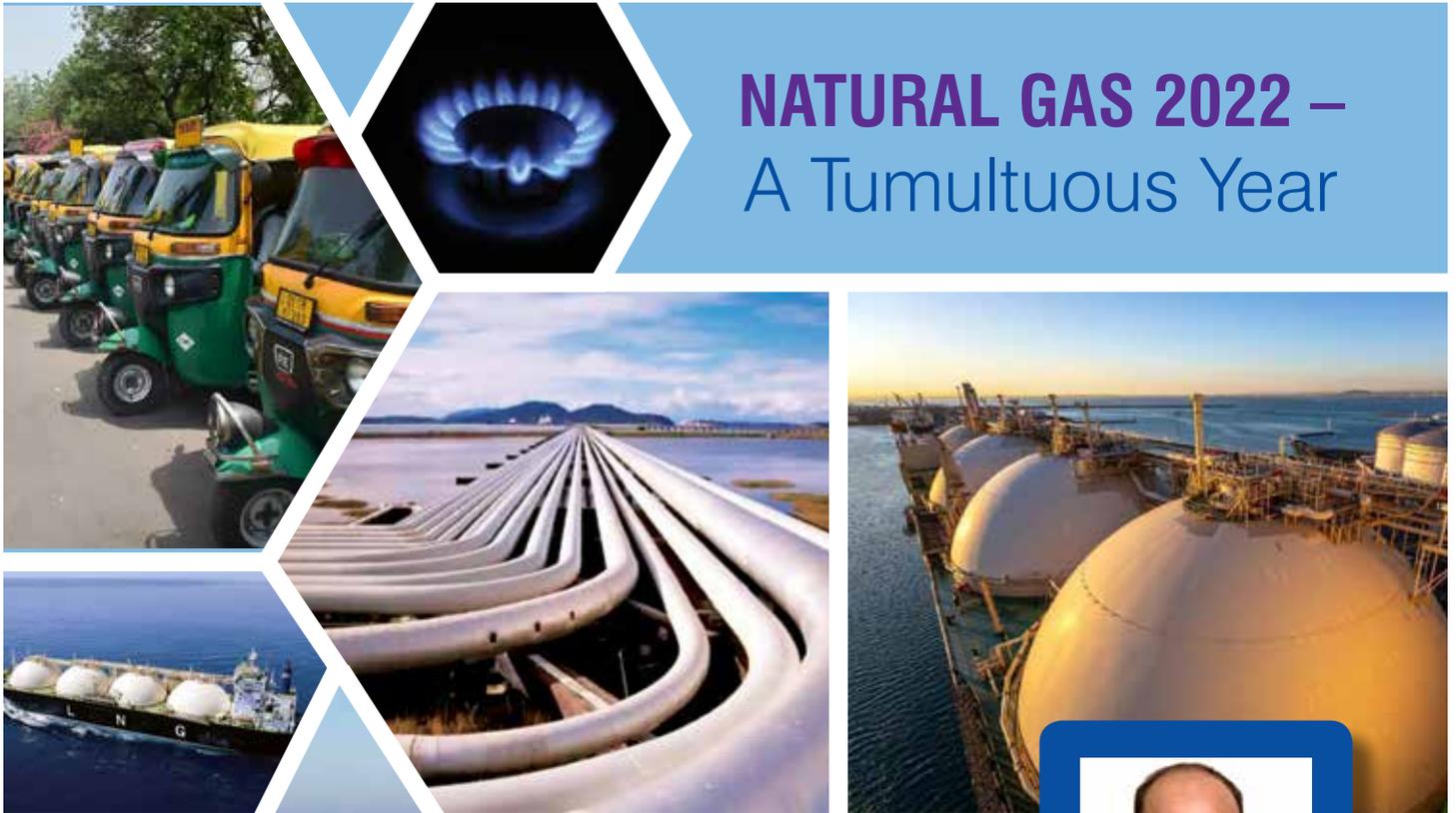
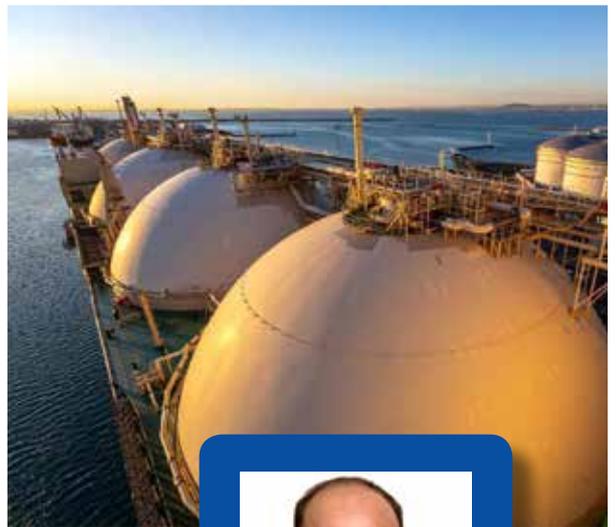




Gas Statistics



NATURAL GAS 2022 – A Tumultuous Year



Ashu Shinghal
Managing Director,
Mahanagar Gas Limited

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NGS: A Roundup of the Year 2022



The year 2022 has been a year like no other. Economic, environmental and geopolitical turmoil have defined the past 12 months. The Omicron variants were a highlight in the year 2022, as the virus continues to mutate. The world witnessed Russia's invasion of Ukraine in February leading to global crises for both food and energy as well as displacing millions of people. Inflation was unusually high in countries around the world in 2022. Climate change led to many record-breaking temperatures around the world - from runways melting to devastating wildfires. During the summer of 2022, Europe witnessed the worst drought in 500 years. Flooding in India's neighbouring country from June to August killed more than 1,391 people and caused huge financial losses emerging out of damage to houses, crops and key infrastructure. In China, factories were forced to shut down in August due to decreased water levels around the Yangtze River Basin which curbed electricity generation at hydropower plants. The world population exceeded 8 billion on 15 November 2022.

The year gone by was full of uncertainty for the global natural gas sector. Indian gas sector was also no exception. However, despite the crisis, the Indian gas sector was more or less successfully able to tide over 2022. **The feature story of this issue of GSR** presents an overview of the turns and twists in the Indian gas sector which showed resistance to all the hindering factors impacting the economy and continued on the growth path.

During the year 2022, we, at Natural Gas Society continued the efforts towards achieving our objectives with the guidance, support and cooperation from our constituent members. While the periodicals like Quarterly GSR, Fortnightly Snapshots and the Daily News Update were regularly published on our website, several other initiatives were taken by organising technical events, industry meets, knowledge partnerships in technical events organised by others, participation in various important events, establishing

industry-academia interface, membership drive, etc.

With the objective of bringing the technical fraternity together to deliberate and address the issues and challenges in the Operations & Maintenance activities, NGS organised **O&M Conference** on February 23 & 24, 2022 in virtual mode.

It provided a platform for the exchange of new ideas and the best practices in



the domain of O&M. While the keynote address was delivered by Shri S P Manglani, CEO, Adani Total gas Ltd. (ATGL), the conference was inaugurated by Shri Manoj Jain, CMD, GAIL (India) Ltd. We received a very encouraging response from the industry members and had speakers & delegates from M/s ATGL, PIL, IGL, MGL, Think Gas Ltd., MNGL, Torrent Gas Ltd., Secure Meters, etc.

To address the need for more intensive communication/interaction amongst the senior executives/professionals of the organisations working in the natural Gas/CGD sector for discussing/sharing their experience/concerns with other Member companies, NGS initiated efforts to create a common platform wherein the industry leaders can meet and deliberate on relevant issues, on a regular basis. Accordingly, a one-day **"NG Summit"** – (the first such Summit) was organised on August 5, 2022, in New Delhi. The event was attended by 29 leaders/professionals from various NGS member organisations and other invitees. These included the leaders and representatives from ATGL, BGL, CUGL, GAIL, IGL, MGL, MNGL, PIL, Think Gas and Secure Meters. The Summit included very participative and



interactive deliberations on the issues related to NG/CGD business. These discussions broadly pertained to areas like Policy, Technical, Commercial, Innovation and Sustainability.

Yet another initiative proposed by NGS is that of 'ज्ञानानुभव प्रवाह सहयात्रा' (GPS) for addressing the need for enhancing optimisation in O&M activities and for experience sharing. It is envisaged that representatives of various member entities will visit the installations of the other companies for sharing of experiences and best practices. This proposition has been well received.

To utilise the available experienced manpower, i.e. the superannuated employees from Hydrocarbon/NG/CGD sectors like IOCL, BPCL, HPCL, OIL, GAIL, MGL, IGL, Adani Total Gas Ltd., Torrent Gas, etc., NGS plans to create a database or a **Talent Pool** of experienced professionals make their services available to the companies who need specific expert services. Various companies have been contacted by NGS and the response has been received from some of them; more to follow.

Aiming at collaboration for knowledge & experience sharing on a broader horizon, NGS engaged with other organisations as a **Knowledge Partner/Associate**. ED, NGS and other Senior Consultants were invited to Advisory Board/Speaker/Session Moderator with ISGF in India Smart Utility Week (ISUW 2022) (March 2022), with FICCI in LEADS 2022 (Leadership, Excellence, Adaptability, Diversity & Sustainability) (Sept 2022), with Messe Frankfurt in LNG India Summit (7th Edition, Nov 2022), with ITex in PipeTech 2022 (Nov 2022), etc. It is proposed to continue with such efforts in alignment with the objectives of NGS for the benefit of its members.

NGS has the privilege of technical expertise sharing with bodies like the Bureau of Indian standards (BIS). Shri V C Chittoda, Sr. Consultant, NGS was unanimously appointed as Convener of the panel for Thermal Mass Flow Meters Panel (BIS-PGD-26). He is also representing as a member of the committee for review of BIS standards for CNG High-Pressure Cylinder (MED 16) and Metering of Natural Gas (PGD 26). He is also invited to various relevant technical events as session chair/moderator etc. from time to time. Other senior consultants of NGS, Shri A N Pandey and Shri Amarendra Kumar also have had similar active



participation in the technical events of relevance.

Efforts are also being made for **Industry-Academia collaboration for mutual benefit**. In this direction, we are happy to share that Rajiv Gandhi Institute of Petroleum Technology (RG IPT), Jais has been inducted as an **Associate Member of NGS**. Other similar institutions like UPES, Dehradun, Indian Institute of Petroleum & Energy (I IPE), Visakhapatnam, etc. have also been invited for membership of NGS.

Though the framework of rules of NGS has a provision for Individual Membership, somehow, it remained untapped hitherto. I am happy to share that now we have made a beginning in the direction of broadening the membership base and Mr. Milan Donga – a Chemical Engineer & entrepreneur has been enrolled as **the first individual member** of NGS. Many other individuals have expressed interest in becoming members.

In so far as **our publications** are concerned, they are being well received by the readers. It gives a nice feeling and a sense of satisfaction when some important person holding a high position asks: "I am unable to trace a copy of July 2022 issue of GSR which contained useful material. Will you please send it to me again?". However, we consider it as a motivation for continuing with the efforts for doing better; aiming at continual improvement. **As always, we look forward to your valuable feedback and suggestions**, in this regard.

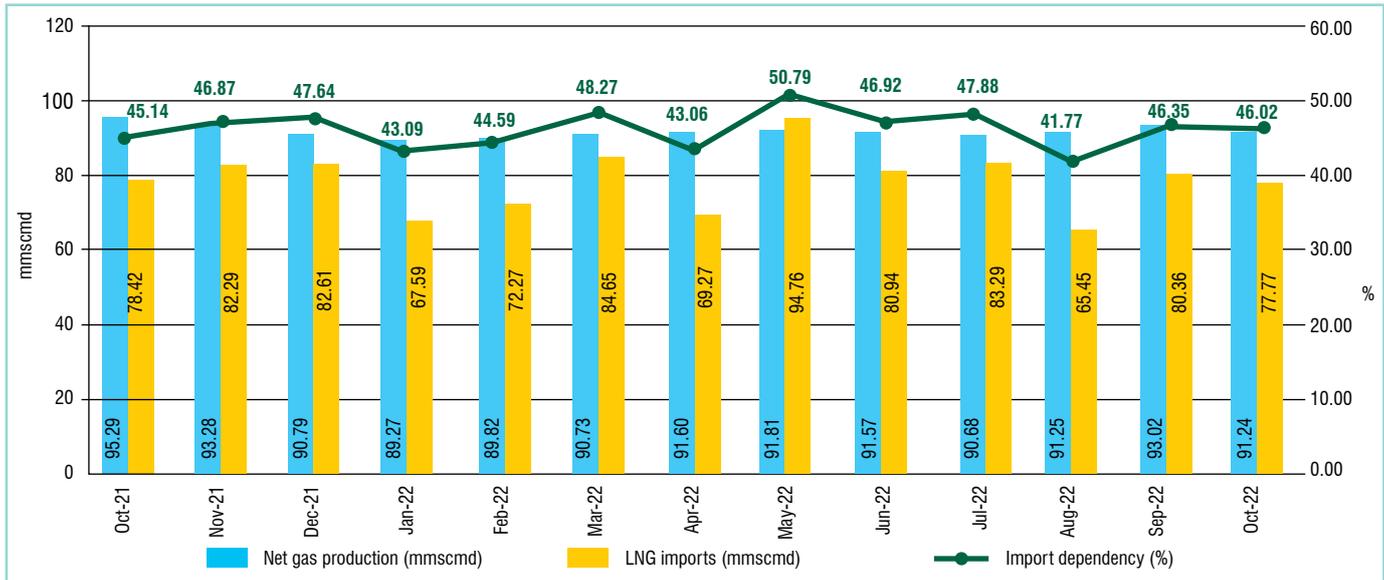
I, on behalf of NGS and my behalf, extend **warm wishes and greetings to you and your family for a very happy, healthy, safe and prosperous New Year 2023.**

D V Shastry

GAS STATISTICS - DOMESTIC AND INTERNATIONAL

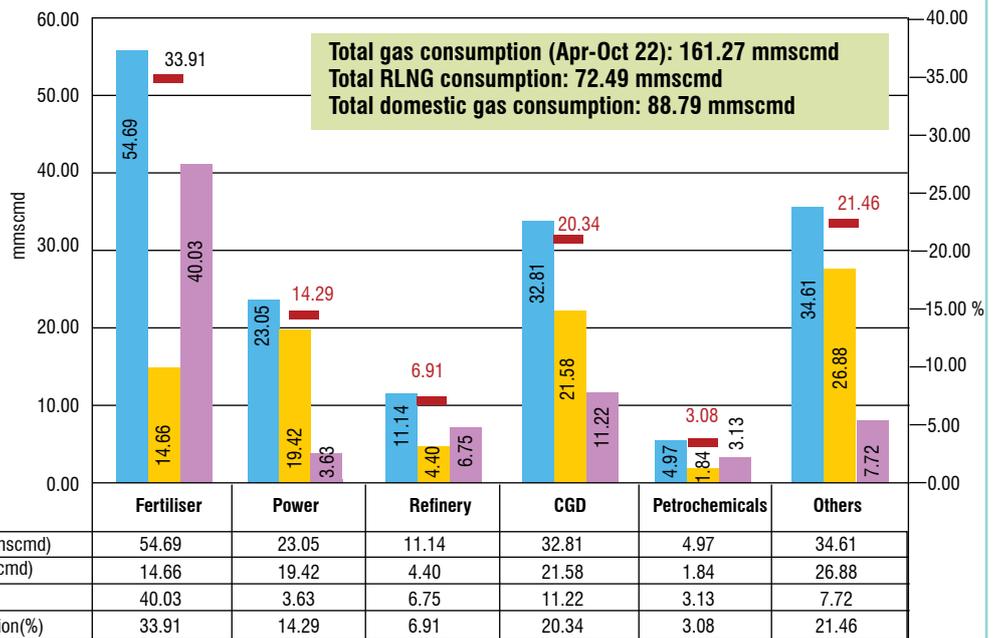
Gas Production/Consumption/Imports (mmscmd)

TREND IN GAS PRODUCTION/IMPORTS (MMSCMD)



SECTOR-WISE GAS CONSUMPTION OF DOMESTIC GAS AND RLNG (APR-OCT 2022)

India's LNG imports during 2022 kept fluctuating while the domestic gas production remained almost at the same level. The LNG imports suffered following Russia's invasion of Ukraine in February 2022 and the resultant sky-high international spot LNG prices. The international gas prices were at a record high in August. Sector-wise, CGD strengthened its share to over 20% during Apr-Oct 2022.



TREND IN CONSUMPTION OF PETROLEUM PRODUCTS

In '000 MT	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22
LPG	2481	2347	2479	2567	2398	2475	2164	2165	2232	2410	2395	2447	2400	2468
Naphtha	1260	1232	1099	1437	1125	1136	1073	897	1045	1140	1157	1108	958	1008
MS	2750	2645	2816	2473	2550	2908	2797	3017	2968	2808	3006	2827	2996	2860
HSD	6618	6513	7303	6374	6511	7704	7203	7286	7677	6638	6341	6257	6982	7760
FO & LSHS	559	511	565	543	530	590	523	535	537	560	601	596	572	557
Petroleum coke	1326	1086	1740	1849	1570	1717	1308	1235	1223	1345	1240	1319	1344	1144

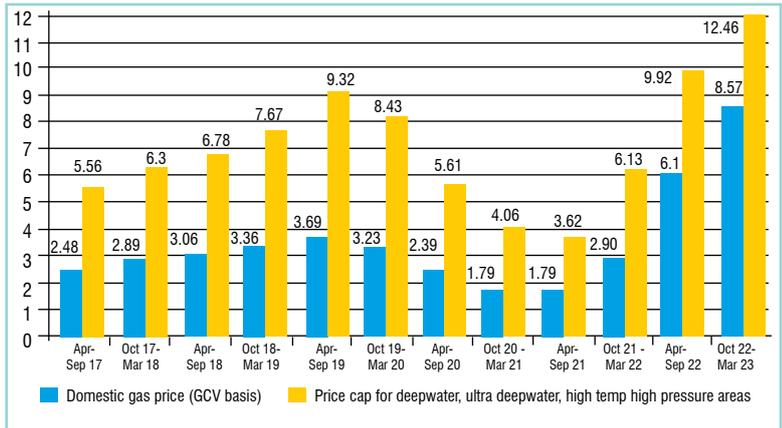
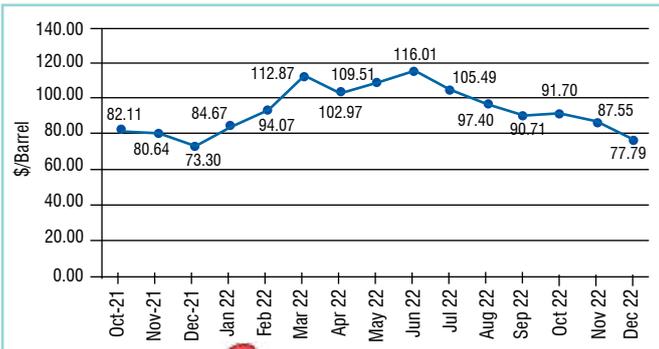
Source: PPAC, NGS Research

GAS STATISTICS - DOMESTIC AND INTERNATIONAL

DOMESTIC GAS PRICE (\$/MMBTU)

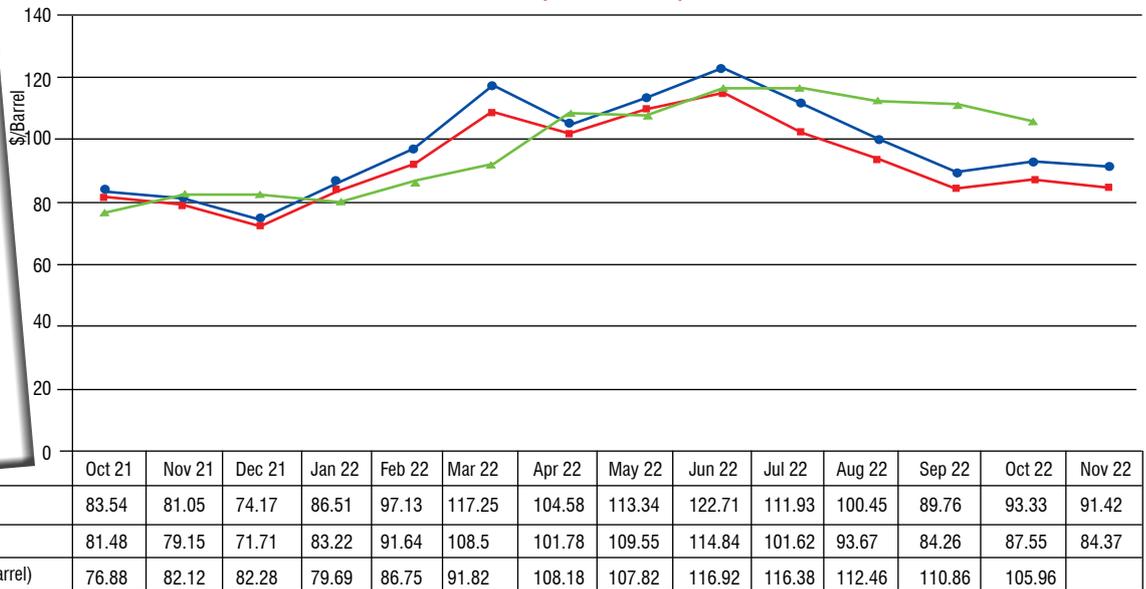
Gas - Price & Analytics

CRUDE PRICE (INDIAN BASKET)

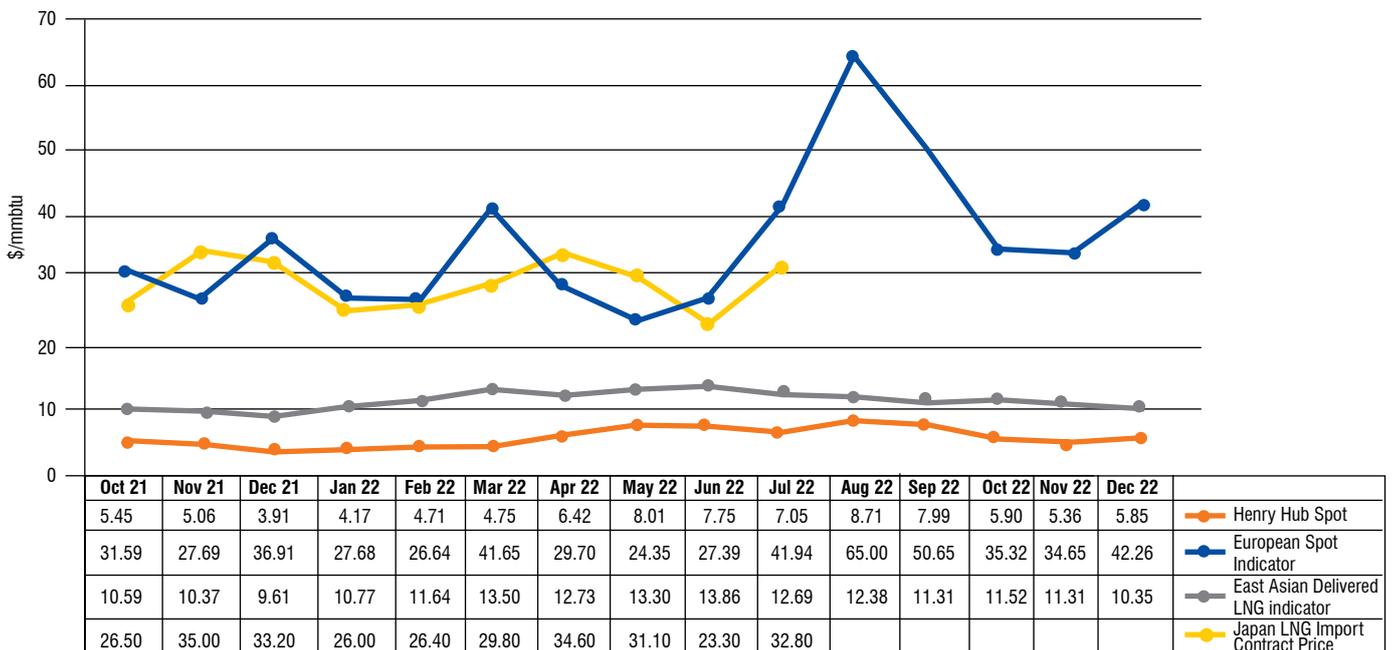


The domestic price of gas (APM price) was increased to \$8.57/mmbtu for the ongoing period Oct 2022- Mar 2023. The huge increase was a result of the prevalent high crude and prices in the international market. The crude prices shot way past \$100/barrel during months following Russian invasion. The European gas prices were at a record high in August because of huge shortage of gas after Russian supplies were adversely affected.

BRENT/ WTI/ JAPAN OIL IMPORT PRICE (\$/BARREL)



INTERNATIONAL GAS/LNG PRICES (\$/MMBTU)



Source: NGS Research, PPAC, EIA, LNG Journal, *Japan LNG contract prices not available after July

GAS STATISTICS - DOMESTIC AND INTERNATIONAL



CNG / PNG

State-wise CNG stations & PNG connections in India (as of 30.9. 2022)

State/UT	CNG Stations	PNG connections		
		Domestic	Commercial	Industrial
Andhra Pradesh	144	239,712	397	31
Andhra Pradesh, Karnataka & Tamil Nadu	28	18	0	2
Assam	1	46,109	1,307	437
Bihar	67	83,017	50	2
Bihar & Jharkhand	1	5,347	0	0
Chandigarh (UT), Haryana, Punjab & Himachal Pradesh	24	24,136	104	18
Dadra & Nagar Haveli (UT)	7	9,796	53	52
Daman & Diu (UT)	4	5,087	44	40
Daman and Diu & Gujarat	13	1,505	3	0
Goa	10	10,275	15	25
Gujarat	964	2,815,128	21,760	5,729
Haryana	284	280,164	728	1,319
Haryana & Himachal Pradesh	9	0	0	0
Haryana & Punjab	16	0	0	0
Himachal Pradesh	7	3,112	0	0
Jharkhand	59	91,653	2	0
Karnataka	224	356,925	474	266
Kerala	91	21,041	18	14
Kerala & Puducherry	9	0	0	0
Madhya Pradesh	190	173,495	292	388
Madhya Pradesh and Chhattisgarh	3	0	0	0
Madhya Pradesh and Rajasthan	23	135	0	0
Madhya Pradesh and Uttar Pradesh	15	0	0	0
Maharashtra	598	2,498,689	4,542	788
Maharashtra & Gujarat	48	130,928	2	12
National Capital Territory of Delhi (UT)	461	1,313,646	3,292	1,749
Odisha	42	72,933	4	0
Puducherry & Tamil Nadu	7	50	0	0
Punjab	173	47,117	203	210
Rajasthan	191	172,038	55	196
Tamil Nadu	146	2	0	5
Telangana	129	174,692	71	90
Tripura	18	56,828	506	62
Uttar Pradesh	672	1,255,075	2,003	2,365
Uttar Pradesh & Rajasthan	36	18,958	36	340
Uttar Pradesh and Uttarakhand	16	6,263	0	0
Uttarakhand	29	63,756	46	72
West Bengal	41	0	0	0
Total	4,800	9,977,630	36,007	14,212

Source: PNGRB

Note: 1. All the GAs where PNG connections/CNG Stations have been established are considered as Operational, 2. Under normal conditions. Operation of any particular GA commences within around one year of authorization. 3. State/UTs wherever clubbed are based on the GAs authorised by PNGRB.

CGD / LNG / PIPELINES

Common Carrier Gas pipeline network (as of 30.06. 2022)

Length in km & Capacity in mmscmd		GAIL	GSPL	PIL	IOC	AGCL	RGPL	GGL	DFPCL	ONGC	GIGL	GITL	Others*	Total
		Operational	Length	9602	2695	1459	143	107	304	73	42	24		
	Capacity	167.2	43	85	20	2.4	3.5	5.1	0.7	6				333
Partially commissioned	Length	4519			166						1131	365		6180
	Capacity													
Total operational	Length	14121	2695	1459	309	107	304	73	42	24	1131	365		20629
Under Construction	Length	5404	100		1265						1201	1666	3550	13186
	Capacity		3										149	
Total Length		19524	2795	1459	1574	107	304	73	42	24	2332	2031	3550	33815

Source: PNGRB; *Others-APGDC, HEPL, IGGL, IMC, Consortium of H-Energy; Total authorized Natural Gas pipelines including Tie-in connectivity, dedicated & STPL is 35528 kms

Existing LNG Terminals

Location	Promoters	Capacity (mmtpa) on 1.11.2022	Cap. Utilisation (Apr- Sep 22) (%)
Dahej	Petronet LNG	17.5	83.5
Hazira	Shell Energy	5.2	48.3
Dabhol*	Konkan LNG	5	19.2
Kochi	Petronet LNG	5	16.9
Mundra	GSPC LNG	5	17.8
Ennore	Indian Oil LNG	5	13
Total capacity		42.7	

* to be increased to 5 mmtpa with breakwater; only HP stream of capacity of 2.9 MMTPA is commissioned

The number of CNG stations and PNG connections stood at 4800 and 10 million respectively at the end of September 2022. The LNG regasification capacity remained at 42.7 MMTPA while the country had a total operational pipeline network of over 20,000 km as of June 2022.



NGS' NG/LNG
SNAPSHOT

SNAPSHOT, a fortnightly
Newsletter, is a round up of gas sector
covering India, as well as the **global
industry**, published by
Natural Gas Society and
available on its website
www.ngsindia.org

This is a newsletter where you
can find current developments
& news from the Gas industry.

Snapshot covers **national &
international news** on City Gas
Distribution, Gas Pipelines, Policies, LNG,
NGVs, Marine & Techonology etc.



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“It is better to light a candle than curse the darkness”, says Mr. Ashu Shinghal. According to him, the most important qualities in life are to have honesty and integrity in whatever job is assigned while being contended yet firm in the challenging situations which come in life. He feels, “In a lighter vein, I find that if the day is well spent, the same is measured in having a good quality sleep”.

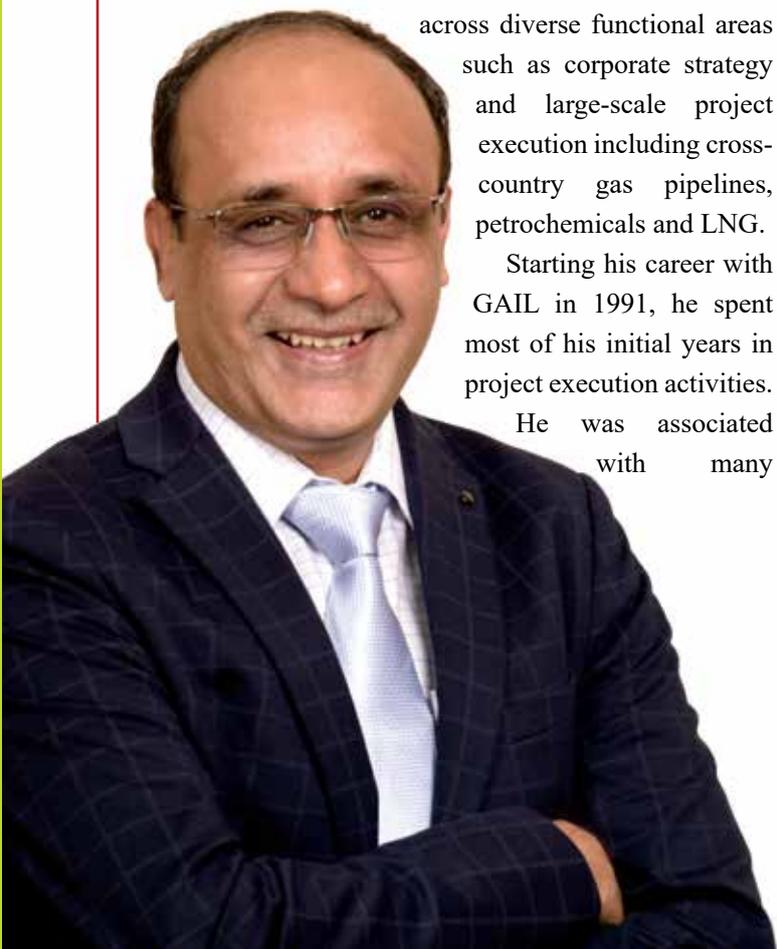
Natural Gas Society spoke to Mr. Ashu Shinghal, Managing Director, Mahanagar Gas Limited, a leading City Gas Distribution company operating in Mumbai and nearby regions about his journey and achievements and his outlook on the gas sector....

A mechanical engineer from NIT, Silchar and an MBA in Operations Management, Mr. Shinghal is a seasoned professional with over 30 years of work experience in the hydrocarbon sector. He has worked

across diverse functional areas such as corporate strategy and large-scale project execution including cross-country gas pipelines, petrochemicals and LNG.

Starting his career with GAIL in 1991, he spent most of his initial years in project execution activities.

He was associated with many



Ashu Shinghal,
Managing Director, Mahanagar Gas Limited

prestigious projects of GAIL such as Dahej- Vijaipur pipeline (DVPL), Dahej-Uran pipeline (DUPL) and Dabhol-Panvel pipeline (DPPL). Apart from this, he was also associated with the Pata LPG plant, right from its conceptualisation to commissioning.

Subsequently, he worked with the Chairman’s office at GAIL as Technical Head associated with strategic decision-making. Before joining Mahanagar Gas, he was heading Corporate Strategy, Planning & Advocacy, Risk Management, Total Quality Management and Sustainable Development departments at GAIL as Executive Director while also being responsible for the role of Chief Risk Officer of the organisation.

When asked about some of the noteworthy projects handled by him during his professional career, he lists down the implementation of high-pressure cross-country gas pipelines, LPG and petrochemical expansion projects worth a total capital expenditure of approx. Rs 20,000 crore as his favourite ones. He also recalls the implementation of Project ‘Sanchay’, the profit maximisation initiative, which enabled GAIL to generate an additional profit of around Rs 1000 crore on a three-year NPV basis, as an important project handled by him.

“As far as the gas sector is concerned, we are in a sweet spot because there is a lot of focus by the government to increase the gas share in the primary energy basket from the current 6.3% to 15% in the next 7-8 years”, opines Mr. Shinghal, when asked about what he thinks about the future of the gas sector. He feels that city gas distribution is one of the fastest-growing sectors in gas and it will generate the biggest demand to help the government in achieving this target. “MGL, too, is well placed due to its wide infrastructure and presence in the retail market”, says Mr. Shinghal.

He feels lucky to get excellent opportunities in his career and good support from his family. “My father worked in the defence department. Studying in 8-9 schools until I completed high school allowed me to make new friends every time”, says Mr. Shinghal who gets his good team leadership qualities from there. When asked what allows him to give his full devotion to his career, he proudly says “I am lucky to get full support from my wife so I do not have to worry about anything relating to home affairs. I have two children who are well placed in life”.

He doesn’t carry his office work home and likes to spend his free time reading, watching movies and listening to good music.

NATURAL GAS

2022 –

A Tumultuous Year

By Deepika Lal



The year 2022 was the year of uncertainty for the global natural gas sector. Russia's invasion of Ukraine in the beginning of the year led to a disruption of Russian gas supplies to Europe and triggering a kind of global energy crisis causing spiralling energy prices. The disturbances have since been felt across the world. European nations which were hitherto relying on piped gas had to scout for alternative arrangements while the Western world too faced shortage of supplies amidst increasing gas exports to Europe.

However, despite the crisis, the Indian gas sector was more or less successfully able to tide over 2022. We have made an endeavour to bring to you the turns and twists in the Indian gas story which despite the global turbulence showed resistance to all the negative factors impacting the economy and stayed on the growth path.

Russia's invasion of Ukraine – The Global Gas Impact

Russia has been by far the world's largest exporter of fossil fuels including natural gas;

it supplied 40 per cent of Europe's natural gas, mostly via pipelines. However, after its invasion of Ukraine in the beginning of 2022, pipeline imports from Russia were dramatically reduced in response to Western sanctions. Flows through the Nordstream 1 pipeline, which used to take gas from Russia to Germany ceased. Soon afterwards, the pipeline itself was badly damaged in a series of explosions. Deliveries from Russia to Poland through the Yamal pipeline also ceased. And therefore, Europe became increasingly reliant on LNG imported by sea.

Consequently, European LNG imports in January-September 2022 were 23% higher than in the whole of 2021. This increasing reliance on LNG meant that European buyers paid whatever the market asked to attract cargoes (which could otherwise find buyers elsewhere; particularly in Asia). This led to a dramatic increase in gas prices in international markets from early to mid 2022. The gas prices reached unreasonably high levels by August. European households and businesses were faced with huge increases in their energy payments.

When natural gas prices in Europe skyrocketed,



FEATURE STORY

European buyers sought alternatives, ultimately importing enormous volumes of LNG from the US in order to meet mandated reserves ahead of the winter. However, unseasonably warm temperatures thereafter led to a reduction in heating demand, which in turn kept European storage sites full. Resultantly, LNG tankers in European waters doubled since September. The LNG prices which were hitherto ruling high fell drastically because of so much availability of LNG. However, these LNG vessels lining up offshore held their positions in anticipation that colder weather will increase demand for energy and in turn drive up prices. And they were right. December arrived with colder than normal weather conditions and the prices shot up again. EU Dutch TTF prices, Europe's benchmark for natural gas, skyrocketed from roughly €70/MWh prior to the start of the war to an all-time high of €350/MWh in August before falling to €130/MWh in early December.

Gas in India - The Year of Survival

India is the world's third-largest energy consumer. India's economic growth is closely linked to its energy demand, where oil and gas play a key role.

Within energy, natural gas remains the fuel of choice and a promising energy source because of its low emission of particulate matter, carbon dioxide, nitrous oxide and cleaner burning. However, its per capita consumption of natural gas stands at only around 29 standard cubic metre (SCM) vis-a-vis the world average of 363 SCM. The gas share on primary energy mix also is a mere 6.7% against the world average of 24.7%. For US it is 34.82%, Russia 52.31% and China 8.18%. Considering that and its benefits, the government has time and

again shown its commitment to increasing gas share in India's primary energy mix to 15% by 2030 and it has been supporting that with various policy directives and regulatory changes to reach that goal.

Gas Consumption

While gas consumption had returned to higher than normal levels in 2021-22 supported by opening of the economy after COVID, it took a hit following the Russia's invasion in 2022. Consequently, during the first six months of 2022-23 from April to September, the daily consumption was only 172 MMSCMD, lower than the average daily consumption at 180.5 MMSCMD during the same period of 2021-22. The primary reason was the lower spot purchases of costly LNG in the international market given the high prices driven by Russia-Ukraine conflict. Considering the LNG imports constitute almost 50% of India's gas consumption, India too faced the consequences.

Sector-wise, the fertiliser sector almost maintained its share in gas consumption at around 33% in 2022 (30% in 2021-22). However, the price sensitive power sector's share declined drastically to 14 % (17%) since it was not able to afford the high gas prices. CGD sector, however jumped

Gas Statistics -Production/Consumption/Imports

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Apr-Sep 21	Apr-Sep 22
Net production	84.52	86.93	87.83	82.90	76.12	90.77	90	91.65
LNG Imports	68.08	75.18	78.74	92.84	90.03	84.32	90.55	80.36
Total consumption (incl internal consumption)	152.59	162.11	166.57	175.74	166.15	175.09	180.55	172.01

Sector-wise Gas Consumption 2021-22 (MMSCMD)

	Fertiliser	Power	CGD	Refineries	Petro	Others	Total
RLNG	33.87	7.32	14.35	10.75	6.93	8.96	82.18
Domestic	15.66	20.51	19.01	3.81	0.92	26.39	86.29
Total	49.53	27.83	33.36	14.56	7.85	35.35	168.47
Sector's share in total consumption (%)	29.4	16.5	19.8	8.6	4.6	20.9	100

Sector-wise Gas Consumption (Apr-Sep 22)

	Fertiliser	Power	CGD	Refineries	Petro	Others	Total
RLNG	39.36	3.95	12.36	7.14	3.5	7.84	74.15
Domestic	14.99	18.64	20.85	4.55	1.74	26.88	87.65
Total	54.35	22.58	33.21	11.69	5.25	34.72	161.8
Sector's share in total consumption (%)	33.59	13.96	20.52	7.22	3.24	21.46	100

Gas - Sector Growth During Last 5 years

	2015-16	2021-2022
Gas Consumption	130 mmcmd	168 mmcmd
LNG regasification capacity	21 MMTPA	42.7 MMTPA
CGD gas consumption	17 mmcmd	33.4 mmcmd
GAs covered	64	297 GAs
No. of CNG stations	~1026	4709
No. of PNG connections	~3 million	9.9 million
Pipeline network	16,000 km	20629 km



its share to over 20% with increased demand due to overly priced alternative fuels diesel, gasoline and other alternative fuels in other sectors and the increasing coverage of gas distribution networks. Nevertheless, the overall situation led to a significant stress on the profitability of CGD companies.

What is driving the growth in CGD sector is the expansion of city gas network and price economics of CNG and PNG vis-à-vis competing fuels. This is visible in the numbers. The first CNG station was built in 1992. And now, there are over 4700 CNG stations. The target is 10,000 by 2030. Only 6% population had access to PNG till 2014 and now it is going to be nearly 98% covered by 297 geographical areas (GAs). Resultantly, piped gas is reaching 9.9 million domestic, industrial and commercial consumers as of now. The target is to take this to 60 million by 2030. As the gas grid widens and the connectivity increases further, CGD share could be the primary driver of gas growth in India.

Gas Supply

Consumption in the first six months of 2022-23 was supported by higher gas production at home and lower imports. The domestic production did well with highest output in past few years. While in 2021-22, there was a record gas production of about 91 mmscmd, a huge jump from 2020-21 (76 mmscmd), the same level of output was also maintained for the period April-Sep 2022.

This growth was primarily supported by increasing levels of production at the difficult fields of Reliance Industries and BP's ultra-deep-water KG-D6 Block in the Krishna Godavari basin and ONGC's UIB deep-water gas located in the

KG-DWN 98/2 block on the east coast. These are now contributing 20% of domestic production. Though the ceiling price for gas to be produced from these difficult fields was raised to \$9.92/MMBtu for Apr-Sep 2022 and now stands at \$12.46 for the period of Oct 22-Mar 23, it still remained much lower than imported LNG rates.

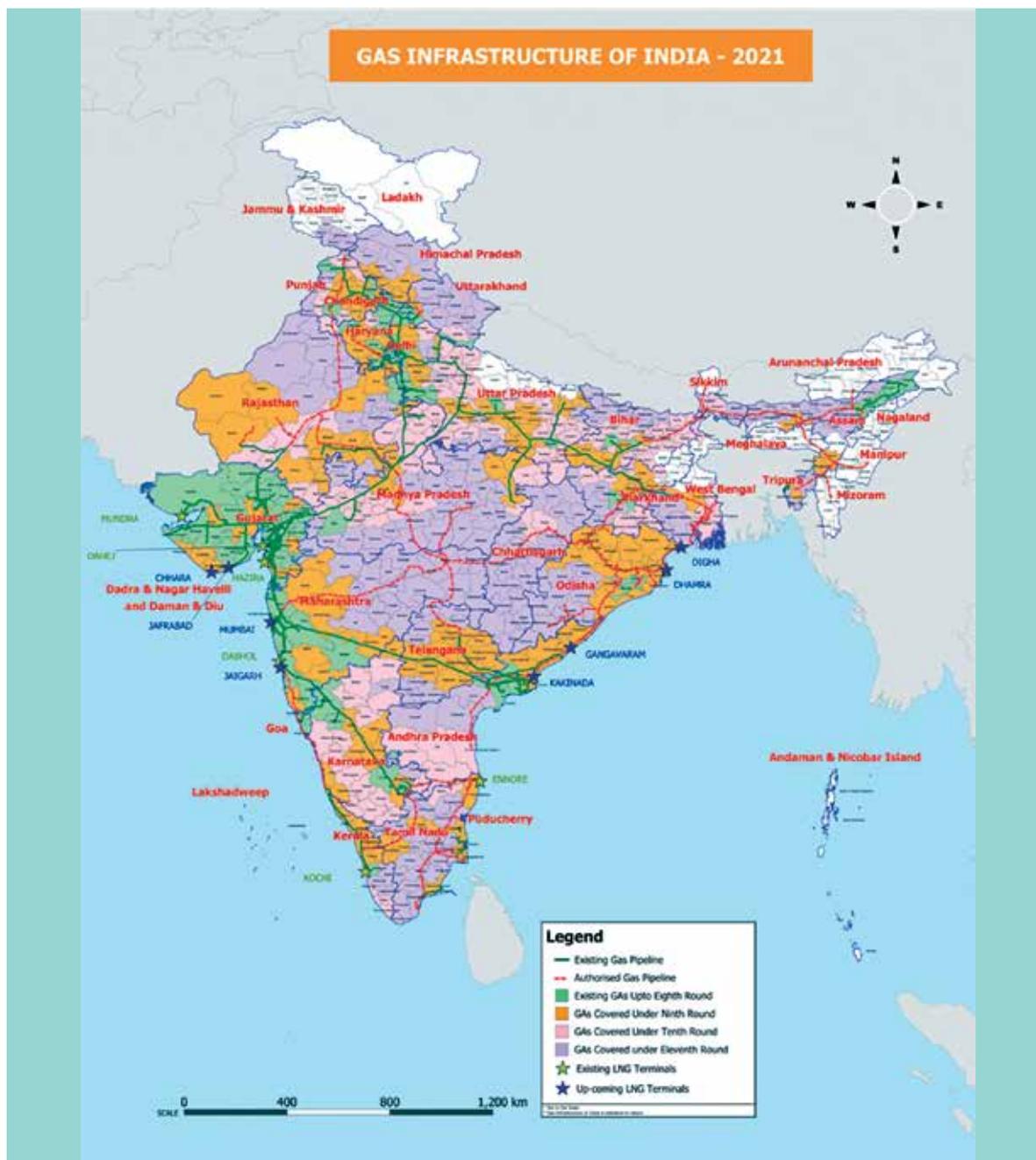
On the other hand, LNG imports saw a decline during 2021-22 to 84 mmscmd and further to only 80 mmscmd during Apr-Sep 2022 because of high prices abroad. In terms of source of importing its gas, India relies on Qatar for 40% of its LNG with the rest coming from the UAE, Oman, US, Russia, Nigeria, Angola, Nigeria and Australia.

Infrastructure Development

Infrastructure development has been a major focus area for the government with gas pipeline grid being established across the country and are at various stages of completion.

In pipelines, about 35,000 km natural gas pipeline network across the country has been authorised with the aim to create a national gas grid. Almost 21,000 km of natural gas pipelines are already operational (as of June 30, 2022) and another 14,000 km are under progress. With the completion of the PM Urja Ganga project in the eastern region, several fertiliser plants and refineries will provide a further boost to the gas demand. Completion of key trunk pipelines like Jagdishpur-Haldia, Kochi-Bangalore, Mehsana-Bhatinda, and the North East grid would facilitate better gas penetration.

Once this network is established, India would be able to provide gas for vehicles and household, commercial or industrial use to 88% of India's geographical area under 297 GAs bid till now.



Since India sources almost 50% of its gas consumption through LNG imports, it is also increasingly investing in building its LNG regasification capacity at different locations which can easily serve the demand centres or feed the gas grid. India currently has six LNG regasification terminals at Kochi, Dabhol, Dahej, Hazira, Mundra and Ennore with a cumulative capacity of 42.7 MMTPA.

It is expected that these will increase from 6 to 10 by 2024 with capacity expanding to 62 MMTPA. Four new terminals are expected at Dhamra in Odisha, Jaigarh in Maharashtra and Chhara and Jafrabad in Gujarat. Existing terminals are also

being expanded. Petronet, for example, will likely add 5 mmtpa capacity at its Dahej terminal. Plans to build a floating terminal at Gopalpur in Odisha are also on.

Gas Prices

The increase in gas prices globally since the beginning of 2022 was reflected in a big jump in the domestic natural gas prices. Domestic gas prices were first raised to \$6.1/MMBTU during Apr 2022-Sep 2022 and then to \$8.57/MMBTU during Oct 2022- Mar 2023. The prices for difficult fields were also increasingly accordingly.

The gas price increase was reflected in the hike



in both CNG and PNG rates across entities from time to time during the year. PNG prices in Delhi rose 52 per cent in just over a year to Rs 53.59 per standard cubic metres (SCM) in October 2022 from Rs 35.11 per standard cubic metres (SCM) in September 2021. CNG prices shot up 57.9 per cent during this period to Rs 78.61 per kg from Rs 49.76.

Gas pricing in India has always posed a problem — and has been revised every six months based on a formulaic mish-mash derived from the weighted average prices of four global benchmarks: the US-based Henry Hub, Canada-based Alberta gas, the UK-based NBP and Russian gas. But neither producers are happy with it nor the consumers. While producers have been seeking complete pricing freedom for marketing their gas, gas consumers have asked for a price band to keep domestic natural gas affordable.

Accordingly, the government set up a committee under the energy expert Sh. Kirit Parikh in September 2022 to review the current gas pricing formula. The committee held consultations with various stakeholders, including gas producers, industry associations, generators, city gas distributors, and fertiliser makers, and submitted its report in November end.

The committee has suggested benchmarking price of natural gas produced from ONGC and OIL's legacy or old fields at 10 per cent of cost of crude oil imported into India. This rate would however be subject to a ceiling or cap price of \$6.5 per mmbtu, until a full deregulation of

prices is implemented in 2027. There would also be a floor of \$4 with a view to cover for cost of production and at the same time keeping cost for fertiliser, power and CNG, which use gas as input raw material, at manageable levels.

The basket of crude oil India imports averaged about \$83 per barrel in December. Going by recommendation of the committee, the price for APM gas, which makes up

for 60 per cent of all gas produced in the country, should be \$8.3 per mmBtu (10 per cent of imported oil price). But ONGC and OIL (OIL) will be paid only \$6.5 in case the recommendation for ceiling and cap price of the committee is accepted by the Cabinet. And therefore, to protect the domestic producers, the committee has also favoured paying them a premium of 20 per cent over such price for any new gas production they add from old fields. For gas produced from difficult fields, the panel has recommended continuing with existing formula without any floor.

Overall, the increased prices for domestic gas were still more affordable than LNG prices ruling in the international market and so the consumers relied more on domestic gas during 2022. It is expected that the domestic gas prices for the next control period could increase further given the speculated spike in the global prices. What is important here is that there should be a stability of domestic gas prices for enabling a consistent gas consumption, thereby ensuring the sectoral growth.

For sourcing our LNG, it is becoming increasingly critical to mitigating the risk of high LNG spot price by maintaining a portfolio mix of long-term, medium-term and spot cargoes. Out of India's total LNG capacity, about 50-60% capacity is booked on a long-term basis, which leaves close to 40% of capacity for spot RLNG. In comparison, countries such as Japan and South Korea have 80% of LNG contracted in long term which protects them in case of high spot prices. More importantly,

EXPERT OPINION

Key Challenges in the Gas Sector & Possible Solutions



AKHIL MEHROTRA, MD & CEO,
Pipeline Infrastructure Limited

- Lack of pipeline connectivity across eastern/southern parts: Fully functional National Gas Grid will help.
- High cost of imported LNG and insufficient availability of domestic gas
- Limited LNG regasification capacity: Completion of new LNG terminals on east coast will be beneficial.
- Shortage of skilled manpower
- Overbooked contractors and suppliers
- Lack of an appropriate pipeline tariff regime
- Absence of a uniform taxation regime: Gas

- should be brought under GST
- Delay in approvals for pipeline laying: 'Single Window Clearance' will fasten the process.
- Falling renewable electricity price, adoption of EVs and increasing focus on hydrogen: Need to find newer user markets for gas such as room heating and cooling, use in telecom service towers, long-distance transport, inland waterways, LNG bunkering in fishing/marine vessels etc. More mobile refuelling units (MRUs) need to be in place.
- Minimal presence of international investors in the sector
- Lower than expected participation in upstream licensing



M. K TIWARI,
Managing Director, BGL

- Non availability of land for CNG stations: Need to encourage use of the Mobile refuelling unit and doorstep CNG delivery
- High gas prices: Immediate implementation of Kirit Parekh committee recommendations is necessary
- Trade margins on CNG sales: Need to rationalise

- trade margins
- Incentivisation of CNG kit manufacturing and retrofitment is important
- Need to recognise and declare CGD as public utility
- Variable VAT and duties on gas: Gas should be brought under GST
- Incentivisation needed for CNG kits manufacturing and retrofitment business
- APM pricing at source point: Uniform city gas station pricing is required



SANJAY SHARMA,
Director (Commercial), MNGL

- Low availability of domestic natural gas and high prices of RLNG
- Inadequate gas pipeline infrastructure: Faster

- execution of national gas grid will help
- Increased cost of setting up CGD networks resulting in delays in achieving MWP targets within timeline/extended timeline
- Massive increase in demand for CGD equipments and infrastructure vs supply constraints



R.K DAS,
Managing Director, CUGL

- Continuous increase in gas price: Opting for IGX for buying /selling of gas instead of a single buyer/seller may be a solution
- Gas supply restrictions on both domestic gas and RLNG: Contracting with multiple buyers / sellers at competitive prices may be a solution
- High VAT tax for CNG and PNG: Gas should be brought under GST
- Need for robust, mandatory guidelines by state governments to discourage use of polluting fuels

- like coal, furnace oil etc. by industries: Issuance of mandatory guidelines are necessary
- Lack of time-bound procedure for issuance of permissions/NOCs from state government authorities: Setting time-bound procedures are important
- Non availability of land for CNG stations at concessional rate in GA limits
- Third party damages of pipeline
- No separate utility corridor for laying of gas pipelines
- Last mover disadvantage as most of the underground space has been already occupied by other utilities

we believe it would be prudent to hedge long-term contracts with pricing linked to Henry Hub, Brent and JKM markers.

The discovery of market-driven prices for natural gas with India's first gas exchange Indian Gas Exchange (IGX) which was set up in June 2020 has been fruitful. Many companies have started trading gas on IGX; infact ONGC became the first company in India to trade domestically produced gas on IGX in May 2022 after the government allowed domestic producers of gas to sell 10% of their annual production on exchanges in August 2021. Selling gas on IGX allows domestic producers to earn market price for their gas as against the lower administered price fixed every six months. This also incentivises them to bring more acreage under production. With more and more sellers and buyers trading on the exchange, it will help in developing India in becoming a more mature and competitive gas market.

Regulatory and Policy Push

Apart from the pricing intervention, the Government continued to focus on fulfilling the increasing demand for gas as well as to increase the share of gas in the energy basket in 2022.

On the supply side, the government is focusing on finding new reserves and tapping existing fields. The Director General of Hydrocarbons (DGH), since the launch of Hydrocarbon Exploration and Licensing Policy in 2016, has offered about two lakh square kms in seven rounds of bidding for 134 blocks. The eighth round bidding process for

36,316 square kms is over and winners are yet to be announced. A few months ago, DGH announced it will offer 26 blocks over nine sedimentary basins covering an area of 2.23 lakh square kms for exploration and development through international competitive bidding. About 36 blocks in these regions are estimated to have an oil and gas resources potential of 1,775 metric million tonnes of oil equivalent.

To create more demand centres across India, the government is connecting more and more areas with gas under city gas distribution. The Petroleum and Natural Gas Regulatory Board successfully conducted 11th and 11A rounds of CGD bidding taking the total number of authorised GAs to 297, covering 98% of country's population and 88% of its area.

Future outlook

All in all, India's outlook for the natural gas sector looks very exciting on the back of rising domestic production, development of missing infrastructure links including pipeline connectivity and additional LNG terminals and supportive regulatory and environmental policies. Robust growth is expected in the Indian oil and gas sector, thereby making the sector quite attractive and conducive for investment. That is evident from the government and companies' planned investments in the sector. Last year, Prime Minister Mr. Narendra Modi announced that the Government plans to invest ~Rs. 7.5 trillion on oil and gas infrastructure in the next five years. This investment will be used



FEATURE STORY

to expand gas infrastructure — pipelines, port-based LNG terminals, CGD networks and gas exploration projects by February 2026.

On supply side, increase in domestic output is expected to continue in the short to medium term as ONGC and Reliance/BP have committed significant investments. Offshore prospects on the east coast should continue to bear fruit with additional supplies from KG Basin. ONGC is planning to invest ₹31,000 crore in exploration over the next three years and has roped in ExxonMobil as E&P partner. The company has cumulatively invested ₹1.5 lakh crore in E&P over past five years.

Reliance Industries is also increasing gas production. With the commissioning of MJ Field, KG-D6 will increase its contribution to India's gas production. RIL and BP are developing three deep-water gas developments in KG D6 — R Cluster, Satellite Cluster and MJ — expected to produce 30 mmscmd gas by 2023. Oil India Ltd (OIL), which produced 8.2 mmscmd of natural gas in FY22, the highest since its inception 63 years ago, is also increasingly pursuing E&P. It drilled seven exploratory and 31 development wells last year alone and is planning oil and gas exploration in Assam and other areas — Assam Shelf & Assam Arakan Fold belt, Rajasthan basin, Mahanadi onshore, Andaman onshore and Kerala-Konkan onshore.

Huge investments are planned in creating infrastructure too (as we discussed above). Various companies such as Adani Total Gas, IOCL, BPCL, HPCL, GAIL, Torrent Gas, Think Gas, AG&PS, etc. have committed further investments. These companies plan to spend thousands of crores in the city gas areas which they won in the 11th and 11A rounds of CGD in the next eight years. Petronet LNG too announced that it would invest ₹40,000 crores in the next five years for expanding LNG import infrastructure.

Consequently, gas demand is expected to be driven by the increasing investment in the sector and the increasing CGD spread. Sector-wise, CGD and small industries are expected to be the key drivers of demand. New industrial clusters/belts, like, Petroleum, Chemicals & Petrochemical Investment Regions (PCPIRs),



National Investment and Manufacturing Zones (NIMZ), Mega Food Parks etc. currently being developed are expected to drive gas demand from the industrial and commercial sectors in the future. Above all, stable gas prices will accelerate the growth of consumption of gas. Also, the increasing awareness about CNG and its cleanliness and price economics vis-a-vis petrol and diesel will establish CNG as a main transport fuel in the coming years.

Globally, Russia-Ukraine conflict has given the world the need to rethink their energy order. Importing countries are now reassessing the role of natural gas as a transition fuel and are looking at securing their energy supplies by exploring more trustworthy alternates. The environmental case for clean energy needed no reinforcement, but the economic arguments in favour of cost-competitive and affordable clean technologies are now stronger — and so too is the energy security case. Infact, many countries may switch from natural gas to renewables. The result may actually be good in the long term leading to changes that have the potential to fasten transition to a more sustainable, cleaner and secure energy system.



The author of this article is Deepika Lal. She has been the lead content writer for GSR since 2015. An economics graduate and an MBA (Finance), she has over 22 years of experience in research and analysis and content writing in the energy sector. She has produced several industry reports and research papers and has profiled many leading names in the oil and gas domain in her professional career.



NATURAL GAS SOCIETY

A new Voice for India's Natural Gas Industry

VISION

The Natural Gas Society, a registered society under the Societies Act, seeks to represent the issues of the industry from time to time and provide critical inputs into sectoral policy through research, collaboration and dialogue. NGS, towards this end, promotes collaboration with similar organizations, so as to share information and best practices for the overall benefit of Natural Gas sector.

MISSION & OBJECTIVES

To represent the collective interest and promote, facilitate and further sustainable growth of Natural Gas Industry in India (except E&P)

To serve as a nodal point for coordination of all efforts at generation and dissemination of information and technology, relevant to natural gas

Work on common interest issues like Safety Standards etc.

ACTIVITIES

Seminars / Workshops

The Society organises Seminars / Conferences on O&M activities / Safety in NG/CGD industry.



1st Natural Gas (NG) Summit 2022



O&M Conference 2022



GasTech 2021



Safety Conference 2021



O&M Conference 2020



Petrotech 2019

- Knowledge partnership in various conferences and seminars like LNG Summit, PipeTech, etc.
- Industry-Academia collaboration for mutual benefit.

KNOWLEDGE & RESEARCH



The Society publishes a quarterly publication 'Gas Statistics Review (GSR)', highlighting the periodical gas data including production, consumption, imports, CNG, PNG, LNG prices both domestic and international.

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Welcoming Rajiv Gandhi Institute of Petroleum Technology as an Associate Member (Academic Institutions Category)



N G S welcomes Rajiv Gandhi Institute of Petroleum Technology (RGIPT) as its Associate Member (Academic Institutions).

The institute, based at Jais, Uttar Pradesh, was set up by the government and has been accorded eminence along the lines of the prestigious IITs. Co-promoted as an energy-specific institute by six PSUs - ONGC, IOC, OIL, GAIL, BPCL and HPCL - in association with the Oil Industry Development Board, the



Natural Gas Society welcomes Rajiv Gandhi Institute of Petroleum Technology as an Associate Member (Academic Institutions)

prime objective of the institute is to provide excellent education, training, and research in the domain of petroleum technology and energy.

Welcoming Mr. Milan Donga as our first Individual Member

We are happy to announce that NGS has opened membership for individuals. We welcome Mr. Milan Donga as our first individual member. A chemical engineer by education, Mr. Donga is a

Director at Clean Green Fuel & Logistics Private Ltd.

They are involved in the business of providing logistics services to transport LNG via road tankers in India.

Natural Gas Society welcomes Mr. Milan Donga, Director, Clean Green Fuel & Logistics Private Ltd as its first Individual Member



SKILLING - The Need of the Hour in the CGD Sector

By Subhash Jain, Nayan Mishra and Patranjan Bhattacharya, Secure Meters Limited

Background

The Petroleum and Natural Gas Regulatory Board's (PNGRB) focus has been on increasing the market share of natural gas in India's energy basket, developing a robust infrastructure to support increased consumption of natural gas, creating a transparent and vibrant natural gas market and balancing the interests of consumers, transporters and producers of natural gas.

Aiming to meet the commitments made in the Paris Convention, the Government of India intends to increase the share of natural gas in India's energy mix from 6.7 per cent to 15 per cent by 2030. Another goal of the government is to expand the City Gas Distribution (CGD) network in the country at a rapid pace. With this in mind, the PNGRB awarded geographical areas (GAs) quickly in the 9th, 10th, and 11th rounds of the CGD bidding process. If the commitments by all CGDs are fulfilled, there will be a ten-fold increase in PNG connections in less than ten years. A gist till 11th round biddings is tabulated below (Table 1)

Demand and availability of skill sets in the CGD segment

CGD is a skill-oriented sector that focuses on laying and operating the network for the natural gas segment and demands many skilled CGD professionals, including engineers, semi-skilled

technicians, plumbers, welders, electricians, fitters and operators to meet the committed targets.

Among other factors, the 40+ CGD entities' success lies in their ability to source skilled and semi-skilled workforce for different jobs. According to an industry estimate, the CGD will have to employ over 10 lakh skilled workers country-wide by 2025 to fulfill its commitment to developing and operating domestic PNG connections. But in various review meetings of ministry and industry-specific workshops, the severe shortage of skills and non-availability of the skilled workforce was recognised as a big problem.

Ensuring safe and robust PNG installation and maintenance practices is a critical business activity that can only be achieved by employing highly skilled workers. If poorly installed or maintained, gas appliances and infrastructure can cause gas leaks, fires, explosions, or carbon monoxide (CO) poisoning, which can be seriously harmful or even fatal for consumers. Hence, the training, qualification, and accreditation of field staff engaged in installation operations should comply with the standard and regulated guidelines while incorporating the best practices from around the world.

The PNGRB regulation on 'Integrity Management System for City or Local Natural Gas Distribution Networks' specifies the minimum training requirements for design, construction,

TABLE 1

Rounds	Geographical Area (GA) – (Nos)	District (Nos)	Pan -India Area coverage (%)	Pan-India Population coverage (%)	Committed Domestic Connections (Cr)
11	295	630	88	98	12.33

MEMBERS' COLUMN

operations & maintenance for CGDs. Despite this, the CGD industry often overlooks these requirements primarily due to a gap between the demand and availability of skilled professionals. Even though India has plenty of relevant skill training institutes, the deployed workforce needs to receive the necessary training. This is mainly because of two primary reasons.

- Most training and skill development centres focus on the upstream and midstream segments, while the downstream segment often gets neglected.
- CGDs and their contractors often overlook training because of the cost involved.

Best practices in advanced gas-based economies

As an example to illustrate the seriousness of intent concerning safety, the UK has adopted as a legal mandate (a law, as opposed to a regulation or a standard) that gas installers (and businesses) working on the residential gas network should be certified against the BS6400-2 standard (specification for installation, exchange, relocation, maintenance and removal of gas meters with a maximum capacity not exceeding six cubic metre per hour – medium pressure, second family gas). A national database registry called 'Gas Safe Register' serves as a final industry authorisation for the field staff to operate on residential and commercial gas networks. This is equivalent to Ireland's 'The Register of Gas Installers of Ireland'. Here, the workers' qualifications vary according to further sub-categories of gas operations (for example, an individual with basic CK1 qualification is allowed to work on connecting cooking appliances, not on metering).

A government-backed body maintains a national registry, and a rule violation based on severity could mean permanent de-licensing. So, if the field staff on the gas network operates without the

correct qualification or correct registration, it is considered a criminal offence.

This framework in the UK has proven to be successful. Today, the country boasts of lowest gas-safety incident rates in the world. This has been possible owing to the institutionalised and accredited professional body – Institution of Gas Engineers and Managers regulating the training procedures and white-listing the installers to operate on consumer premises.

Building skillsets – an Indian practice in power utilities

Numerous industrial training institutes (ITIs) and industrial training centres (ITCs) offer vocational courses, but many haven't been able to keep up with industry demands. While the CGD industry has kept up with good practices to remain competitive, the same has not been true for courses offered by the ITIs and ITCs. Another concern is the availability of qualified trainers.

Education and training would enable a better understanding of the nature of pressurised gas pipelines and help improve the skillsets of the workforce involved in the sector. A perfect example of such skilling and training can be found in the electricity segment in India, where programs like USAID - Distribution Reform Upgrades and Management (DRUM) have been successfully implemented in a mission mode.

A few years back, the Ministry of Power (MoP) - Government of India (GoI) and USAID India recognised that the electricity distribution





sector was lagging because of a lack of domain knowledge among workers of different levels. To solve this issue, USAID India designed and funded the Distribution Reform Upgrades and Management (DRUM) project. This project aimed to train distribution utility workers, engineers, and managers on how to improve 'last mile' power distribution quality and reliability in selected urban and rural areas.

Since this sector had deep drawn problems, it required a long and consistent training program to run for the Discoms. The training activity was regionally spread and comprised of 24 courses on 19 subjects. Several geographically dispersed Indian institutions engaged in the power sector and distribution reform activities conducted these trainings.

Initially, 25,000 upper, middle, and lower-level utility employees were to be trained by 2008, but the goal was revised to 35,000 by 2012. This training component developed a culture of training at all levels of electricity utilities, which was well worth USAID's money. Later, the government adopted this framework to impart its training under its urban electrification program, R-APDRP.

The way forward

Based on the experience in other fields as well as in the CGD business, it is established that

- While workforce deployment is the highest in the downstream segment, there are no prominent training institutes that provide training in this

area. Therefore, multiple training institutes on the downstream side of CGD should be encouraged and established.

- Taking into account UK experience, there is a vital need to have an indigenous gas installer / LMC training institute(s) and an associated accreditation body in India to ensure that field staff (gas installers) are well-versed with the best installation practices and are trained by the recognised institutions. A nominated government organisation can monitor this program.

- With the growth of the CGD sector, the Indian power sector and European countries can be used as models for training and skilling. Providing government funding for such training courses will give training the much-needed momentum it currently lacks.

- A mandate by the government to use a certain minimum percentage of skilled workforce will go a long way in strengthening the skilling ecosystem. The Government of India and PNGRB should consider implementing a policy like BS 6400-2.

Such an ecosystem will encourage organisations from the private and public sectors to create better training infrastructure, a suitable course curriculum and collaboration with industry members to meet the training needs.

Developing a skilled workforce will lead to Health, Safety, Security, and Environment (HSSE) friendly operations, which are crucial to CGD's success.

About Author:



Subhash Jain is an Electrical Engineer from MNIT, Jaipur. He has 32 years of vast experience. He is working with Secure Meters in setting up and completing various services for the last 12 years.



Nayan Mishra is a BE in Electrical and Electronics Engineering and has more than 10 years of industry experience. He is working with Secure Meters as Business Development Manager for utility services for water and gas.



Patranjan Bhattacharya is a B-Tech in Electrical Engineering from IIT, Kharagpur and has about 25 years of industry experience. He joined Secure Meters in 2006 as solution specialist for utility services for water, gas and electricity.



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INDRAPRASTHA GAS LIMITED

IGL BHAWAN, Plot No. 4, Community Centre, R. K. Puram, Sector - 9, New Delhi - 110 022

Phone : 91-11-46074607

(CIN.L23201DL1998PLC097614)

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गेल (इंडिया) लिमिटेड



भारत की अग्रणी प्राकृतिक गैस कंपनी

एनर्जाइजिंग पॉसिबिलिटीज

देश में बेची जाने वाली प्राकृतिक गैस में 53% का योगदान

भारत में कुल प्राकृतिक गैस संचरण पाइपलाइनों के 3/4 भाग का संचालन