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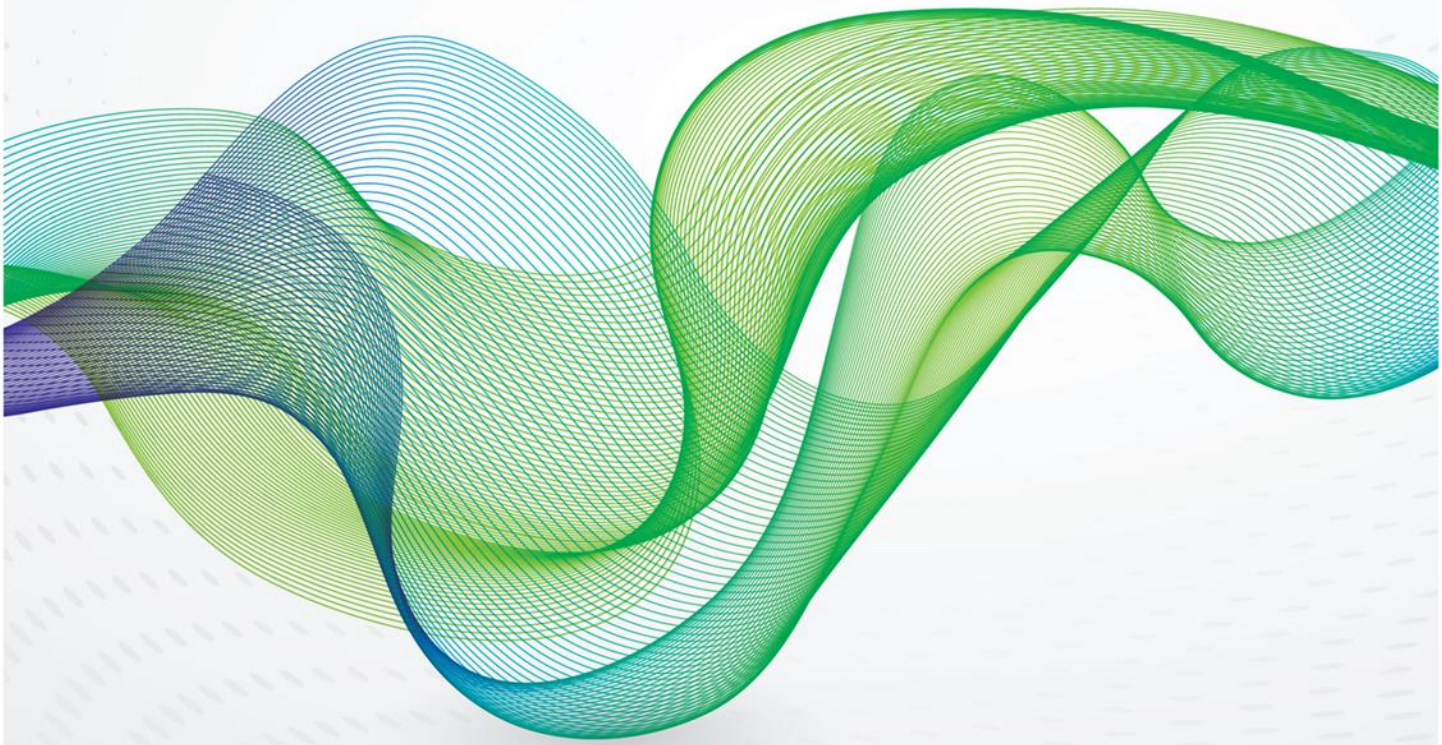
Gas sector reforms in India: How will it change the market outlook?



OIES PAPER: NG 178

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Executive Summary

The Indian gas sector is expected to be one of the world's fastest growing markets over the next two decades. Yet while the Indian government has a stated ambition to increase the share of natural gas in primary energy to around 15 per cent by 2030, there is a wide divergence of views around India's future gas demand and the potential for gas to reach this share. The affordability of gas remains central to this ambition. Following the Russian invasion of Ukraine and the squeeze on global gas supplies, the future of India's domestic industrial structure and pricing policies are key factors in determining the outlook for gas in the country's energy mix.

In 2015, the Oxford Institute for Energy Studies (OIES) published a comprehensive research paper titled 'Gas Pricing Reform in India: Implications for the Indian gas landscape'[1] which argued that the country's lack of a price formation mechanism would be a critical factor going forwards, but that finding a price level that would act both as a spur to supplies and which would promote consumption would be challenging.

Against this backdrop, this paper reviews the major developments in the Indian gas sector over the last seven years and discusses the major policy decisions and reforms which have been undertaken in gas pricing and infrastructure development, and their future implications for both gas supplies and consumption.

It argues that reaching the government's 15 per cent ambition will be extremely challenging. While price reforms undertaken since 2015 are supportive towards production, the exploration-development-production cycle requires a long lead time to deliver, and any increase in output - which is likely - will take time. While LNG is another source of supply, it has to be imported and at the time of writing, is more expensive and also more affected by global dynamics as current events show. Meanwhile, on the demand side, price reforms that have enabled higher global gas prices to be passed on to consumers have also led to a significant reduction in gas use in sectors like power generation. City gas distribution, however, has increased given that it can absorb higher-priced gas including LNG, but future growth here will depend on both price dynamics and the development of electric vehicles.

This paper first looks at the background of gas prices in India and the evolution of market-based mechanisms, before going on to consider how these have impacted upstream production. Finally it looks at the implications for demand.

[1] Gas Pricing Reform in India: Implications for the Indian gas landscape: OIES Paper NG 96, Anupama Sen, 2015 (https://www.oxfordenergy.org/publications/gas-pricing-reform-in-india-implications-for-the-indian-gas-landscape/)

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Introduction

Despite a broad consensus that India's gas market will be amongst the world's fastest growing in the coming decades, a paper penned by the OIES in 2015 argued that the Indian government's official forecasts have tended to be overly optimistic, whereas projections by multilateral organisations tend to be cautious but confused.[2] The presence of two gas consumer markets - one which has prices and quantities set by the Indian government, and another which utilises gas at market (LNG import) prices - has muddied pricing signals, thereby impacting India's gas market development. This dual market structure and the uncertainty it creates around the domestic upstream has complicated assessments of future trends as the price and allocation to different users remains uncertain.

The first attempt to reform pricing was made in June 2013, by linking the price of the majority of domestically produced gas to a weighted average of a set of international prices, including US Henry Hub, UK National Balancing Point (NBP), netback of LNG prices to Japan, and netback of India's contracted LNG imports. Under this proposal, the setting of gas prices was to move from the purview of the government to that of 'market forces'.

This price reform proposal drew mixed reactions. It was welcomed by Indian upstream exploration companies as the lifting of price controls meant they could invest in exploring difficult offshore fields and in developing marginal fields, potentially reversing the decline in domestic production. However, it was opposed by the consuming sectors for whom a lower gas price was essential to maintain low retail prices for their consumers. This was primarily for the fertiliser and power sectors, which collectively accounted for 70 per cent of gas consumption and served a large section of India's predominantly low-income agricultural population.

The subsequent review (by the new government which came to power in 2014), modified the pricing formula by replacing the Japan LNG and Indian import netback price markers with the Alberta Reference price and the Russian domestic gas price. The LNG price was removed from the formula as it was felt that it was predominantly linked to oil and therefore did not reflect gas-on-gas competition.[3] The review committee also felt that the upstream prices reflected what upstream investors were getting in other regions.[4] This formula became applicable in November 2014.

But the price levels of USD 4.66/MMBtu at the time were insufficient to revive domestic production and reverse the decline brought about by the drop in production at the Krishna Godavari Dhirubhai 6 (KG-D6) field. The OIES 2015 paper[5] further argued that production could potentially increase at prices above USD 6-7/MMBtu, with as much as 30 Tcf of reserves forecast to be unlocked at USD 8/MMBtu. But new investments in exploration were unlikely to be determined by the price alone and were also contingent upon the implementation of reforms to the fiscal regime for exploration and overall investment framework.

Meanwhile, on the demand side, the paper argued that subsidies to the fertiliser (urea) sector, one of the two largest gas consuming sectors in India, could only be completely offset by government revenues accrued from production being valued at approximately USD 9-11/MMBtu. It also inferred that any increase in gas prices above then current levels would reduce the absolute size of government subsidies through higher royalties and taxes.

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[2] https://www.oxfordenergy.org/publications/gas-pricing-reform-in-india-implications-for-the-indian-gas-landscape/
[3] Report of the Committee on Gas Pricing 2014 (http://petroleum.nic.in/sites/default/files/committee_report_on_gas_pricing_2014.pdf)
[4] Report of the Committee on Gas Pricing 2014 (http://petroleum.nic.in/sites/default/files/committee_report_on_gas_pricing_2014.pdf
[5] https://www.oxfordenergy.org/publications/gas-pricing-reform-in-india-implications-for-the-indian-gas-landscape/

But in the power sector, given the structure of electricity generation in India and the lack of a carbon price, gas becomes uncompetitive with coal at prices between USD 5.20-6.20/MMBtu. An increase in the gas price to USD 8/MMBtu would have potentially led to a 5 per cent rise in power tariffs if the increase was spread across all units of consumption (from all fuel sources).

Gas pricing – a move towards market-based price formation

The price of gas has been the single most critical element influencing its demand in India. For most of its existence, domestic gas pricing has been 'managed' to keep it competitive (read 'low') as an input to price-sensitive sectors such as power generation and fertilizer (urea) production.[6] This was known as the Administered Price Mechanism (APM). There were two levels of price management – one for upstream producers and one for consumers. A Gas Pool Account was set up to balance the price differential for different consumer categories which was operated by the gas marketer, GAIL India (GAIL).[7]

Given that the approach to gas pricing was that of 'price management', the term APM seems appropriate. The APM price was initially fixed on 'cost plus' basis.[8] The Ministry of Petroleum and Natural Gas would verify these prices from time to time in consultation with the ministries of the consuming industries, namely the Ministry of Fertiliser, Ministry of Power, Ministry of Industries, etc. The consultative approach took into account the conflicting interests of the sellers and consumers, and there was no set timescale for these periodic price reviews. The government was forced to change this approach when it invited private sector participation in the upstream.[9] This gradual move away from APM is described in detail below.

Opening up the upstream

The Indian government started opening the upstream sector to private investors around 1990 through joint ventures. By the mid-1990s, the government had launched a New Exploration & Licensing Policy (NELP) for accelerating exploration and production (E&P) activity. While these efforts evinced interest from some oil majors and quite a few domestic players, NELPs implementation saw some teething problems, primarily the absence of freedom for producers to price their gas and market it.

For a long time, the price paid to upstream producers by the gas marketer (GAIL) was linked to a basket of fuel oils with a base and ceiling price, resulting in a price lower than USD 1.0/MMBtu. In the early 1990s, when India invited private upstream players to collaborate with the NOCs, a similar linkage to fuel oil was offered to these JVs but either without a ceiling or with a higher price ceiling. The price to consumers remained unchanged with the GPA managing the difference.

When more private upstream players started participating through the Production Sharing Contract (PSC) regime of the NELP, there was an expectation of pricing (and marketing) freedom for these producers. The NELP regime did have some provisions that provided freedom to producers to determine the price of gas using arm's-length discovery but that discovered price still required government approval.

The first block to seek price approval under the provisions of NELP was Reliance's (RIL) promising KG D-6 which discovered a price of USD 4.2/MMBtu.[10] To meet the criterion of arms-length discovery,[11] RIL had carried out a bidding process to discover a Brent-linked price whereby it had received bids from

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[6] Power and fertilizer sectors together have traditionally consumed more than 50 per cent of domestic gas supply.
[7] Earlier known as Gas Authority of India Limited.
[8] Report of the Committee on Gas Pricing 2014 (http://petroleum.nic.in/sites/default/files/committee_report_on_gas_pricing_2014.pdf)
[9] To access both private capital and new technology.
[10] This was based on an elaborate formula linked to Brent oil and had other fixed parameters.
[11] Arms-length price discovery is when the price discovery is made by two or more unrelated parties in an open and transparent manner.

five fertiliser companies and five power consumers. When RIL sought approval of this price, the proposal was sent to an Empowered Group of Ministers (EGoM) which approved the price formula with certain changes and also stated that this price formula would be reviewed after five years. The approved formula was:

Selling Price (USD/MMBtu) = 2.5 + (CP-25)^(0.15)

Given that KG D-6 gas was then the single largest source of gas, this price was also used as the benchmark price for gas sold by the NOCs.[12] The validity period of this price formula was to expire on March 31, 2014.

The price review exercise, which was due in April 2014, started much earlier. It was prompted by a sudden decline in production from KG D-6 and a report by the National Auditor which alleged losses to the exchequer due to the ad hoc policies and extensions of the upstream regulator. The Rangarajan Committee, which was given the task to come up with the pricing framework, suggested a weighted average linkage to global upstream prices, using indices like the US Henry Hub, NBP, and netback of LNG imports into India and Japan. However, the implementation of this mechanism was delayed due to the general elections and the new government which undertook a fresh review of pricing.

It is important to put India's gas policy into context, as it has been influenced by a number of drivers since 2014. The new government that came to power in that year stated that its approach to energy policy would be built on five key enablers: energy availability and accessibility, energy affordability, energy efficiency, energy sustainability, and energy security. This approach has created some of the key drivers of the government's policy decisions, namely:

- A desire to reduce oil import dependence by 10 per cent by 2022[13]
- An aim to increase the share of natural gas in primary energy to ~15 per cent by 2030[14]
- Commitments to reduce GHG emissions.[15]

Similarly, the government's ambition to increase private sector participation in the upstream was an additional driver generating greater momentum toward gas price reform.

The new government came up with a revised pricing formula in October 2014. The new formula replaced the LNG netback prices with two upstream prices – Alberta and Russian gas. So the price for gas in India was set based on the following:

- Volume weighted average prices of Henry Hub, Alberta, NBP, and Russia adjusted by USD 0.5/MMBtu for transportation.
- The price would be based on volume and price data for the last four quarters with a lag of one quarter. For example, the price for the period of April - September 2022 would be based on the volumes and prices from Jan 2021 - December 2021.
- The price did not apply to gas produced under certain regimes which existed pre-NELP.
- A provision was kept to allow the application of a premium over and above this price for gas produced from deepwater (DW), ultra-deepwater (UDW), and high-temperature, high-pressure (HPHT) fields.

[12] The government used other parameters like transportation costs etc., to arrive at producer prices in different zones in the country.
[13] https://www.pib.gov.in/PressReleasePage.aspx?PRID=1677636
[14] Petroleum Minister (https://www.business-standard.com/article/news-cm/india-committed-to-achieve-15-share-of-natural-gas-in-primary-energy-mix-by-2030-121060801239_1.html), Prime Minister https://www.financialexpress.com/economy/share-of-gas-in-india-energy-basket-to-double-says-pm-narendra-modi/2165193/
[15] https://pib.gov.in/newsite/printrelease.aspx?relid=128403

This was a big step to making 'government approval' transparent and predictable for upstream pricing. It achieved uniformity to a certain extent as it applied to a large volume of the gas production and there was no need for individual producers to discover prices separately and seek government approval for them.

In addition to regulating the price, historically the government had also allocated gas to consumers through the Gas Linkage Committee (GLC).[16] When private sector participation started through NELP, there was an expectation that private players would be allowed the freedom to market gas, without recourse to the GLC. The next big reform for the natural gas sector was undertaken in March 2016[17] when the government removed this hurdle, albeit just for DW, UDW, and HPHT gas fields that would start production after January 1, 2016. Producers from these fields were now free to market/sell their gas to anyone and discover[18] the price for their gas subject to a ceiling.[19]

In May 2016, the government also announced the Discovered Small Fields policy[20] whereby it offered full pricing (and marketing) freedom without any ceiling for gas produced from discovered small fields. In April 2018, this full pricing freedom was extended to unconventional hydrocarbons like coalbed methane (CBM).

In December 2020, the government institutionalized these pricing and marketing reform mechanisms by notifying[21] that identification of consumers and any price discovery should be undertaken through an electronic bidding portal operated by an independent agency approved by the government[22] based on 'Arm's Length Sale'.[23]

A few e-auctions have subsequently been undertaken to discover price and purchaser:

- In November 2019, RIL-BP discovered a price of 8.6 per cent of Brent crude (USD/MMBtu), subject to the ceiling mentioned above
- In February 2021, RIL-BP discovered a price of JKM-0.18 USD/MMBtu subject to a ceiling of USD 3.62/MMBtu at the time of discovery
- In April 2021, RIL discovered a price of 9 per cent of Brent for their CBM production, with no ceiling applicable
- In May 2021, RIL-BP discovered a price of JKM-0.06 USD/MMBtu subject to a ceiling of USD3.62/MMBtu at the time of discovery
- In March 2022, RIL & HOEC discovered a price of 13.2 per cent of Brent plus USD8.28 /MMBtu and 22 per cent of Brent respectively for their CBM production. There is no ceiling applicable.

Figure 1 shows the gas prices based on these formulae from November 2014 to date compared to average LNG import prices:

[16] The Gas Linkage Committee (GLC) was constituted by the Ministry of Petroleum & Natural Gas in 1991 as an Inter-Ministerial Committee under the chairmanship of the Secretary (P&NG) and having as members, representatives of the Planning Commission, Ministry of Finance, Ministry of Power, Ministry of Chemicals & Fertilizers, Ministry of Steel, etc. The GLC was set up to recommend to the government the allocation of natural gas available under the APM and to review the progress of projects for the utilisation of natural gas,

[17] https://mopng.gov.in/en/exp-and-prod/psc

[18] The price discovery mechanism is explained in subsequent sections.

[19] The ceiling price is an average of imported fuel oil, naphtha, coal, and LNG.

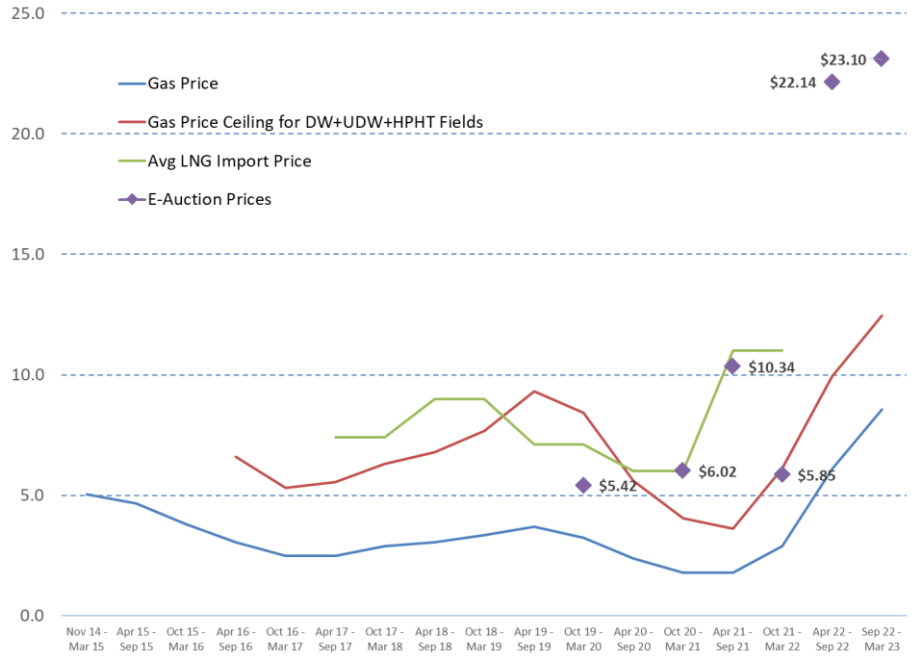
[20] https://mopng.gov.in/files/TableManagements/EP_Inv_DSF.pdf

[21] https://mopng.gov.in/en/exp-and-prod/psc

[22] Currently, there are five such agencies whose portals can be used for e-auctions.

[23] Arm's-length sale is a sale between sellers and buyers who are not related through common ownership.

Figure 1: Gas Prices (USD/MMBtu)



Source: PPAC data, MoPNG reports

A functioning gas exchange

India has had a long history of regulating the price of energy commodities. While there have been many attempts to move towards market-determined prices, it is only in the last 10-15 years that there has been some action in this direction and even then only for certain energy commodities.

The prices for suppliers of domestic natural resources (coal, natural gas, and oil) were regulated by the respective ministries, namely the Ministry of Petroleum and Natural Gas, Ministry of Coal, and the Ministry of Power. Given that India has been, and continues to be, a major importer of energy resources, the government has also regulated/controlled the prices of energy to the final consumer, for both electricity and petroleum products including natural gas. However, over the last fifteen years there have been conscious efforts to remove government intervention in energy prices, either by allowing the market to function or by handing the regulating function to an independent entity.[24]

For example, although oil marketing companies have been given the freedom to set prices for petrol, diesel, and LPG since 2014, , there is still implicit government control as it owns the oil marketing companies. Domestic coal prices continue to be determined by the Ministry of Coal, while natural gas prices are now being discovered through a process of arms-length auctioning. Power prices to consumers are set by the relevant regulators through an elaborate process. In the coal and power sectors, markets have existed for more than ten years which discover prices for small volumes.

The power exchange in India started functioning in 2008 and has been adopted as a mechanism for price discovery and trading. For an initial couple of years, as the volumes traded grew, buyers and sellers started gaining confidence in the ability of the exchange to discover electricity prices to reflect market fundamentals (despite all the imperfections of the power market in India). It became an important indicator of the demand/supply situation and a critical input to decisions for investment into power generation/supply. The volume of trade on the power exchange, though only about 8 per cent of total power consumption, has been growing steadily.

[24] Regulators have been regulating electricity prices, for example.

A similar price discovery mechanism and a trading platform were much needed for the natural gas market in India. However, government control of the price and allocation of volume to consumers meant that there was no gas available to trade in the market and hence no opportunity for price discovery.

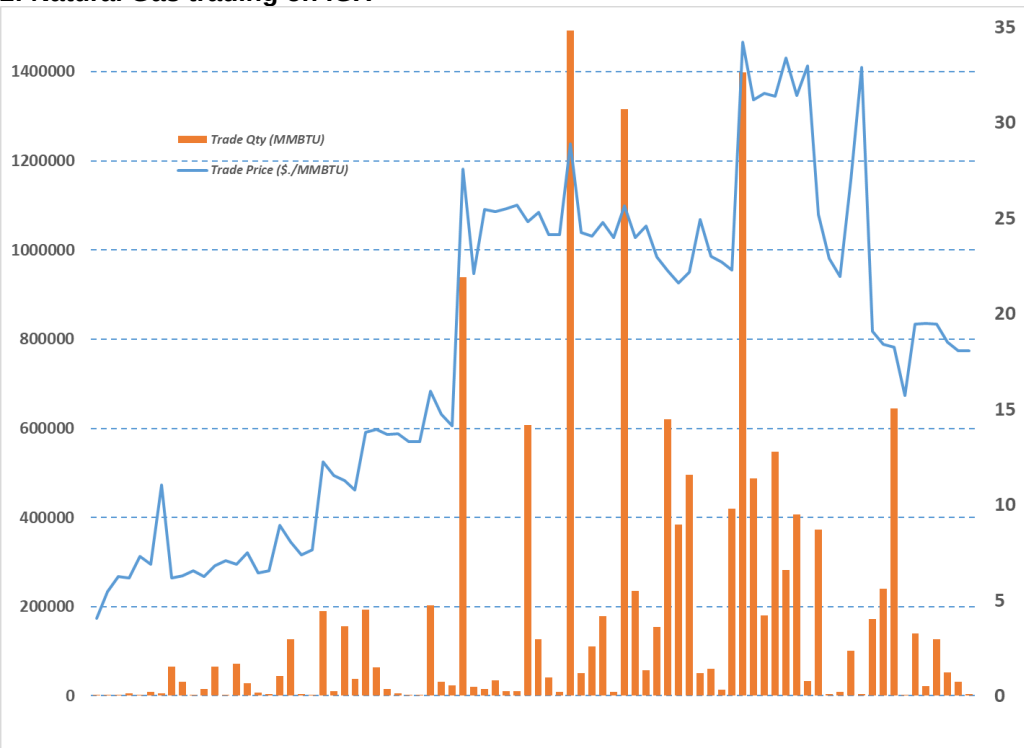
Over the last seven to eight years, the government has relinquished its control of prices for some volumes of natural gas (small gas fields and CBM), and the entry of larger volumes of spot/shorter contracts of LNG have created a favourable situation for gas trading. In June 2020, a trading platform/exchange for natural gas, the Indian Gas Exchange (IGX), was launched. The gas exchange is regulated by the Petroleum and Natural Gas Regulatory Board as per PNGRB (Gas Exchange) Regulation, 2020. Upstream gas producers can also use it for price discovery of DW, UDW, and HPHT gas. The volumes traded on the exchange have grown steadily.

Here are some of the salient features of what IGX offers to natural gas buyers and sellers:

- Physical delivery contracts
- Daily, day ahead, weekly, weekday, fortnightly, and monthly contracts in lots of 50 MMBtu
- Delivery at five delivery points (hubs) – Dahej, Hazira, KG Basin, Dabhol, and Jaigarh
- Delivered or ex-hub transactions
- Price discovery is based on the principle of demand vs supply on the IGX platform. The market clearing price is arrived at based on valid purchase and sale bids which are aggregated to trace a demand-supply curve.

Figure 2 shows the volumes traded and the price discovered daily for various products.

Figure 2: Natural Gas trading on IGX



Source: https://www.igxindia.com/

As the chart shows, the gas price discovery on the exchange has been influenced by the marginal supply of gas which is primarily regasified LNG (RLNG). Because the gas exchange offers only physical delivery contracts, currently the trades can be used only by those sources of gas that are connected to

the gas pipeline network. Currently, the volume of gas traded on the IGX is less than 1.5 per cent of the country's overall gas consumption.

However, it does play a key role for the gas buyers and sellers by providing the following:[25]

- Transparency through standard contracts with a clear framework
- Flexibility to trade on any day using multiple products at multiple delivery points
- Delivery facilitation by IGX
- Payment security by IGX as financial counterparty
- Ease of doing transactions through an electronic platform
- Price discovery resulting from the participation of multiple buyers and sellers.

Implications for domestic gas production

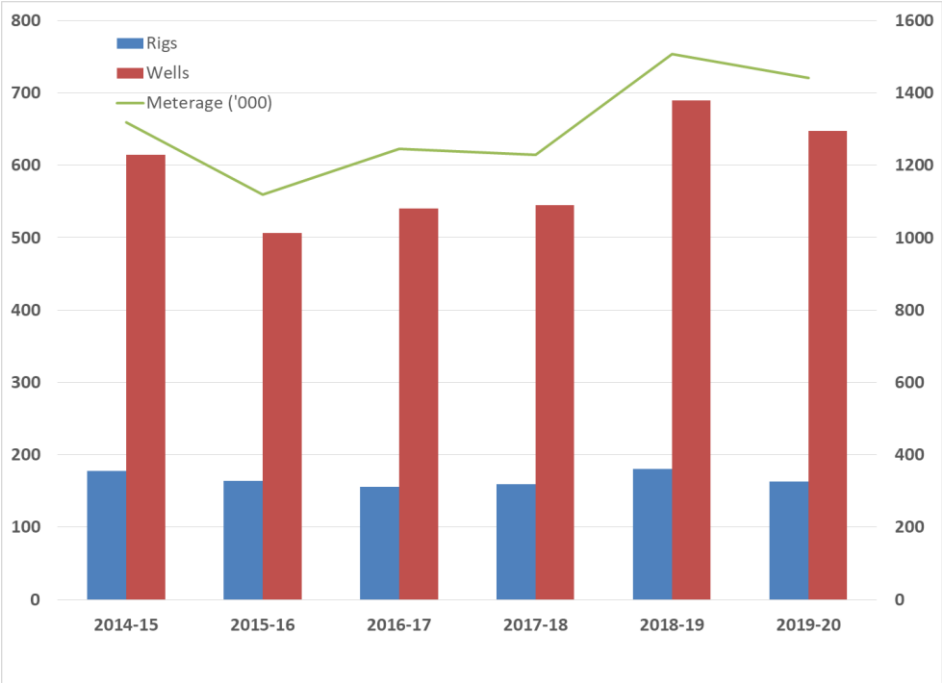
In addition to price reforms, the Indian government has introduced other operational/policy reforms for the upstream sector. Some of the other major reforms are:[26]

- In 2018, a Hydrocarbon Exploration & Licensing Policy (HELP) was launched that provided a single license for conventional and unconventional hydrocarbons - conventional oil and gas, coal-bed methane, shale oil, gas hydrates, etc. HELP offers reduced and graded royalty rates along with exemption in the initial years for exploration in DW and UDW areas.
- A new model of Revenue Sharing Contract (RSC) replaced the earlier model of Production Sharing Contract (PSC). This is an easy-to-operate model that removes the government's micro-management and focuses only on production and revenue (not on cost recovery).
- An Open Acreage Licensing Program (OALP) was introduced along with HELP. The OALP is based on the National Data Repository which provides E&P players seamless access to the entire geological database for interpretation and analysis. This in turn allows players to carve out blocks of their choice and submit an Expression of Interest (EoI) at any time during the year. In the 6 rounds of bidding under the OALP, 126 blocks have been awarded. Most of the blocks have been taken by the NOCs and private sector participation has not been encouraging except for Vedanta Resources which bagged 41 blocks in the very first round.
- In line with enhanced hydrocarbons exploration and production, Marginal Field Policy (now called Discovered Small Field Policy (DSF)) was launched in 2016 to effectively exploit untapped established reserves. These small and marginal fields were discovered by the NOCs but were not economically viable due to the fiscal regime and their small size. Under the DSF policy, two bidding rounds were conducted in 2016 and 2018 offering 54 Contract Areas, of which 37 were on-land and 17 were off-shore. An additional 100 discoveries have been awarded for development. The third and the latest round was closed in June 2022, offering 32 Contract Areas of which 11 were on-land and 21 were off-shore.

However, given the nature of upstream activities which require a long gestation period, the results even in terms of exploration and development activity are not yet visible as can be seen in Figure 3.

Figure 3: Upstream Exploration

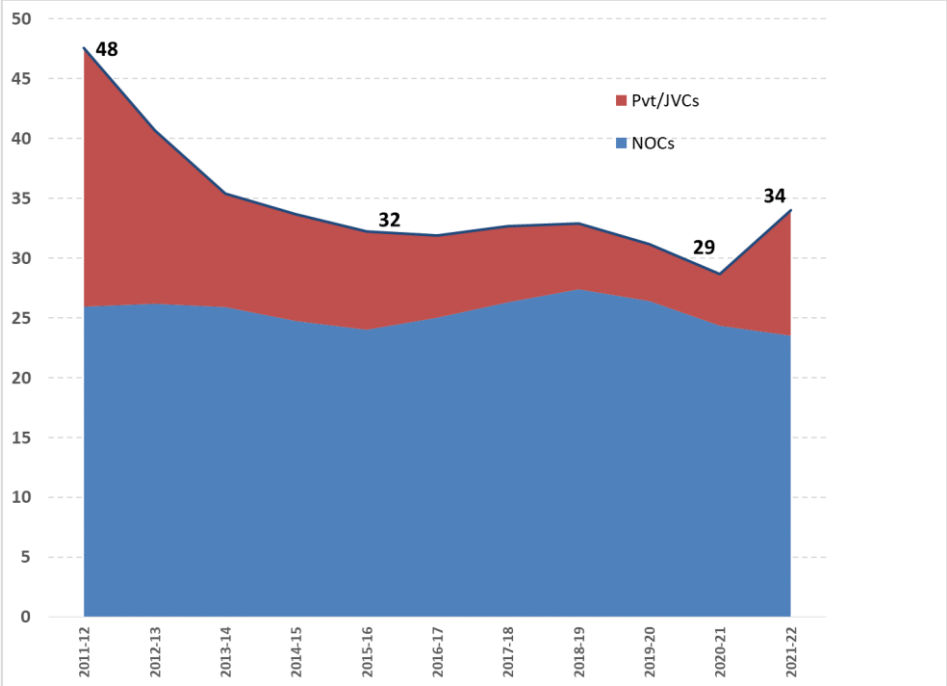
[25] IGX Website - https://www.igxindia.com/
[26] Please refer - https://mopng.gov.in/en/exp-and-prod/acts-rules, https://mopng.gov.in/en/exp-and-prod/psc



Source: MoPNG Annual Reports

Figure 4 shows the domestic gas supply over the last ten years.

Figure 4: Domestic Production (BCM)



Source: PPAC

Exploration and production activity has witnessed a further decline in the last two years due to the COVID pandemic. The supply of domestic gas also seems to have stagnated after the decline of production from KG D-6. However, in the last fiscal year domestic gas production increased by about 17 per cent as RIL-BP started production from some new fields from its KG D-6 block. While this

increase may not be solely attributable to the pricing reforms (as the upstream resource and state of the project also contributed to the rise in output), they seem to have played a key role.

One of the characteristics of the upstream industry is the long lead time required for each of its segments – exploration, development, and production. During the 2016-2021 period, Indian gas prices remained below USD4/MMBtu as the global indices (that determine these prices) remained low. This effectively did not provide much incentive to bring any additional volumes from the discovered fields. Difficult fields which qualify for the next level of prices (through price discovery subject to a ceiling) need a longer development period and RIL-BP developed their UDW R-Cluster blocks to start production in 2020. It is fair to summarise that gas price reform has impacted the gas market positively although given the initial low price period, the long lead times, and the pandemic, the impact has not been as much as anticipated.

These reforms correspond with some of the long-standing demands of the upstream players in addition to administrative issues of clearances, etc. The reforms have happened incrementally over the last twenty years, and it is quite likely that they will gather pace as the market starts to see more domestic gas volumes, albeit at higher prices. This is supported by greater exploration activity and improvements in the quality and availability of data.

In summary, since 2015 there have been several significant developments on the gas pricing front in India. The government has continued its approach of 'managing' the price for most of the gas supply from the pre-NELP and NELP supplies. However, there is now a transparent mechanism through a pricing formula for buyers and sellers to improve the visibility of gas prices. For more difficult upstream production (DW, UDW, and HPHT) a higher (than for those above) price discovery is possible albeit with a ceiling that is linked to imported fuels. Meanwhile, for marginal fields and CBM, this ceiling has been removed and the price can be discovered through e-auctioning. Finally, the development of a functioning gas exchange has brought transparency to gas sales and purchase, even though it currently only applies to a small portion of India's gas.

The OIES 2015 paper concluded that in terms of pricing, the most likely outcome going forward would be a continuation of the existing system, potentially incorporating some elements of a market-based price formation mechanism. In 2022, one can conclude that this has indeed been the case. However, policymakers can build on these measures to achieve a gas price formation mechanism that reflects market realities.

The next key reforms to watch out for in the gas market are whether the government will extend the pricing and marketing freedom to the large volume of gas that is still allocated and whose price is still determined by the formula, and whether or not the government will lift the price ceiling for difficult fields.

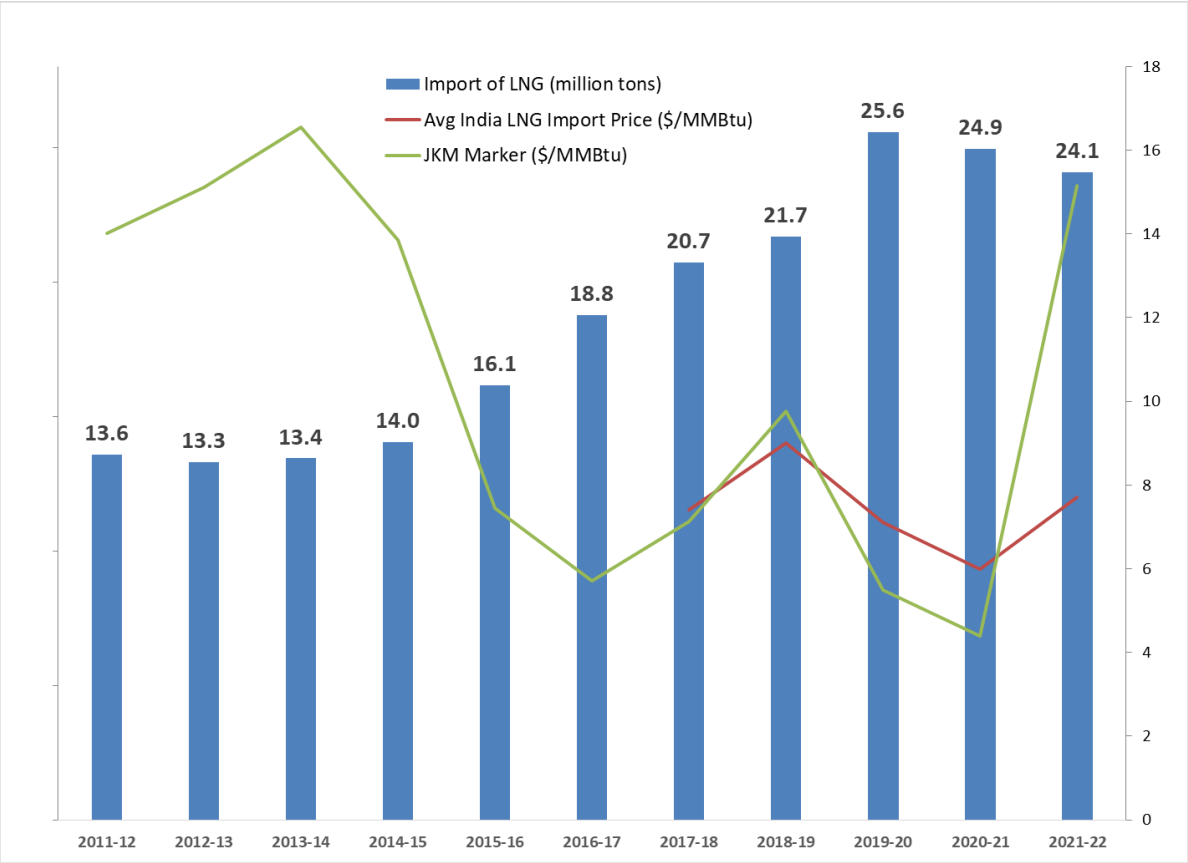
LNG imports - steadily increasing

India started importing LNG in 2004 when Petronet LNG started operating its terminal at Dahej. The Dahej terminal was a classic LNG deal characterized by long-term contracts. This was closely followed by Shell's terminal at neighbouring Hazira which was, by contrast, a merchant terminal. However, as the Indian economy did well over the next several years, both these terminals managed to prosper and expanded their import capacities further.

An initial import deal with Qatar followed after tough negotiations, and a fixed price was arrived at for the first five years. Given the long-term nature of the contract, the seller offered a pricing formula to soften the impact of any subsequent higher oil prices.

As players grew more confident that the Indian market could absorb LNG at market prices, the number of importers and terminals increased and consumption of LNG increased steadily. Figure 5 shows LNG consumption in the country over the last ten years.

Figure 5: Indian LNG Imports



Source: PPAC

India has six operating LNG terminals that import LNG from various sources through both long-term and short-term/spot contracts.

Table 1: India's Operating LNG terminals

	Owner	Capacity (MMTPA)
Dahej	Petronet LNG	17.5
Hazira	Shell	5
Kochi	Petronet LNG	5
Dabhol	GAIL	1.7
Mundra	GSPC LNG	5
Ennore	Indian Oil	5
	Total	39.2

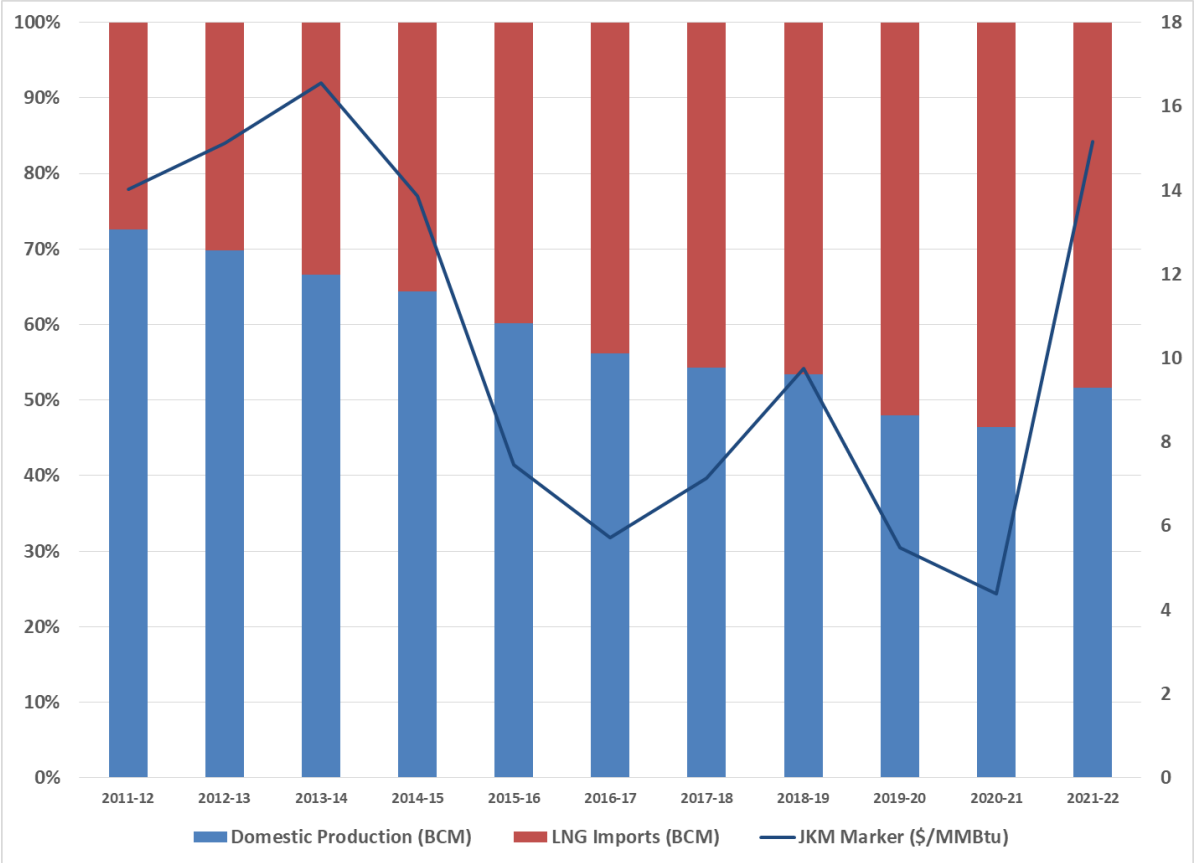
Source: MoPNG Annual Reports

While a large proportion of Indian LNG imports is through long-term contracts, players have been importing short-term/spot cargos as and when the market (read 'price') has been favourable, and primarily when they have been able to compete with oil products. Figure 6 shows the share of LNG in the total gas supply over the last ten years and the LNG marker prices. LNG now contributes 50 per

cent of Indian natural gas supply. Its increase in share seems to have been driven by the sharp decline in the KG D-6 production by 2012 and relatively 'lower' import prices in the intervening period.

An interesting point to note is that as the domestic gas price reforms start offering a better price to domestic gas suppliers, domestic gas production will rise and reduce the share of LNG in the overall supply. This happened in 2021-22 as RIL-BP's domestic output came to the market, reducing the share of LNG. It could be argued that this is just one data point. However, the pricing reforms do indicate this could happen more frequently in the near future which could be a good sign for the Indian upstream industry.

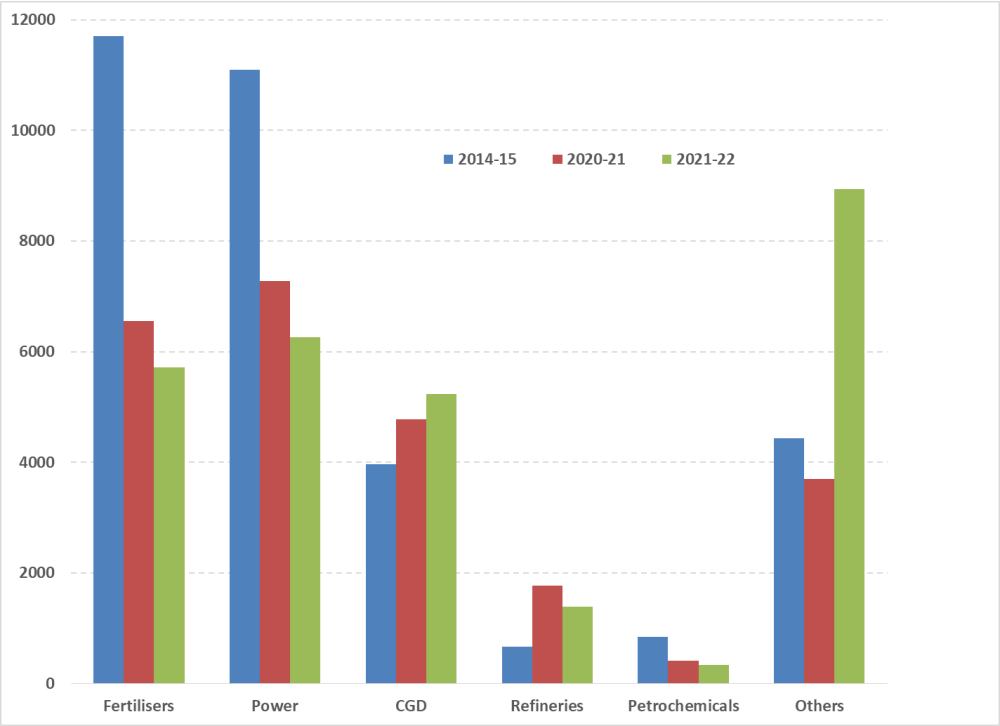
Figure 6: LNG Share in Gas Supplies



Source: PPAC, MoPNG Reports

Indeed, LNG use is price sensitive: with domestic gas being the cheapest, it is consumed first. So to the extent that domestic output can be raised, LNG imports will become less of a priority. That said, LNG will still be consumed in sectors where it has to be used, such as fertilisers, or where it is competitive with alternative fuels. In the transport sector, LNG will need to compete with diesel, while in industry it competes with LPG, naphtha, and fuel oil. The sectoral consumption of gas and LNG over the years has changed significantly, driven by price and affordability. Figure 7 shows domestic gas consumption by sector in 2014 compared to the two most recent years.

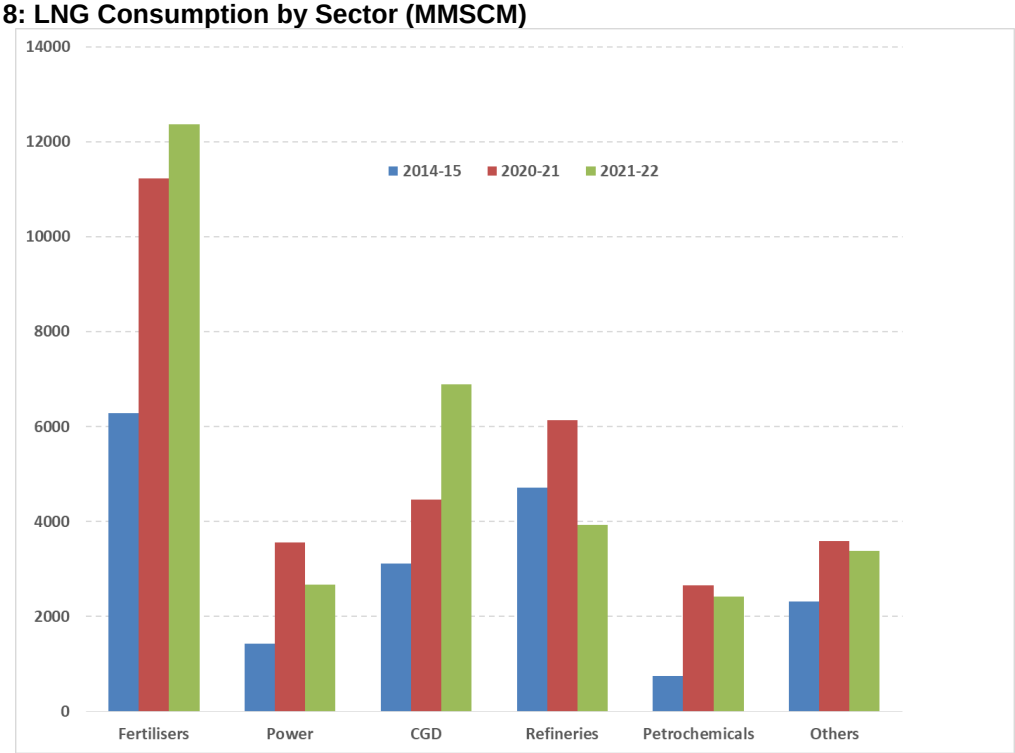
Figure 7: Domestic Gas Consumption by Sector (MMSCM)



Source: PPAC, MoPNG

Figure 8 shows the trend for LNG consumption over the same time frames.

Figure 8: LNG Consumption by Sector (MMSCM)



Source: PPAC, MoPNG

The consumption patterns of domestic gas and LNG highlight some interesting trends in the market.

First, the decline in the supply of domestic gas forced sectors such as fertilizers to switch to LNG, irrespective of the price, due to the inelasticity of its gas demand and the strategic nature of the industry. Secondly, the power sector - which is the most price-sensitive given the sector dynamics - has reduced its consumption significantly. This is possible due to large quantities of renewable energy coming into the grid in addition to the mainstay coal-based generation. Thirdly, the city gas distribution (CGD) sector has increased its share both of domestic gas and LNG. The reasons for this are twofold: higher allocation of domestic gas as the sector gets priority, and its ability to switch to LNG, especially for compressed natural gas (CNG).

Finally, an interesting change can be seen in the year 2021-22 when the consumption of domestic gas by others – primarily small industries –increased substantially. This is because the higher-priced domestic gas from new fields (e.g. RIL-BP's KG Basin field) was bought by these industries given their higher affordability.

The consumption dynamics may alter significantly if large volumes of gas are needed to provide flexible balancing power to the grid in order to absorb large intermittent renewable supplies. A similar impact could be seen if the government needs to provide a premium to natural gas for its cleaner profile to meet climate change and emissions commitments. For now, though, there is no indication from the government that it will tax coal heavily or seek to replace it with gas. On balance, there is a firm belief that battery storage and other flexible sources (hydro, counterbalancing generation profiles of RE, demand profiles, etc.) will be sufficient to manage intermittency in the power sector. As such, at the time of writing, there is no specific inclination to promote gas-based generation to balance the grid.

City Gas Distribution

The city gas distribution networks (CGD) were set up in urban areas by the oil companies (IOC, BPCL, HPCL) and gas marketers (GAIL, Gujarat Gas, BG) to supply gas for domestic/commercial consumers. However, in the late 1990s, they were boosted through judicial intervention when the Supreme Court of India mandated the reduction of air pollution in Delhi and Mumbai. This resulted in the introduction of vehicles running on CNG in these cities to replace diesel vehicles. In subsequent years, this template was adopted by many other cities which wanted to reduce air pollution and where natural gas was available.

Given the critical nature of CNG in transportation in urban areas, CGD also became a priority for the allocation of domestic gas.

While the input gas price to CGDs was regulated (as discussed in the pricing section), the consumer price was benchmarked with oil products like LPG and diesel. While both LPG and diesel prices were regulated by the government, CGD players could make a significant margin on CNG sales and this provided a good incentive for investments.

With the creation of the Petroleum and Natural Gas Regulatory Board (PNGRB) in 2006, the CGD sector came under its regulatory purview. However, the PNGRB did not have any power to regulate consumer prices. Its remit was restricted to the authorizing, monitoring the development of, regulating operations of, and pricing the network. The PNGRB accelerated the activity of bidding and awarding the CGD network, and the process also brought in players other than the oil companies and the gas marketers.

Post-2015, the focus and push on CGD investments increased significantly. One of the main reasons for this trend was the government's plan to provide piped gas to urban consumers and use the 'released' LPG for rural consumers who were either not using clean fuels or were not getting sufficient clean fuel. To incentivize the switch to LPG in rural areas, a cash Direct Benefit Transfer (DBT) was provided to consumers rather than a fuel subsidy. Improving air quality in urban areas constitutes another important objective in promoting CGD networks.

CGD companies are authorized to serve a defined geographical area (GA) by developing a network in that GA. The networks enjoy exclusivity for 25 years and 5 years for marketing to the consumers in that GA. The CGD entity serves households (piped natural gas), vehicles (CNG), commercial consumers

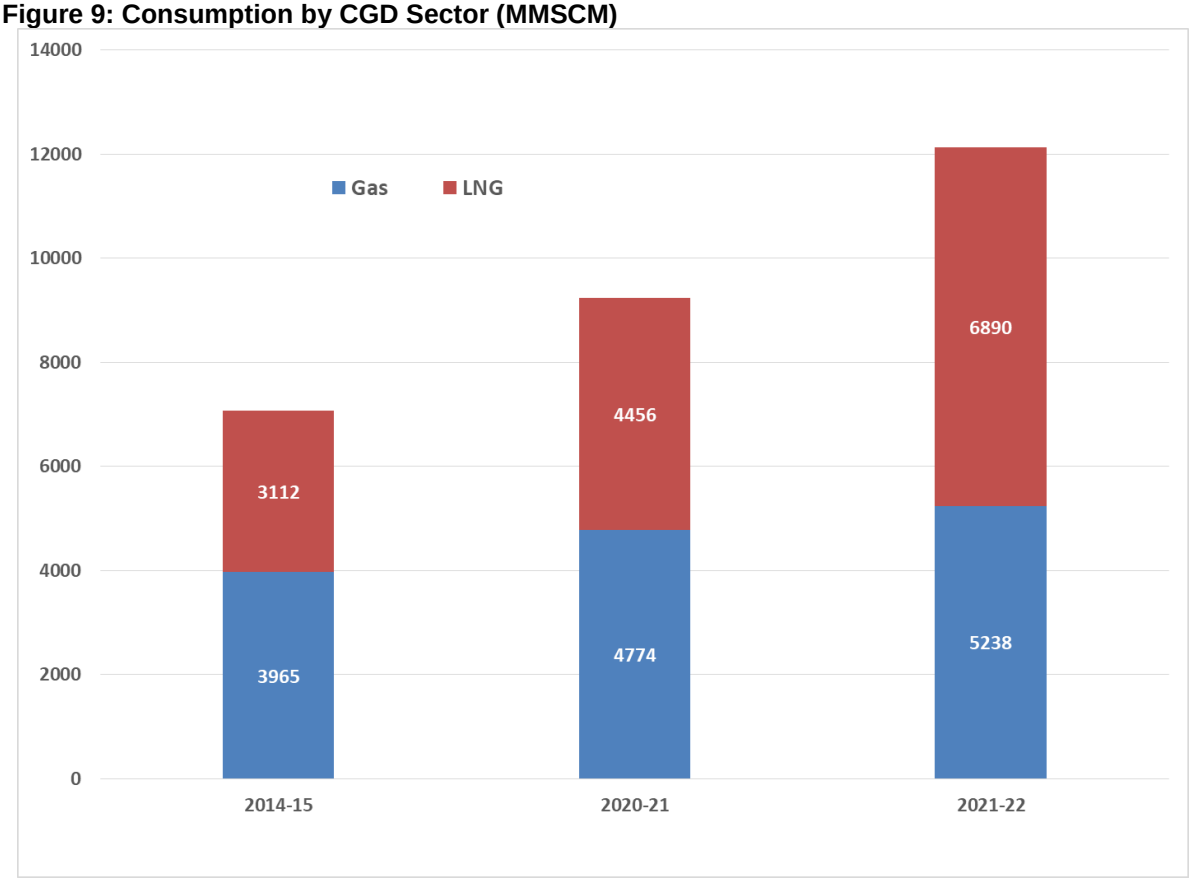
(e.g. restaurants), and small industries (consuming less than 50000 SCM/day). PNGRB conducts an elaborate bidding process to award GAs to a suitable entity.

The recent push has resulted in accelerated awards of GAs. The GAs have also become much bigger in terms of the area they cover, often encompassing a whole district. The following statistics indicate the extent of activity in this sector:

- Since 2015, 229 GAs have been awarded, of which 197 have been awarded in the last 3 years
- As of October 2021, CGD networks have connected 8.2 million households, 33000 commercial establishments, and 12500 small industries. The government had set the objective of connecting 10 million households to PNG by 2018.
- There are about 3400 CNG stations that supplied close to 2.5 million tons of CNG to vehicles in 2020-21.

This push for the development of the CGD networks is visible in the consumption growth as shown in Figure 9.

Figure 9: Consumption by CGD Sector (MMSCM)



Source: PPAC

In the absence of space heating demand, Indian CGD demand will continue to be slow to build. However, over the last few years, it has become the second-largest consumer of gas and LNG. The economics of CGDs enables them to absorb market-priced gas/LNG, unlike the power sector which can absorb only low-priced gas. It is therefore clear that demand from the CGD sector will be slow and steady, and can support market-priced domestic gas as well as LNG imports. However, the emerging electrification of transport in urban areas could be a threat to this growth.

Given that the future growth of gas consumption is likely to come from CGD, it is important to monitor CGD progress. Growth in consumption will be driven by the speed of CGD infrastructure build-out. CGD

demand however is not without challengers. The interplay between electrification of transportation through electric vehicles and the uptake of CNG will determine consumption growth. It is thus critical to monitor the dynamics of electric vehicles (EVs) versus CNG vehicles in urban areas. At the time of writing, government policies continue to promote EVs more actively than CNGs, but there is likely space for both to grow, especially since the EV charging infrastructure remains underdeveloped and relatively expensive.

SATAT Initiative

SATAT stands for Sustainable Alternative Towards Affordable Transportation. In 2018, the Indian government launched the SATAT scheme for generating Compressed Bio Gas (CBG). The scheme promotes the production of CBG from waste materials such as agricultural residue, cattle dung, sugarcane press mud, Municipal Solid Waste (MSW), and sewage treatment plant waste. SATAT enables efficient treatment and disposal of municipal solid waste and possibly reduces urban air pollution that emanates from farm stubble-burning.

Salient features of the SATAT scheme include:

- The production of 15 million tons of CBG from 5000 plants
- Entrepreneurs who set up CBG plants enter into a long-term agreement with the oil marketing companies to supply CBG to oil marketing companies for sale as automotive and industrial fuels
- The producer of the CBG has been assured a price equivalent to the CNG price for the first five years and a long-term offtake contract by the oil marketing company.

In the last 4 years, 3192 Letters of Intent have been issued to set up CBG plants, 28 plants have been commissioned, and around 5300 MT of CBG have been sold.

SATAT is a small but important initiative that will add CBG to the domestic supply sources. Since the CBG will be generated locally, it will come with the benefits of local generation and a less complex supply chain that produces energy at the consumption point. Plus it has added benefits of being a green source of energy. The scale of production will depend largely on the maturity of the technology over the next 3-5 years and the technology cost profile.

Taxes on natural gas

A small but important aspect of gas price for consumers is the multiple levels of taxes on gas. In July 2017, India introduced a Goods & Services Tax (GST) regime to simplify its tax structure by absorbing a variety of national, state, and local level taxes/levies into a single GST for a good or a service. GST was adopted to create one single national market for goods and services, and getting all the entities to agree to this structure was a huge task as it meant state and local governments relinquishing their power to levy tax. While a consensus was reached on shifting most goods and services to the GST regime, a few were excluded. These were the ones that the state/local governments realised contributed significantly to their tax kitty and therefore ones they wanted to retain their tax-setting power over.

Consequently, natural gas (and some other petroleum products) is still not included under the GST regime. At the same time, coal has been put under the GST regime in the 5 per cent tax bracket. This means that individual states are free to impose VAT on gas sales within the states. This has led to a situation where, in some states, gas gets taxed at 25 per cent, while coal enjoys a uniform tax rate of 5 per cent across all states. Similarly, there are other competing petroleum products like fuel oil which are also under GST and enjoy much lower, uniform tax rates. Efforts to bring gas under GST have not yet been successful, affecting its competitiveness with other fuels. Efforts are continuing to get a consensus among the states to bring gas under the GST.

Conclusions

What are the major policy developments?

As discussed in this paper, there have been quite a few major policy developments introduced in the Indian gas sector since 2015. They range from formula-driven prices for gas, allowing marketing and pricing freedom to (some) upstream producers, ease of doing business for operators through policies like HELP with OALP, and attracting investment in infrastructure like city gas distribution. A lot of these developments have been the result of long sought demands from the oil and gas sector.

India's energy strategy has been described by the former Minister of Petroleum and Natural Gas as follows: 'Our twin objectives are to enhance availability and affordability of clean fossil fuels and green fuels and to reduce the carbon footprint through a healthy mix of all commercially-viable energy sources. The guiding key enablers are energy availability and accessibility to all, energy affordability to the poorest of the poor, efficiency in energy use, energy sustainability to combat climate change as a responsible global citizen, and security for mitigating global uncertainties. Apart from renewable energy, India will focus on cleaner use of fossil fuels, greater reliance on domestic fuels to drive biofuels, increasing the contribution of electricity, moving into emerging fuels, like hydrogen and promoting digital innovation across all energy systems. Our energy agenda is inclusive, market-based and climate-sensitive. We have adopted multiple pathways for energy transition'.

This approach supports increasing domestic gas production and consumption. However, growth in gas consumption will be determined by its affordability. The policy changes discussed above have been in line with the approach to the energy security adopted by the government. Reforms in the energy sector, including in the oil and gas sector, have been a work in progress for many years, of which gas pricing and marketing reform have been among the most critical ones that have made progress over the last few years.

What has been the impact of these reforms on gas supply and consumption?

On the gas supply side, the exploration-development-production cycle requires a long lead time to deliver – typically 7-10 years. For most of the last seven years, exploration and production activity has been subdued due to low global prices and it saw a further decline during the COVID pandemic. The supply of domestic gas thus stagnated after the decline of production from KG D-6. In the last fiscal year (Apr 2021 – Mar 2022), gas production increased by about 17 per cent following new fields coming into production. This is likely to be the result of the positive impact of the reforms, primarily the pricing reforms aided by the freedom to market gas. It can also be expected that exploration and production will pick up going forward.

Meanwhile, consumption has also been impacted by the pricing reforms, with increasing gas prices leading to a significant reduction in gas use in sectors such as power generation. Consumption by the CGD sector, however, has increased given that it can absorb higher-priced gas including LNG.

While the reforms will have a positive impact on the natural gas sector in general by increasing domestic supply and consumption, changes in consumption patterns will impact this pace of development. For instance, as domestic gas supply increases, the fertiliser sector will absorb more domestic output, even at a higher price, while the power sector is more flexible and price sensitive.

India's desire to increase the share of natural gas in primary energy to 15 per cent by 2030 can be met only if the power sector becomes a major consumer of gas. Given the dynamics of the power sector in India and the inroads made by renewable energy, that is possible only in a prolonged low gas price scenario. Some detailed studies that have been carried out recently indicate that even in such a

scenario, the share of natural gas would rise to only 16-18 per cent by 2040[27] , thus even with low gas prices, the 15 per cent target would be missed.[28]

However, these studies also point out that gas is not as effective as renewable energy in reducing carbon emissions. So in a carbon-constrained scenario, gas loses its place to renewable energy. Thus the share of natural gas in the Indian primary energy mix is expected to rise slowly.

While it is almost certain that the gas price will increase at least in the short term, it is unlikely that the government will subsidise it. The current government seems to be in favour of giving subsidies directly to the consumer rather than subsidising commodities.[29] It is likely that reforms will continue with the greater aim of increasing domestic supplies. However, as brought out in this paper, there is a clear trend of gas consumption increasing in sectors like CGD which can consume market-priced gas and this trend can be expected to continue.

As pointed out earlier, increasing domestic gas supply inevitably requires long lead times, and the positive impact of price reforms on the upstream will take time to play out. That said, all the major policy developments discussed in this paper will certainly support the overall development of domestic supplies. As the OIES 2015 paper highlights, between gas prices of USD 8 - 10/MMBtu, up to 55 Tcf of new commercial production can be unlocked, provided everything else remains supportive.[30] The last seven years have seen positive developments for the upstream sector and the results should soon become evident.

[27] Energising India – NITI Aayog & IEEJ, 2017
[28] CEEW (https://www.ceew.in/sites/default/files/natural-gas-sector-future-prices-and-investments-in-india.pdf)
[29] For example, the direct transfer of LPG subsidy to consumers, removal of subsidy on diesel, etc.
[30] Fiscal regime, clearances, continuity of policies, etc.