predominantly methane, is a cheap and environment-friendly fuel and currently the country consumes around 45 million tonnes of oil equivalent (mtoe) of natural gas, which comes to nearly 6.2 per cent of its primary energy consumption.

Eminent experts at the inaugural session of the Workshop

Globally, natural gas constitutes 24 per cent of the primary energy consumption. In India, Gujarat, which has relatively better access to natural gas, is having a share of 25 per cent in its energy basket. The government proposes to increase the share of natural gas in the whole of its energy consumption to 15 per cent by 2022 and upto 20 percent by 2030.

Mr. S.Rath

The economic advantage of gas over other conventional fuels is that it is 40 per cent cheaper than liquefied petroleum gas (LPG). Compressed natural gas (CNG), often a substitute for petrol and diesel, is 60 per cent cheaper than gasoline and 45 per cent cheaper than diesel.

Along with the promotional efforts to shift to a gas-based economy and consequent growing demand, it is necessary ensure ready availability of natural gas and gas market development. As per draft National Energy Policy of NITI Aayog, US $ 150 billion capital investment is needed in energy sector on an annual basis until 2040.

Against this background, Pandit Deendayal Petroleum University (PDPU) and Gas Technology Institute (GTI), US along with DEW Journal organized a one day brainstorming session by experts of the field to discuss current status and future growth opportunities and challenges for the Indian gas industry in the wake of the country's call to be a gas based economy in the coming decade.

The collaboration of PDPU with GTI has been at the behest of the government of India for the development of natural gas sector in India. GTI is an American non-profit research, development and training organisation that addresses global energy and environmental challenges in the natural gas industry and energy markets.

Jointly opening the Meet Mr. S.Rath, Member (I&T), The Petroleum and Natural Gas Regulatory Board (PNGRB) along with Mr. Ashutosh Bharadwaj, Dy.Director General, Directorate General of Hydrocarbons, Government of India laid emphasis on energy access, energy efficiency, energy sustainability, energy security. They provided an overview and current status of Indian gas industry besides the potential of unconventional oil and gas and government's policy initiatives and the unprecedented reforms in the energy sector witnessed during the past few years.

The major policy initiatives taken by the Government during the last about four years to enhance production include, finalization of Hydrocarbon Exploration & Licensing Policy (HELP) and Open Acreage Licensing Policy (OALP), formulation of Discovered Small Field Policy (DSF), survey of un-appraised area of sedimentary basins, setting up of National Data Repository, policy framework for exploration and exploitation of unconventional hydrocarbons, streamlining of production contracts and fiscal incentives, etc.

Speaking on the occasion Mr.Rath presented the vision of PNGRB to create a vibrant energy market with rapid and orderly growth through facilitation of flow of investments into the basic infrastructure for efficient transportation and distribution of petroleum, petroleum products and natural gas.

According to the Vision 2030 of the PNGRB, Mr.Rath said India can be divided into six major regional natural gas markets namely Northern, Western, Central, Southern, Eastern and North-Eastern market, out of which the Western and Northern markets currently have the highest consumption due to better pipeline connectivity. However, with the increasing coverage and reach of natural gas

Dr. Palak Sheth

Prof. Anirbid Sircar

infrastructure in India, this regional imbalance expected to get corrected he pointed out.

In future, the gas demand is all set to grow significantly at a CAGR of 6.8% from 242.6 MMSCMD in 2012-13 to 746 MMSCMD in 2029-30, he said. This demand represents the Realistic Demand for gas in India. Gas based power generation is expected to contribute the highest, in the range of 36% to 47%, to this demand in the projected period (2012-13 to 2029-30). The share of fertilizer sector in the overall gas consumption in the country is expected to go down from 25% in FY 2013 to 15% in FY 2030 owing to higher growth in other sectors. The contribution to the overall demand from the CGD sector is set to increase from 6% to 11% during the projected period. The demand from CGD sector includes demand for combined heating and cooling power plants from Industries he pointed out.

Natural gas availability through non-conventional sources like Shale Gas and Gas Hydrates has not been considered in gas supply projections in the absence of clarity on key variables like data as most of India remains unexplored/under-explored, regulatory policy and lack of domestic infrastructure. The total supply of natural gas is expected to grow at a CAGR of 7.2% from 2012 to 2030 reaching 400 MMSCMD by 2021-22 and 474 MMSCMD by 2029-30 Mr. Rath said.

He also touched upon natural gas demand, the demand-supply gap that is likely to prevail till 2030, India's current network of natural gas transmission pipelines and its future expansion plans, and certain regulatory reforms. He even stressed City Gas Distribution (CGD) sector in India is seeing a rapid growth, which has never been witnessed earlier.

On distribution of Letter of Intents for 50 Geographical Areas (GAs) under the 10th CGD Bidding Round for CGD Mr.Rath apprised the Tenth round covered 50 Geographical Areas (GAs) spread over 14 states and 124 districts (112 full and 12 part), covering 24% of India's population and 18% of its area. This heralds new era w.r.t. the availability of convenient, environment-friendly and cheaper natural gas for more than 70 % of the country's population spread across 27 States and Union Territories, he stressed.

Mr.Rath said it is envisaged that the above initiative would help in creating a robust infrastructure by bringing investment of about Rs. 50,000 Crore, generate employment and play a significant role in achieving the shift towards a gas-based economy, with natural gas as the next generation, cheaper and environment friendly fossil fuel.

Mr. Ashutosh Bharadwaj, Dy.Director General, Directorate General of Hydrocarbons, Government of India in his address touched upon the Hydrocarbon Exploration and Licensing Policy (HELP) and the four main facets of the policy namely (i.) uniform license for exploration and production of all forms of hydrocarbon, (ii.) an open acreage policy, (iii.) easy to administer revenue sharing model and (iv.) marketing and pricing freedom for the crude oil and natural gas produced.

He added HELP has enhanced domestic oil & gas production, bring substantial investment in the sector and generate sizeable employment. The policy is also aimed at enhancing transparency and reducing administrative discretion.

The uniform license will enable the contractor to explore conventional as well as unconventional oil and gas resources including CBM, shale gas/oil, tight gas and gas hydrates under a single license, he added. The concept of Open Acreage Policy will enable E&P companies choose the blocks from the designated area he added.

The major policy initiatives taken by the Government during the last about four years to enhance production include, finalization of Hydrocarbon Exploration & Licensing Policy (HELP) and Open Acreage Licensing Policy (OALP), formulation of Discovered Small Field Policy (DSF), survey of un-appraised area of sedimentary basins, setting up of National Data Repository, policy framework for exploration and exploitation of unconventional hydrocarbons, streamlining of production contracts and fiscal incentives, etc. were also deliberated upon by Mr.Bharadwaj.

Mr.Bharadwaj also touched upon the exploration & development of unconventional hydrocarbon resources like Gas Hydrate, Shale Gas/Oil and Oil Shale that could supplement the natural gas share.

Earlier Dr. Palak Sheth, Director (Planning & Development) in President's Office at Pandit Deendayal Petroleum University (PDPU) briefed the experts and the invited guests about PDPU and the various research areas undertaken by it including study on natural gas in national interest. He apprised PDPU offers multiple courses ranging from engineering, arts and management along with maximum exposure and opportunities to its students through various national and International exchange programs with best Universities worldwide.

On some of the unique features of the university, Dr.Sheth spoke of the university's emphasis on problem solving and practice with sound fundamentals, through active and continued partnership with energy & infrastructure sector companies and National and International Universities, Consultants and Vendors; Top down approach from 'Systems to Components' to better appreciate holistic education; Rural, Industry and Research internships to provide a better understanding and challenges faced in rural and urban Indian landscape, industry culture and career options for students; and emphasis on holistic engineering as key to long-term economic and environmental sustainability of communities.

Prof. Subhash Shah, Director, School of Petroleum Technology, PDPU threw light on the objectives of the Workshop in the present context where India is eyeing to be a gas based economy.

Mr.Shah said, in recent years the demand for natural gas in India has increased significantly due to its higher availability, development of transmission and distribution infrastructure, the savings from the usage of natural gas in place of alternate fuels, the environment friendly characteristics of natural gas as a fuel and the overall favorable economics of supplying gas at reasonable prices to end consumers. Power and Fertilizer sector remain the two biggest contributors to natural gas demand in India and continue to account for more than 55% of gas consumption, he said.

Prof. Subhash Shah

The supply of natural gas he added is likely to increase in future with the help of increase in domestic gas production and imported LNG. However, the expected increase in domestic production at present is significantly lower than earlier projections due to a steady reduction in gas output from the KG D6 field. The capacity of RLNG terminals in India is expected to increase from 17.3 MMTPA in 2012-13 to 83 MMTPA in 2029-30 assuming all the existing and planned terminals in India would materialize.

A report summarizing industry survey conducted by PDPU and GTI that threw light on the key insights and issues was discussed by Prof. Anirbid Sircar, Director General, Gujarat Energy Research & Management Institute (GERMI) in his address. GERMI is a Centre of excellence in the energy sector, promoted by Gujarat State Petroleum Corporation Limited (GSPC), Government of Gujarat Undertaking and has four mandates - Research and Development, Consultancy, Training and Education.

To take up issues like natural gas supply in India; India's gas market development and pathway's forward, the Meet discussed all of these subjects and their intricacies through three dedicated Panel Discussions each participated by eminent panelists - the experts of the industry.

Panel Discussion-I focusing on "Natural Gas Supply in India" moderated by Prof. Anirbid Sircar

The first Panel on "Natural Gas Supply in India" covered topics like India's natural gas resources development, LNG regasification, transmission & storage network, supply options like RNG and natural gas pricing and competition with other fuels. The eminent panelists were Mr. Rod Rinholm, Executive Director, Business Development and Education, Gas Technology Institute; Mr. Anil Joshi, President, GSPC LNG Ltd.; Mr. Mukul Srivastava, Head Exploration-Shale Gas Division, Reliance Industries Limited; Mr. Raghavanachari Suresh, Head O&M Pipeline, Reliance Gas Pipeline Ltd.; Mr. Nirmal Shahni, Country Manager & Executive Director - South Asia, IHS Markit; Ms. Pallavi Adhikari, Communication Chairperson, SPE India Section; Dr. Akhilesh Magal, Head Renewable Advisory, GERMI; Dr. P.H. Rao, Principal Research Scientist, GERMI; and Mr. Vivek Mittal, GM-Marketing, Petronet LNG. Prof.Anirbid Sircar, Director General, Gujarat Energy Research & Management Institute (GERMI) moderated the Panel.

Speaking on the ocassion, Mr. Anil Joshi, President, GSPC LNG Ltd. mentioned GSPC and other entities, has set up the 5 MMTPA LNG receiving, storage and regasification terminal at Mundra, Kutch, Gujarat. The facilities created comprise of two LNG storage tanks of 1,60,000 cubic meters each, regasification facilities having five open rack vaporisers and LNG jetty capable of receiving the LNG vessels of sizes ranging from 75,000 m3 to 260,000 m3. The terminal also has a facility for LNG truck loading.

This state of the art LNG terminal, Mr. Joshi added shall help realise the vision of a gas based economy for the country and also help towards meeting the nation's climate change commitments made at various international forums. The gas market is poised to grow in the country driven by the vision of Government of India to increase the consumption of Natural Gas in the overall energy basket from existing 6.5% to 15% in next few years.

The R-LNG from the terminal shall be evacuated by the 67 Km Mundra-Anjar Natural Gas transmission pipeline being developed by Gujarat State Petronet Limited (GSPL). The Mundra-Anjar pipeline further connects to the existing Gujarat State Petronet Limited

A view of the distinguished audience at the Workshop

Panel Discussion-II focusing on "India's Natural Gas market development" moderated by Mr.Arun Kr.Singhal

(GSPL) Gas Grid, he said.

Reliance Gas Pipelines Limited, Mr. Mukul Srivastava, Head Exploration-Shale Gas Division said his company is engaged in laying, building and operating pipelines and offers transportation service through its pipelines to customers desirous of availing the service.

Reliance, he said has been awarded by the Government of India the CBM blocks, located in the districts of Shahdol and Annupur in the state of Madhya Pradesh. The plateau production of CBM from these blocks is expected to be about 3.5 mmscmd.

To evacuate and transport gas from these blocks to the potential customers it is planned to build and operate a natural gas pipeline from Shahdol in Madhya Pradesh to Phulpur in Uttar Pradesh where it hooks up with GAIL's existing Hazira -Vijaipur- Jagdishpur (HVJ) Pipeline Network, Mr. Srivastava said.

The other panelists also shed light on the theme of the discussion and how their companies are contributing towards the country's goal to be a gas based economy in the coming years.

The second Panel Discussion on "India's Natural Gas market development" flagged issues related to City Gas Distribution, Market drivers and opportunities besides focus on new technologies and applications in furthering the gas market development. Chaired and moderated by Mr.Arun Kr.Singhal, Chief Editor, DEW Journal, the panel was participated by Mr. Ashish Kumar, COO, Essar Oil and Gas Exploration & Production Limited; Mr. E.S. Ranganathan, MD, Indraprastha Gas Limited (IGL); Mr. Omkarnath Gyani, Head Institute of Reservoir Studies, ONGC; Mr. Vinod Tahiliani, CEO, India Gas Solution (A JV of Reliance Industries Limited & BP); Mr. Pankaj Pal, Vice President, CGD Business, Torrent Gas; Ms. Shivani Chugh, Principal Associate, J. Sagar Associates; Dr. Sunil Kumar Khare, HoD Petroleum Engineering & Earth Sciences, UPES; Dr. Suresh Chandra, former OSD, Planning Commission, Government of India; Dr. Sayed Zaheer Hasan, Principal Research Scientist, GERMI; and Mr. Manish Seth, CEO, Enertech Fuel Solutions.

To set the tone of the panel Mr.Singhal pointed out that Government has put thrust to promote the

A view of the distinguished audience at the Workshop

usage of environment friendly clean fuel i.e. natural gas as a fuel/feedstock across the country to move towards a gas based economy. Accordingly, development of CGD networks has been focused to increase the availability of cleaner cooking fuel (i.e. PNG) and transportation fuel (i.e. CNG) to the citizens of the country. The expansion of CGD network will also benefit to industrial and commercial units by ensuring the uninterrupted supply of natural gas.

He emphasized presently the share of gas in the country's energy mix is just over 6% and the aim is to reach the 15% figure. He said that efforts are not only being made to increase the use and supply of Gas, but also to produce gas through agro-wastes and other products and including the same into the CGD network.

On why India is going for natural gas , Mr.Singhal said it is a superior fuel as compared with coal and other liquid fuels being an environment friendly, safer and cheaper fuel. Natural Gas is supplied through pipelines just like water from the tap. Natural Gas (as CNG) he added is cheaper by 60% as compared with petrol and 45 % w.r.t. Diesel. Similarly, Natural Gas (as PNG) is cheaper by 40 % as compared with market price LPG and price of PNG almost matches with that of subsidized LPG (based on prices in Delhi).

India made a commitment in COP21 Paris Convention in December 2015 that by 2030; it would reduce carbon emission by 33% of 2005 levels. Natural gas, as domestic kitchen fuel,


Mr. Vinod Tahiliani

Sharing his views Mr. Vinod Tahiliani, CEO, India Gas Solution stressed the sectors that need to be prioritised to drive demand growth are sectors where gas is competitive (industry, mobility and CGD) and can easily replace liquid fuels.

Industry: Actions needed to stimulate this demand are:

- Influence the mindset of customers by highlighting the benefits of using gas (cheaper than liquid fuels, cleaner, efficient, convenient);
- Ensure gas availability though expansion of pipeline network with non-discriminatory third-party access to ensure competitive supply; and
- Mandated use of gas (for urban areas) and strict compliance with pollution norms through electronic online monitoring

Mobility: A significant opportunity exists to have two to three-fold increase in gas demand for mobility by encouraging adoption of gas/LNG as transportation fuel. With 10% conversion to natural gas vehicles (NGVs), the Indian gas vehicles fleet could be the biggest in the world (25 million vehicles by 2040). For this, we need to develop the entire eco-system consisting of:

- automobile OEMs designing and offering gas fueled vehicle models;
- conversions through recognized vendors with good quality standards
- spurring growth in fueling infrastructure
- similar customer experience as for liquid fuels through adequate number of retail outlets, reduced waiting times and service network.

An enabling policy framework could facilitate development of this eco-system with:

- mandated conversion in urban areas to help with air quality;
- lower taxes on NGVs; and
- higher authorized life of NGVs vs. liquid fuels

CGD: Driven by Government push, CGD gas demand is expected to double by 2025. This will be achieved through:

- Ensuring licensed entities meet their infrastructure buildout targets
- Planning regulations to require gas infrastructure for new buildings
- Non-discriminatory third-party access to CGD infrastructure post exclusivity period to increase supply competition.

Reforming gas markets will be key to unlocking gas demand - key enablers are:

- Remove tax and pricing distortions and anomalies
- Reform the gas market and ensure non-discriminatory access to all participants to gas infrastructure
- Develop the gas infrastructure to increase market connectivity

as fuel for transport sector as well as a fuel for industries and commercial units, can play a significant role in reducing carbon emission.

In achieving the above, a massive infrastructure development has to be undertaken for India to have a natural gas based economy, he added.

India he said accords high priority to promoting a gas based and clean economy. Currently natural gas forms a relatively small share of our energy mix. Gas infrastructure projects of over 8 billion US dollars are under implementation across the country. We aim to increase share of natural gas in energy mix from current 6.5% to 15% by 2022. Going forward, we intend to create a robust natural gas trading hub. The process to formalize the concept has already been initiated by our Government.


Dr. Sayed Zaheer Hasan


Mr. Omkarnath Gyani


Mr. Manish Seth


Mr. Pankaj Pal


Ms. Shivani Chugh


Dr. Sunil Kumar Khare


Mr. ES Ranganatha

As a panelist of the second panel discussion Mr. ES Ranganatha, Managing Director, Indrapastha Gas Limited disclosed his company will add over 2 lakh new piped natural gas (PNG) connections this fiscal. This will be the highest number of piped gas connections disbursed by the gas retailer in a year. We will be closing the current financial year with the highest ever number of new connections added in a year. Till now nearly 1.78 lakh new connections have been disbursed and we are adding 900-1,000 connections every day he stated.

Mr. Ranganatha pointed out as of December 2018, IGL had 10.29 lakh residential consumers and 4,095 industrial or commercial customers, and the company reported a consumption of 403 mmscm of natural gas by its PNG consumers.

Under IGL's current sales volume mix, CNG (for vehicles) accounts for 75% of the total while commercial and industrial units command 11 per cent. Sales to other CGD companies account for 8% and residential consumers, just 6%, he said

IGL has also formed a long-term contract for regasified LNG to meet the piped natural gas (industrial and commercial) demand. It is also buying short-term gas from the open market. Mr. Ranganathan informed.

Speaking on the occasion Mr.Manish Seth, Chief Executive Officer, Enertech Fuel Solutions said the unfolding city gas distribution (CGD) bidding and implementation would help develop an entire ecosystem of opportunities, which would open up many avenues for entrepreneurs.

There would be need of experienced and trained

Mr. Ashish Kumar

The key points highlighted by Mr. Ashish Kumar, COO, Essar Oil and Gas Exploration & Production Limited during the panel discussion were:

1. Policy Initiatives taken by Govt has given a major boost to gas exploration and production, especially in the area of unconventional oil and gas. Positive enablers like policy on
   a. Early monetization of CBM
   b. Market linked price for CBM gas.
   c. Simultaneous exploration policy for unconventional in existing acreages.
   d. Recent changes in incentives for category II and III basins.
   e. EOR/ EGR
2. Vision of Hydrocarbon Import Dependency reduction by 10% by the year 2022 and increase share of gas in primary energy mix to 15%, looks ambitious but doable.
3. City Gas Distribution will provide a major boost to gas based economy
   a. Till round 9 -> 136 Districts 92 GA covering 19.8% population. 9th round -> 174 Districts 86 GA covering 26.4 % population. 10th round -> 124 Districts 50 GA covering 24.2% population. Total 402 Districts 228 GA covering 70% of the population
   b. City Gas Distribution changed to Village Gas Distribution as allocation is done on Geographical area. Leads/Ensures to gasification of rural India
4. Financial Impact of Gasification
   a. India imports close to 5 million Barrels per day
      i. 1$ increase in crude oil price impacts import bill by 13000 Crore annually
      ii. 1 barrel is equivalent to 170 SCM
   b. 1% of 5 million is 50k barrels or 8.5 million SCMD { $65 per barrel/ INR 70 per dollar}
      i. Substitution saves $ 250 million annually (based on domestic price)
5. Environmental Impact of Gasification
   a. Use of natural gas is clean
   b. Natural gas is 30% less polluting than coal and 50 % less polluting than Oil
6. Bio gas
   - Biogas composition is Methane (60-70%), CO2 (25-50)% and N2(0-10)%
   - Mandate by GOI – 10% into CGD gas basket
   - India's Petroleum & Natural Gas Minister has said as many as 5,000 plants for extracting biogas from agricultural residue, cattle dung and municipal solid waste are envisaged to be set up in the country in next five years at a massive Rs 1.75 lakh crore investment.
   - State-owned fuel marketing companies to purchase all the bio-gas from these plants at Rs 46 per kg.
   - The price of Rs 46 per kg that is attractive being offered at more than the domestic natural gas price.
   - Rs 46/kg converts to Rs 30/m3 ($13.5/MMBTU)

Benefits of BGO

- Reclamation of land
- Reduction of escape gas into the environment

manpower, contractors, Project Equipment, O&M of CGD infrastructure, Cascades, metering etc.

There are some as ambiguities, which need to be removed to encourage more investment in the sector, he added.

Establishment of Gas Exchange Mr.Seth said requires multiple players be encouraged to participate including consumers, sellers, traders and investors.

Today consumers in the catchment area cannot access gas from a source more competitive than the authorized entity, even if they want to do so using alternate means like Cascades and without using CGG entity infrastructure, he pointed out.

He stressed, regional grids have not been given the attention they deserve. It is the development of Regional grid that has made Gujarat market a shining light for the Gas Sector.

Hurried CGD bidding raises questions over the unrealistic bidding done by several players. Many of the CGD networks require large investment in Sub-Transmission lines, which could have been avoided if regional Grids were there according to Mr.Seth.

He added, unbundling of marketing and transportation needs to be implemented in letter and spirit. Multiple price levels distort the market and need to be done away with. Gas needs to be brought under GST Mr.Seth said.

The two key note presentations were also delivered by Dr.Ranjit Banerjee, Advisor-HELP, Directorate General of Hydrocarbons (DGH), Ministry of Petroleum & Natural Gas, Government of India and Mr.David Carroll, President & CEO, GTI, US and Immediate past President,

Special Report dewjournal.com

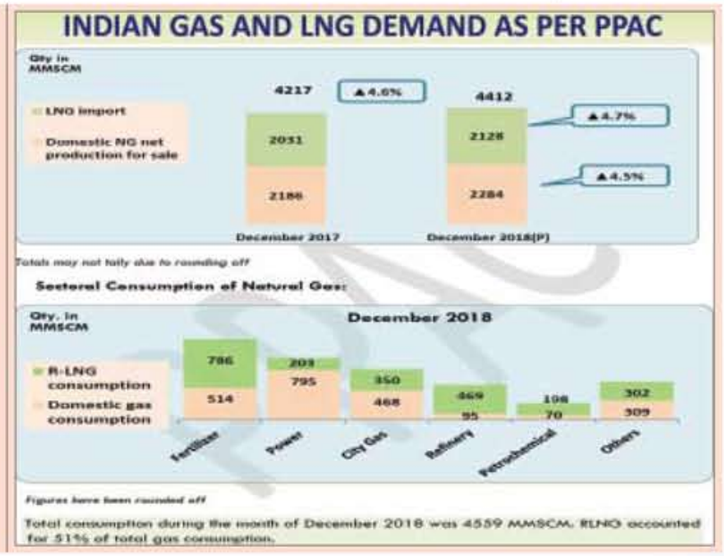
Mr.David Carroll


Dr.Ranjit Banerjee

WHY GAS MARKETS IN INDIA REMAIN TO BE IN EVOLVING STAGE FOR LAST 2 DECADES?

- During last 11 years (2006-2017) oil demand has grown by 5.2%; while natural gas demand growth has been about 3.7%.
- Indian LNG demand relatively slower in low price supply regime.
- IOCL gets commissioning LNG.
- New FSRUs & LNG terminals.
- Soft LNG prices under low to moderate oil prices
- But big question?????.
- Why Indian Gas markets not rapidly expanding.
- We implemented NPS-3 for fertiliser sector in 2014 permitting LNG price pass through for urea production.
- However, power sector with additional demand of 50-70 MMSCD remains static.
- Will CGD replace at-least 25% of liquid fuel demand for transport, LPG (Cooking) and industrial sector.


Dr. Suresh Chandra, former OSD, Planning Commission, Government of India talked about the opportunities and challenges in the Indian gas market with special emphasis on why gas markets in India remain to be in evolving stage for last 2 decades?



Panel Discussion-I focusing on "Pathway's forward in the field of Natural Gas" moderated by Prof. Subhash Shah

International Gas Union.

Dr.Banerjee talked about natural gas appraisal in India, while Mr.Carroll threw light on the global perspectives on natural gas development.

The third Panel on "Pathway's forward in the field of Natural Gas" was participated by experts from India and the US, who shed light on the subject in relation to Indian context and international best practices. The panel moderated and chaired by Prof. Subhash Shah, Director, School of Petroleum Technology, PDPU & Shell-Total Chair Professor, PDPU. The Panelists were Mr.David Carroll, President & CEO, GTI, US and Immediate past President, International Gas Union; Mr. Rod Rinholm, Executive Director, Business Development and Education, Gas Technology Institute; and Prof.Anirbid Sircar, Director General, Gujarat Energy Research & Management Institute (GERMI). The panel opined India is committed a gas based economy to enhance quality of life and its environment commitments

The other major issues discussed during the Meet and the various Panel Discussions related to:

Demand and Supply of Natural Gas: The supply of natural gas in the country along with the quantum of LNG imported during the last three years and the current year is shown in the Table-1.

Domestic gas is being allocated to all sectors as per Gas Utilization Policy of the Government. The domestic gas is first allocated to the priority sector such CGD sector for PNG (Domestic) and CNG (Transport), Fertilizer, Power, LPG etc.

Any demand over and above domestic gas (including for SME Sector) may be met through imported R-LNG, which is imported under open general license on mutually agreed terms. The details of domestic gas production in the country, average production of KG-D-6 and Domestic Gas supply to Power sector and Fertilizers sector are shown in the Table-2.

Table-1.

Natural Gas	2015-16	2016-17	2017-18	2018-19 (P) (April-Oct 2018)
Net availability of domestic gas	31129	30848	31731	18586
LNG import	21388	24686	26328	16468
Total consumption	52517	55534	58059	35054

(in MMSCM)

Table-2.

	2013-14	2014-15	2015-16	2016-17	2017-18
Domestic gas production	97.00	90.99	88.12	87.39	89.45
Average gas 13.54 production of KG-D6	11.91	10.33	7.45	5.5	
Domestic gas supply to Power Sector	27.26	25.33	22.87	25.00	25.71
Domestic gas supply to Fertilizers Sector	30.30	26.70	26.51	21.52	18.83
Domestic gas supply to industries including SME	15.21	12.74	9.63	10.90	13.84

(in MMSCM)

Table-3.

	Natural Gas Production (in BCM)	Natural gas Import (in BCM)	Natural gas Consumption (in BCM)
2015-16	32.25	21.38	52.51
2016-17	31.90	24.68	55.53
2017-18	32.65	26.32	58.06

**BCM- Billion Cubic Metre*

Natural gas production and import: The details of natural gas production, consumption and import in the country for the last three years are as shown in the Table-3.

Expansion of Gas Pipeline Network across the country: Government has envisaged to develop the National Gas Grid and City Gas Distribution (CGD) networks in the country to enhance the availability and accessibility of natural gas to public at large. At present about 16,788 km natural gas pipeline is operational and about 14,239 km gas pipelines are being developed. These pipelines have been authorized by Petroleum and Natural Gas Regulatory Board (PNGRB) and are at various stages of planning/execution/Pre-project activities etc. With the completion of 9th CGD Bidding Round, CGD would be accessible in 178 Geographical Areas (GAs) covering approximately 280 districts spread over 26 States and UTs.

PNGRB has reported that as per commitment given by various entities in the GAs approved for issuance of Letter of Intent (LoI) in 9th CGD bidding round, approximately 98,000 km of pipeline will be built. Completion of 9th round and 10th rounds of CGD network will involve more than Rupees one lakh crore of investment in the CGD sector.

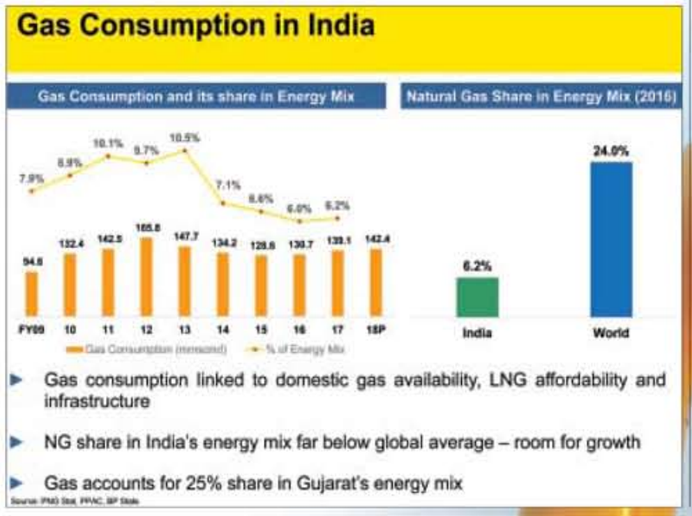
Expansion of PNG and CNG coverage in the country: Petroleum and Natural Gas Regulatory Board (PNGRB) is the authority to grant authorization to the entities for the development of City Gas Distribution (CGD) network in Geographical Areas (GAs) as per PNGRB Act, 2006. PNGRB identifies GAs for authorizing the development of CGD network in synchronization with the development of natural gas pipeline connectivity/ natural gas availability. The authorized CGD entities develop the Piped Natural Gas (PNG)/ Compressed Natural Gas (CNG) network to supply natural gas to households, industrial and commercial units in their respective GAs.

Upto the 8th CGD bidding round, there are 96 GAs in 23 States/ Union Territories (UTs) where CGD network is accessible. PNGRB has granted authorization for additional 84 GAs in 9th CGD Bidding Round. With the completion of 9th CGD Bidding Round, CGD would be accessible in 178 GAs covering approximately 280 districts spread over 26 States and UTs. PNGRB has also launched 10th CGD Bidding Round covering 50 GAs spread over 14 States and 124 districts (112 full and 12 part). As per PNGRB, after successful completion of 10th CGD Bidding Round, 70% of the country's population would have access to CGD network.

Mr. Rod Rinholm

Presently, Oil and Gas Public Sector Undertakings have total 59 overseas assets in 28 countries of which 23 are producing, 7 are developmental blocks, 25 are exploratory and 4 are pipeline projects. There are total 15 MoUs that India has signed with various countries for cooperation in the oil and gas sector.

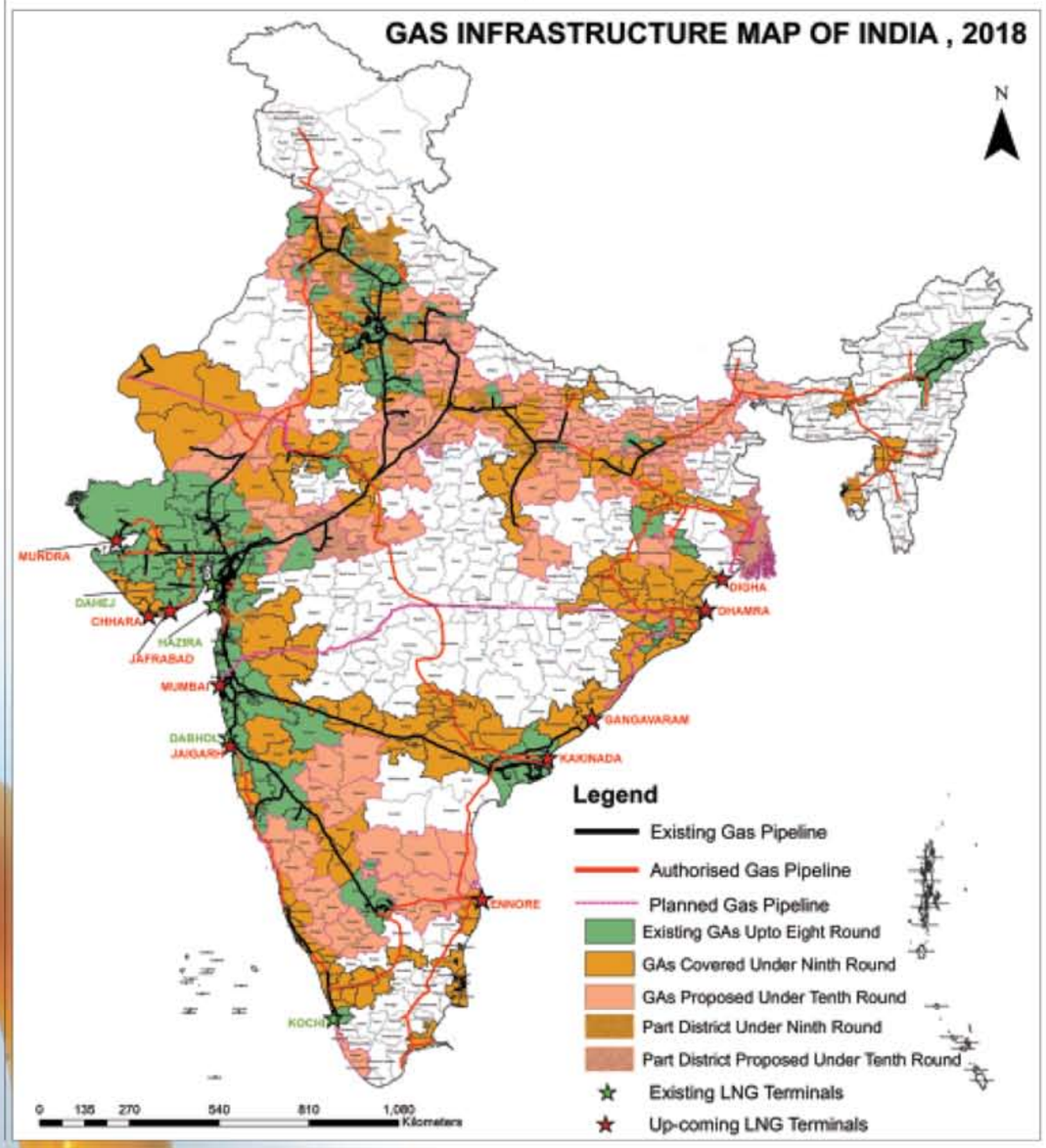
With respect to Paradip-Haldia-Barauni oil pipeline (PHBPL), the executing agency has taken up pre-project activities, such as statutory clearances and



acquisition of Right of Use under P&MP Act.

PNGRB has authorized Indradhanush Gas Grid Limited (IGGL) for the development of North East Gas Grid to connect eight states of North Eastern India. The executing agency has taken up Pre-project activities such as statutory clearances and acquisition of Right of Use under P&MP Act. The executing agency has taken up the pipeline execution work of Jagadishpur –Haldia –Bokaro Dhamra Pipeline (JHBDPL).

Status of National Gas Grid: The Government has envisaged developing the National Gas Grid. At present about 16,788 Km natural gas pipeline is operational and about 14,239 Km gas pipelines are being developed to increase the availability of natural gas across the country. These pipelines have been authorized by Petroleum and Natural Gas Regulatory Board (PNGRB) and are at various stages of execution viz. Pre-Project activities/laying/testing/commissioning etc.



In order to develop the national gas grid, Government has taken a decision to provide a capital grant of Rs.5176 crore (i.e. 40% of the estimated capital cost of Rs.12,940 Crore) to GAIL for development of a 2655 Km long Jagdishpur-Haldia/Bokaro-Dhamra Gas Pipeline (JHBDPL) project. This pipeline will transport Natural Gas to the industrial, commercial, domestic and transport sectors in the States of Bihar, Jharkhand, Odisha, West Bengal and Uttar Pradesh.

PNGRB has authorized GAIL to develop North East gas pipeline to develop approximately 750 km long Barauni - Guwahati pipeline as an integral part of Jagadishpur –Haldia –Bokaro Dhamra Pipeline (JHBDPL) project, which will connect North East region with the National Gas Grid. Further, PNGRB has also authorized Indradhanush Gas Grid Limited (IGGL), a joint venture company of five Central Public Sector Enterprises (CPSEs) i.e. IOCL, ONGC, GAIL, OIL and NRL for the development of North East Gas Grid to connect eight states of North Eastern India.

Oil and Gas Reserves in KG Basin: Crude oil and natural gas recoverable reserve established by the Oil and Natural Gas Corporation (ONGC) and private / joint venture Companies in the Krishna Godavari (KG) Basin is about 698 Million Metric Tonne of oil and oil equivalent

PNGRB has authorized GAIL to develop North East gas pipeline to develop approximately 750 km long Barauni - Guwahati pipeline as an integral part of Jagadishpur-Haldia-Bokaro Dhamra Pipeline project, which will connect North East region with the National Gas Grid. Further, PNGRB has also authorized Indradhanush Gas Grid Limited, a joint venture company of five Central Public Sector Enterprises i.e. IndianOil, ONGC, GAIL, Oil India and Numaligarh Refinery for the development of North East Gas Grid to connect eight states of North Eastern India

of gas. Crude oil production in the KG Basin is about 19,190 barrels per day and Natural gas production is 9.8 Million Metric Standard Cubic Metre per day (MMSCMD).

The production cost of companies vary from field to field depending upon size of the reservoir, location, availability of surface facilities, stage of production, etc. As per available information, the production cost of crude oil in KG basin varies from USD 12 to USD 42 per barrel whereas in other basins it varies from USD 15 to USD 62 per barrel. Similarly, the cost of natural gas production in KG basin varies from USD 4 to USD 8 per Million British Thermal Unit (MMBTU) whereas it varies from USD 2 to USD 8 per MMBTU in other basins.

The sale price of crude oil production in KG basin is based on international benchmark of crude oil price. The natural gas price is computed as per the formula prescribed under the New Domestic Natural Gas Pricing Guidelines 2014. However, in case of natural gas produced from Deepwater, Ultra Deep Water and High Pressure-High Temperature marketing including pricing freedom is allowed subject to ceiling under the extant Policy Guidelines dated 21st March, 2016. On account of this, sale price of natural gas during 2017-18 in KG Basin varies from USD 2.7 to USD 7.7 per MMBTU depending upon production from onland / shallow water blocks or Deepwater blocks.

Establishing Gas Trading Hub/Exchange in the country: With the coming up of the gas trading hub(s)/ exchange(s) in the country, natural gas can be freely traded and supplied through a market mechanism. In view of the administrative, legal, operational issues involved, a precise time frame for operationalizing the gas trading exchange/ hub cannot be indicated at this stage.

Promoting use of Compressed Bio Gas as alternative Green Transport Fuel: Government is promoting the use of Compressed Bio Gas (CBG) as an alternative green transport fuel, which is purified and compressed biogas, produced through a process of anaerobic decomposition from various waste/ biomass sources including Municipal solid waste. In this direction, Oil PSUs have launched 'Sustainable Alternative Towards Affordable Transportation' i.e. 'SATAT' initiative. Under this initiative, Public Sector Oil Marketing Companies (OMCs) and GAIL have invited Expression of interest (EOI) to procure CBG from potential entrepreneurs for establishment of 5000 CBG plants across the country with an estimated production of 15 MMT CBG per annum by 2023. OMCs and GAIL have offered Rs 46/- per kg delivered price for procurement of CBG.

The potential for Compressed Bio-Gas (CBG) production from various sources in India is estimated at about 62 mtpa. CBG produced will be transported through cascades of cylinders to the fuel station as a green transport fuel alternative. The 1,500-strong CNG stations network in the country currently serves about 32 lakh gas-based vehicles. The National Policy on Biofuels 2018 emphasises active promotion of advanced bio-fuels, including CBG

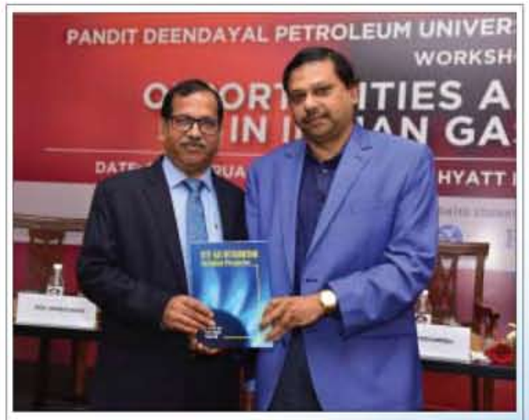
To increase indigenous production of ethanol, the Government has taken many steps. The production of ethanol/ alcohol in the country is approximately 310 Cr. Liters per annum. This also varies depending on sugarcane production. Ethanol/Alcohol is mainly used in chemical, potable liquor, pharma sectors and for EBP programme.

Compressed Bio-Gas as an alternative, green transport fuel: Bio-gas is produced naturally through a process of anaerobic decomposition from waste / bio-mass sources like agriculture residue, cattle dung, sugarcane press mud, municipal solid waste, sewage treatment plant waste, etc. After purification, it is compressed and called CBG, which has pure methane content of over 95%. Compressed Bio-Gas is exactly similar to the commercially available natural gas in its composition and energy potential. With calorific value (~52,000 KJ/kg) and other properties similar to CNG, Compressed Bio-Gas can be used as an alternative, renewable automotive fuel. Given the abundance of biomass in the country, Compressed Bio-Gas has the potential to replace CNG in automotive, industrial and commercial uses in the coming years.

There are multiple benefits from converting agricultural residue, cattle dung and municipal solid waste into CBG on a commercial scale:

- Responsible waste management, reduction in carbon emissions and pollution
- Additional revenue source for farmers
- Boost to entrepreneurship, rural economy and employment
- Support to national commitments in achieving climate change goals
- Reduction in import of natural gas and crude oil
- Buffer against crude oil/gas price fluctuations

The potential for Compressed Bio-Gas production from various sources in India is estimated at about 62



Book Presentation: Prof.Anirbid Sircar, Director General, Gujarat Energy Research & Management Institute (GERMI) presented a copy of his book "City Gas Distribution: An Indian Perspective" to Mr. S.Rath, Member (I&T), The Petroleum and Natural Gas Regulatory Board (PNGRB) during the Workshop.

This book is a first of its kind collation of various aspects of CGD sector. This book highlights various gametes of CGD business such as – Natural gas scenario in India and abroad; Regulatory framework of CGD industry, role of PNGRB in the sector, CGD bidding criteria, authorization, and registration of entities; Gas distribution value chain along with equipments and techniques used in the sector; Challenges and issues faced by the stakeholders in CGD sector; and CGD financing. Innovations in the sector are also brought out in this book to attract the researchers for taking CGD as a subject for research. The last chapter covers the safe practices, environmental standards and emergency response planning for HSE issues in CGD industry. The book covers in detail, the technical and financial aspects of the CGD business in a lucid way which will help the students, researchers and professionals involved in the subject.

million tonnes per annum.

Compressed Bio-Gas plants are proposed to be set up mainly through independent entrepreneurs. CBG produced at these plants will be transported through cascades of cylinders to the fuel station networks of OMCs for marketing as a green transport fuel alternative. The 1,500-strong CNG stations network in the country currently serves about 32 lakh gas-based vehicles. The Working Group on Biofuels, set up under the National Policy on Biofuels 2018, is in the process of finalising a pan-India pricing model for Compressed Bio-Gas. The National Policy on Biofuels 2018 emphasises active promotion of advanced bio-fuels, including CBG.

Compressed Bio-Gas can be produced from various bio-mass/waste sources, including agricultural residue, municipal solid waste, sugarcane press mud, distillery spent wash, cattle dung and sewage treatment plant waste. The other waste streams, i.e, rotten potatoes from cold storages, rotten vegetables, dairy plants, chicken/poultry litter, food waste, horticulture waste, forestry residues and treated organic waste from industrial effluent treatment plants (ETPs) can be used to generate biogas.

Going forward, Compressed Bio-Gas networks can be integrated with city gas distribution (CGD) networks to boost supplies to domestic and retail users in existing and upcoming markets. Besides retailing from OMC fuel stations, Compressed Bio-Gas can at a later date be injected into CGD pipelines too for efficient distribution and optimised access of a cleaner and more affordable fuel.

The Meet underlined that reforms in Natural Gas sector in India are important and PNGRB is performing an important role in refining the gas usage model. A Mini Gas Grid in North East connecting all state capitals being developed by a JV of 5 companies will cover 1,500 kms is also being developed. It was opined that greater partnership with State Governments is needed and they should co-operate and support the CGD entities in making states pollution free.

The experts through various presentation emphasized that the current LNG Infrastructure is a bottleneck and needs to be stepped up from 26 MMTPA now to about 50 MMTPA by 2022.

It was also focused during the Meet that globally, biofuels have caught the attention in last decade and it is imperative to keep up with the pace of developments in the field of biofuels. Biofuels in India are of strategic importance as it augers well with the ongoing initiatives of the Government such as Make in India, Swachh Bharat Abhiyan, Skill Development and offers great opportunity to integrate with the ambitious targets of doubling of Farmers Income, Import Reduction, Employment Generation, Waste to Wealth Creation.

While a general consensus of the experts during the meet supported the governments thrust to promote the usage of environment friendly clean fuel i.e. natural gas as a fuel/feedstock across the country to move towards a gas based economy, it reminded of the numerous issues and challenges that need to be addressed on a war footing to make sure India's commitment during COP21 Paris Convention in December 2015 of reducing carbon emissions by 33 percent of 2005 levels by 2030 is achieved. dewjournal.com