Market Intelligence
& Analytics

CRISIL
An S&P Global Company

City gas distribution market assessment

IRM Energy

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Consulting

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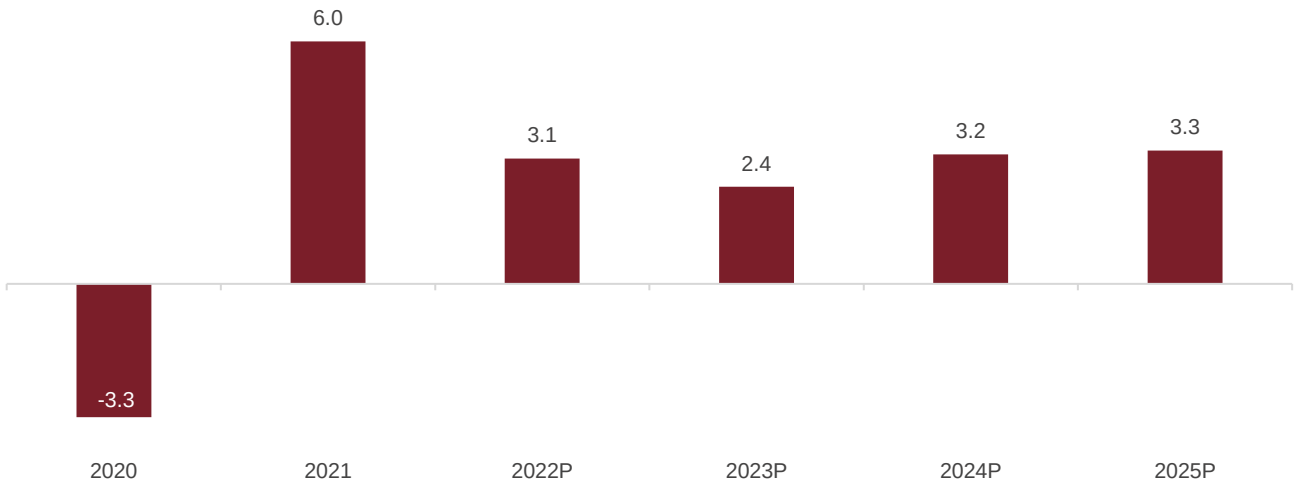
1 Global economic outlook

- S&P Global projects global gross domestic product (GDP) to grow at 3.1% in calendar year 2022 and 2.4% in 2023. In September 2022, it lowered its growth forecasts. Rising interest rates, the unprecedented European energy crisis, and the lingering effects of Covid-19 are battering growth across geographies, though Asia-Pacific remains a relative outperformer.
- S&P Global expects the economic impact of the Russia-Ukraine conflict to peak in 2022, but drag on amid on-again, off-again fighting. Financial conditions are tightening as central banks have raised rates quickly, foreshadowing slower growth. Most leading and sentiment indicators are pointing toward slower growth as well.
- Eurozone is forecast to take the biggest hit to growth, given its proximity to the war zone and higher exposure to volatile global energy costs. S&P Global expect a sharp slowdown in eurozone growth in 2023. An unprecedented deterioration in the terms of trade has also pushed inflation to record highs.
- Most Asia-Pacific countries have internalised Covid-19 and seem to be gaining pace in industrial activity. But they remain affected by volatile commodity prices. Core inflation has shot up in some Asia-Pacific economies, less so in others. It has soared in Australia, South Korea, and New Zealand, and remains high in India. On the other hand, it has stayed low in China and Japan, and modest in Hong Kong, Indonesia, Malaysia, Taiwan, and Thailand.

Figure 1: Expected growth rate in global GDP (%)



P: Projected

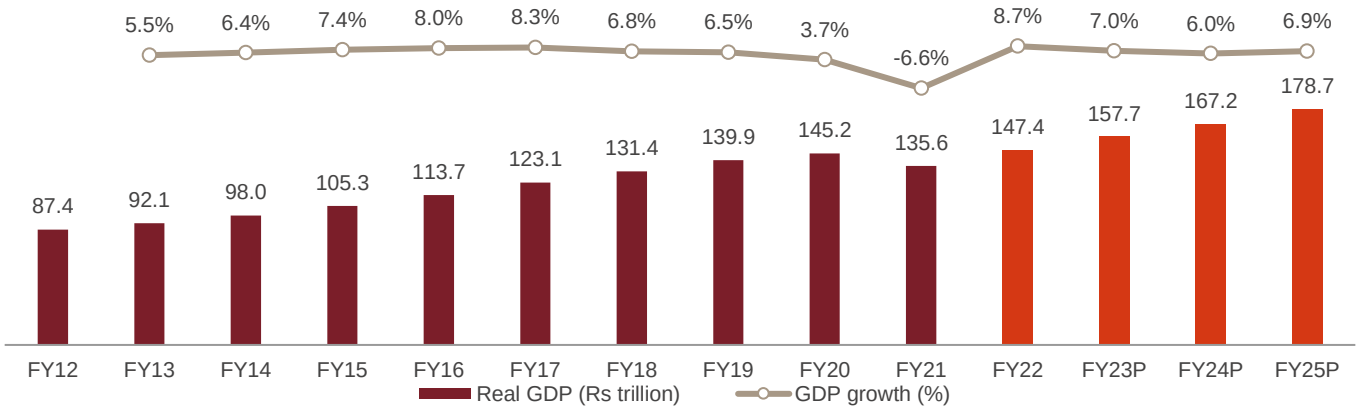
Source: S&P Global, Oxford Economics

2 Overview of India's socio-economic landscape

2.1 India's Macro-economic scenario

India is expected to grow at a faster clip than its peers, driven by stronger domestic demand. Investment prospects are optimistic given the government's capex push, progress of the Production-Linked Incentive (PLI) scheme, healthier corporate balance sheets, and a well-capitalized banking sector with low non-performing assets (NPAs). That said, CRISIL MI&A Consulting has recently revised its real GDP growth projection for India to 7% this fiscal, with downside risks of heightened geopolitical tensions. It still expects India to remain the fastest-growing economy.

Figure 2: India GDP outlook



P: Projected

Source: CRISIL MI&A Consulting, Central Statistics Office (CSO), S&P Global and Oxford Economics

2.1.1 Factors that will shape growth this fiscal and next

Three factors will play a prominent role.

- The global slowdown will impact domestic industrial activity through the exports channel
- The one-time lift to contact-based services from domestic demand will abate next fiscal, but government capex will stay supportive
- Tightening domestic financial conditions will hurt growth next fiscal

2.1.2 Macroeconomic indicators snapshot

Table 1: Key projections

Indicators	FY17	FY18	FY19	FY20	FY21	FY22	FY23P	FY24P
Real GDP growth (%)	**8.3**	**6.8**	**6.5**	**3.7**	**-6.6**	**8.7**	**7.0**	**6.0**
CPI[1] (%, average)	4.5	3.6	3.4	4.8	6.2	5.5	6.8	5.2
CAD[2]/GDP (%)	-0.7	-1.8	-2.1	-0.9	0.9	1.2	3.0	2.7
FAD[3]/GDP (%)	3.5	3.5	3.4	4.6	9.2	6.9	6.4	9.0
Exchange rate (Rs/$, March-end)	65.9	65.0	69.5	74.4	72.8	76.2	78.0	82.0
10-year G-sec yield (%, March-end)	6.8	7.6	7.5	6.2	6.2	6.8	7.5	7.4

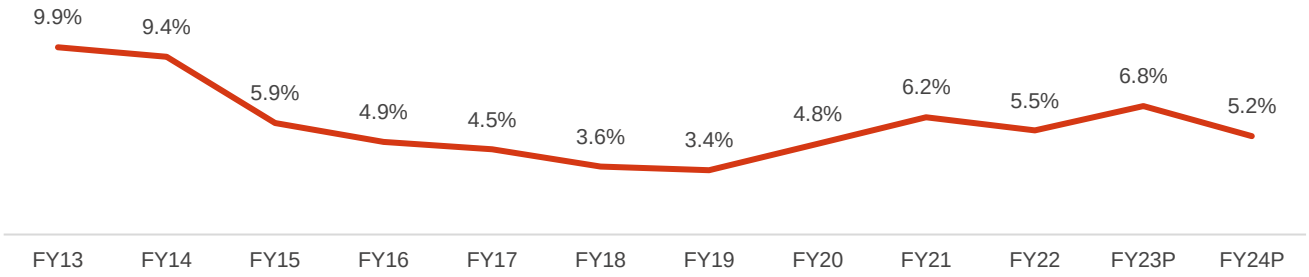
P: Projected; [1] Consumer price index [2] Current account deficit [3] Fiscal deficit

Source: CSO, RBI, CRISIL MI&A Consulting, S&P Global

2.1.3 Inflationary pressures set to rise and broaden this fiscal

Consumer price index (CPI) inflation moderated to 5.5% in fiscal 2022 from 6.2% the previous year. However, the fall was largely driven by food (3.8% vs 7.7%). The other two components, viz., fuel (11.3% vs 2.7%) and core (6.0% vs 5.5%) saw inflation rise. Fuel inflation is projected to stay high due to the sharp rise in crude oil prices. CRISIL expect CPI inflation to come in at 6.8%, on average, this fiscal.

Figure 3: CPI inflation (%, y-o-y)



P: Projected

Source: CSO, CRISIL MI&A Consulting

2.1.4 Rising oil and commodity prices to push up CAD

Geo-political developments in the fourth quarter of fiscal 2022 led to a spike in crude and commodity prices. CRISIL estimated India's CAD at 1.6% of GDP for fiscal 2022. This is projected to widen to 3% in fiscal 2023, with imports becoming costlier owing to higher commodity prices, while exports face slowing external demand.

2.2 India's growth vis-à-vis other economies

Table 2: GDP growth forecast of major economies

Country/Region	2021	2022	2023P	2024P	2025P
India	-6.6%	8.7%	7.0%	6.0%	6.9%
US	5.7%	1.6%	0.2%	1.6%	1.9%
Eurozone	5.2%	3.1%	0.3%	1.8%	1.7%
China	8.1%	2.7%	4.7%	4.8%	4.7%
Japan	1.7%	1.6%	1.4%	1.4%	1.3%
Brazil	5.0%	2.5%	0.6%	2.0%	2.1%

P: Projected

Note: For India, growth projections are for fiscal years

Source: S&P Global, CRISIL MI&A Consulting

Table 3: Growth outlook of major economies

Country	Growth outlook
US	S&P Global forecasts GDP growth at 1.6% for 2022 and 0.2% for 2023, as it expects the economy to fall into a shallow recession in the first half of 2023. Inflation likely peaked in third quarter of 2022 but will remain high on continued supply-chain disruptions. The US Federal Reserve (Fed) is expected to keep monetary policy tight until inflation begins to moderate in the second half of 2023.
Eurozone	S&P Global expects the eurozone to be hit hardest by the war, with higher energy prices as the key trigger of growth slowdown. Consumer price inflation is projected at 8.2% this year and 5.2% in 2023 on the back of higher energy and food prices. Lower international demand, particularly from China, is also expected to dampen growth.
China	Momentum continues to be soft as fresh Covid-19 outbreaks and associated restrictions affect activity again, particularly in the services sector. China's recovery should remain muted through the first quarter of 2023 amid a largely unchanged Covid-19 stance and weak property sector. The government has lowered its growth targets as it prioritises a zero Covid strategy for now, while policy support remains modest.
Japan	Japan's economy has picked up with the impact of Covid-19 waning, despite being affected by factors such as rise in commodity prices. Private consumption has increased moderately, particularly of services. S&P Global expect the economy to grow at 1.6% in 2022 and 1.4% in 2023
Brazil	GDP projections have been lowered because of the impact of supply-chain disruptions on manufacturing, abrupt monetary policy tightening in the face of persistently high inflation, and a more challenging fiscal scenario. S&P Global expect inflation to stay above the central bank's target through the rest of 2022 and in 2023 as well, which will prompt the central bank to keep real interest rates relatively high throughout that period.

Source: S&P Global, CRISIL MI&A Consulting

3 Government focus on transition to a gas-based economy

3.1 Target to raise natural gas share in energy mix to 15% by 2030

India is not only third-largest energy consumer in the world after China and the US but also one of the fastest growing energy consumers among its peers. Moreover, India has annually been reiterating its commitment to bring down carbon emissions as pledged at the Paris Agreement. The share of natural gas in India's primary energy mix has increased from 6.3% in 2020 to 6.7% 2021. This is still way below the global average share of 24%, in the global energy use.

3.1.1 Development of National Gas Grid

The Indian government has been consistently taking steps to develop natural gas infrastructure across the country. As of June 30, 2022, the country had 21,946 km of natural gas pipelines in operation. It also plans to develop a vibrant gas market across the country through 13,262 km of additional pipelines, to complete the National Gas Grid (NGG). Development of the NGG would connect all the major demand and supply centres in India. In addition, the government is taking various measures to promote use and distributorship of liquified natural gas (LNG) through establishment/capacity enhancements of LNG terminals and regasification. It aims to create regasification capacity of 70 mmtpa (million metric ton per annum) by 2030 and 100 mmtpa by 2040.

3.1.2 Policy measures

Since 2014, the government has taken various steps through policy interventions and monetary support to promote use of natural gas in midstream and downstream sectors and maximise the coverage of natural gas among the country's population. Some of these measures are outlined below:

Upstream sector

- Introduction of new domestic natural gas pricing guidelines in 2014 to market link price of domestic natural gas to international gas prices
- Introduction of hydrocarbon exploration and licensing policy (HELP)/open acreage licensing policy (OLAP) replacing new exploration licensing policy (NELP). The NELP policy was aimed at enhancing transparency and reducing administrative discretion.
- Marketing freedom including pricing freedom for gas procured from discoveries in high pressure high temperature (HPHT), deep water, and ultra-deep water in 2016, subject to ceiling price based on landed alternative fuel
- Pricing and marketing freedom to producers of natural gas from coal seams (coal bed methane) in 2017

Midstream sector

- The government has identified the requirement for development of additional pipeline networks to complete the gas grid. The Petroleum and Natural Gas Regulatory Board (PNGRB) has authorised pipelines, which are at various stages of execution.
- Formation of a joint venture (JV) company, viz., Indradhanush Gas Grid Ltd, to develop Northeast India Gas Grid (~1,656 km) in a phased manner at an estimated cost of Rs 9,265 crore.

Downstream sector

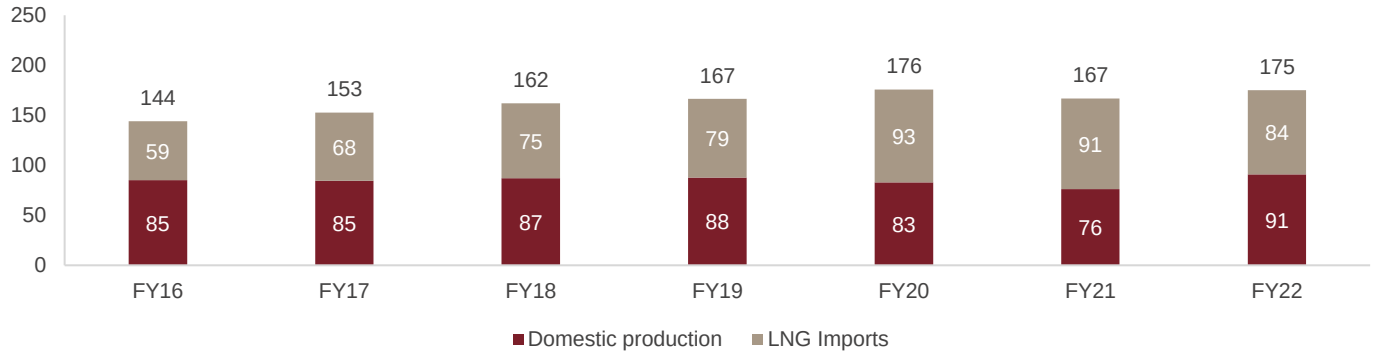
- After the completion of 11 and 11A CGD bidding rounds by PNGRB, the CGD network should potentially cover 98% of population and 88% of geographical area of the country including smart cities situated within the GAs.
- The government has given priority in allocation of domestic gas (the cheapest gas available in country) for supply to households in the form of piped natural gas (PNG - domestic) and transport segment in the form of compressed natural gas (CNG - transport) across the country.

4 Overview of and outlook on natural gas market in India

Natural gas consumption in India clocked a compound annual growth rate (CAGR) of 3.8% between fiscals 2016 and 2020, rising to ~176 mmscmd in fiscal 2020. However, it dipped 5% in fiscal 2021 due to Covid-19 related challenges such as constrained transportation and industrial activities.

Demand rose again ~4.8% in fiscal 2022. Growth was driven by higher offtake from end-use industries as economic and industrial activity and personal mobility gained traction. Segments such as CGD saw healthy growth. However, demand from the power segment declined as higher LNG prices affected the load factor (PLF) of gas-based power plants. Natural gas demand is estimated to increase in fiscal 2023, driven by strong growth in the CGD and fertiliser sectors.

Figure 4: Review of natural gas consumption in India (mmscmd, FY16-FY22)



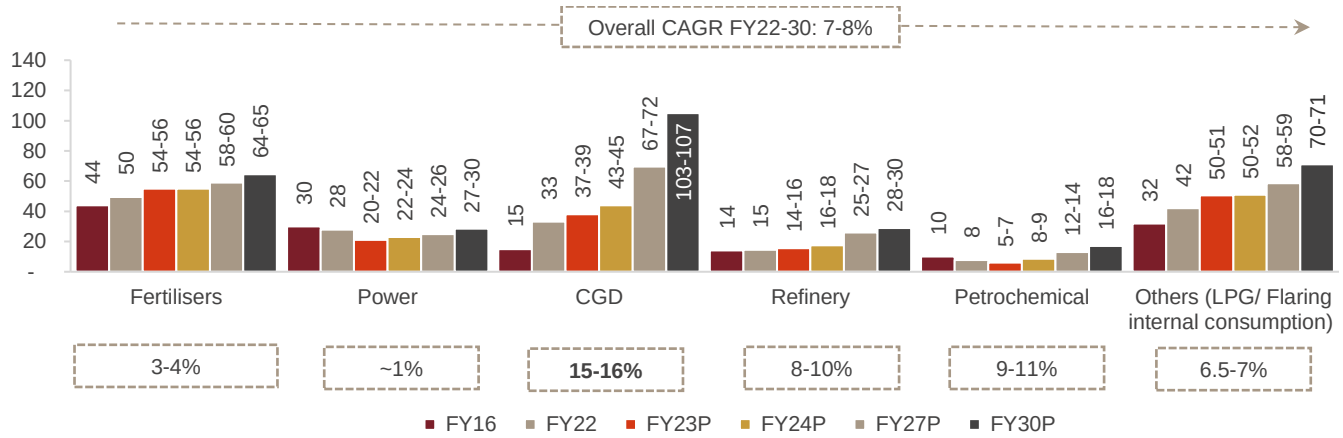
Note: Sum of net production (available for consumption) and LNG imports

Source: Ministry of Petroleum and Natural Gas (MoPNG), Petroleum Planning & Analysis Cell (PPAC)

4.1 Demand by end-user industries

The fertiliser, CGD and power sectors accounted for ~63% of the total gas consumption of ~175 mmscmd in fiscal 2022. Fertilisers had the maximum share of 28%. CRISIL MI&A Consulting expects demand for natural gas to increase at 7-8% CAGR to 309-320 mmscmd between fiscals 2022 and 2030. We expect the CGD network and fertiliser units to fuel demand because of improved domestic gas supply and governmental policy/financial support.

Figure 5: Sector-wise natural gas demand outlook, FY22-30 (mmscmd)



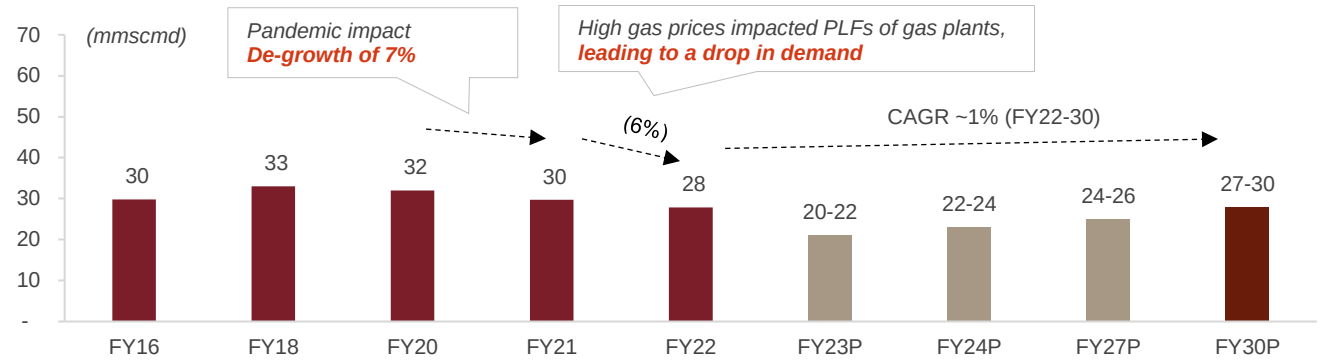
P: Projected

Source: MoPNG, PPAC, CRISIL MI&A Consulting

4.1.1 Power

Demand from power sector is highly price sensitive. This has become more pronounced with declining domestic gas production, coupled with lack of priority for the sector in domestic gas allocation. The sector's dependency on imported gas (re-gasified LNG, or RLNG) is also on the rise. The share of RLNG in power sector increased from 5% in fiscal 2016 to 26% in fiscal 2022.

Figure 6: Power - natural gas demand outlook, FY22-30 (mmscmd)



P: Projected

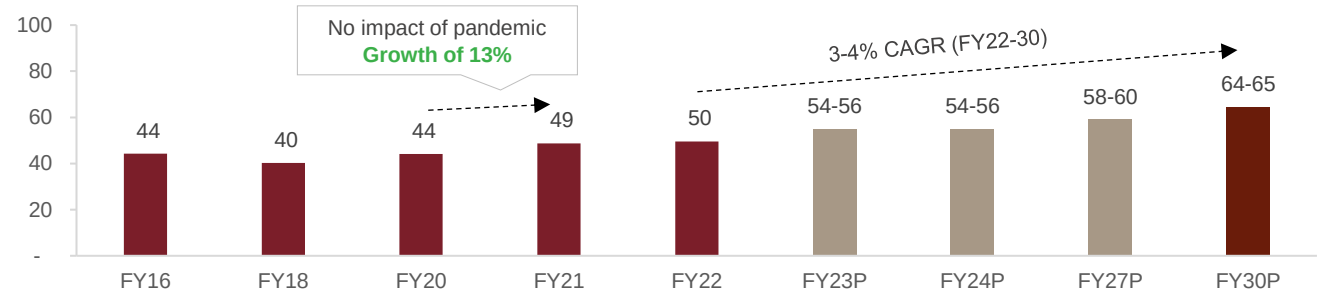
Source: MoPNG, PPAC, CRISIL MI&A Consulting

Natural gas demand fell in fiscals 2021 and 2022 when consumption dropped. Demand is expected to log 1% CAGR between fiscals 2022 and 2030. PLF of gas-based power plants is expected to increase marginally to ~20% by fiscal 2027 from low levels of 16.5% in fiscal 2022. Dependence on RLNG is expected to continue, given the power sector comes third after CGD and fertilisers in terms of priority for domestic gas allocation.

4.1.2 Fertilisers

This sector is the largest and most sustainable driver of natural gas demand in India. Currently, there are 32 units producing agriculture grade urea, with a capacity of 25.5 million tonne (MT). Raw materials required for urea manufacturing are carbon dioxide and ammonia. Ammonia is produced from natural gas or LNG. Natural gas forms ~70-80% of the cost for urea production.

Figure 7: Fertilisers - natural gas demand outlook, FY22-30 (mmscmd)



P: Projected

Note: mmscmd (million metric standard cubic meter per day)

Source: MoPNG, PPAC, CRISIL MI&A Consulting

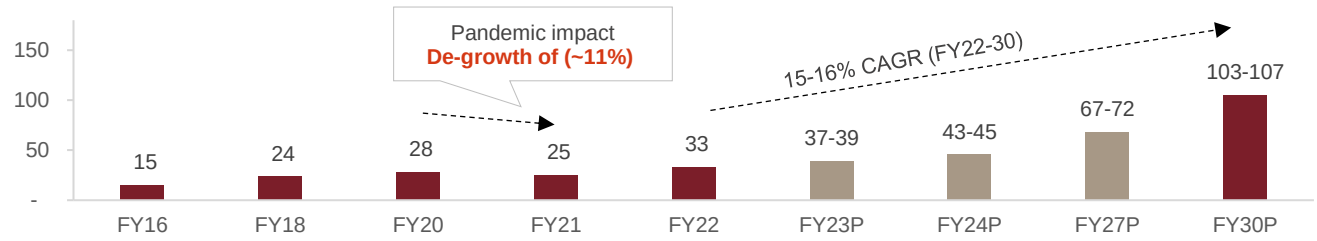
In fiscal 2023, demand from fertilisers segment is expected to grow at a healthy pace of 7-9%, driven by a rise in urea production led by revival of two natural gas-based urea plants with a total capacity of 2.6 million tons per annum and the ramping up of Ramagundam and Gorakhpur urea plants. Moreover, expectation of normal monsoon leading to good crop output

and higher urea production, will also support growth. The government is also trying to revive sick urea units in Sindri, Gorakhpur, Talcher and Barauni over the next five years. The Jagdishpur-Haldia pipeline has already reached Barauni and Gorakhpur and is expected to reach Sindri this fiscal. CRISIL MI&A Consultingforecasts natural gas demand from the fertiliser sector to increase to 64-65 mmscmd in fiscal 2030 from ~50 mmscmd in fiscal 2022, at 3-4% CAGR.

4.1.3 CGD

Demand from the CGD segment was the major driver for growth in gas demand in fiscal 2022. The segment reported ~32% year-on-year growth, over the low base of fiscal 2021 when the demand was impacted by pandemic. CRISIL MI&A Consulting expects natural gas demand from the CGD sector to log 15-16% CAGR between fiscals 2022 and 2030, growing to 103-107 mmscmd. Demand from each sub-segment, including CNG and PNG (domestic and industrial), is likely to grow at a healthy pace over the forecast period, with an expansion in the gas network to more cities. Increase in penetration is expected to be a key demand driver for the PNG and CNG segment. The pace of development of the CGD network would be another key determinant of growth, going forward.

Figure 8: CGD - natural gas demand outlook, FY22-30 (mmscmd)

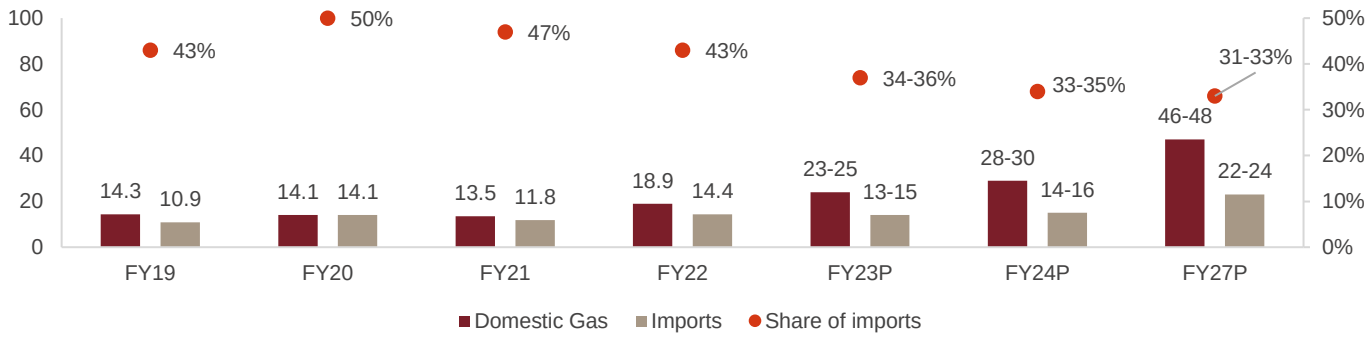


P: Projected

Source: MoPNG, PPAC, CRISIL MI&A Consulting

Rising demand in the CGD segment has led to greater dependence on both domestic gas and imported gas. Demand from the CGD segment (domestic and transport) is expected to be majorly met by domestic gas, as it comes first in the priority list for allocation. As these segments are expected to form ~70% of the overall CGD demand in fiscal 2030, the remaining, i.e., industrial, and commercial demand for CGD (~30% of overall demand) will be met through RLNG in fiscal 2030. Major factors that would drive growth in CGD volumes are expanding geographical coverage and improving cost competitiveness of gas. Assured domestic gas supply would aid competitiveness and drive gas demand for CNG and domestic PNG. While regulatory restrictions and growing awareness of cleaner fuel are expected to aid in fuel conversion in industrial segment.

Figure 9: Share of domestic gas vs imported gas in CGD, FY22-30 (mmscmd)



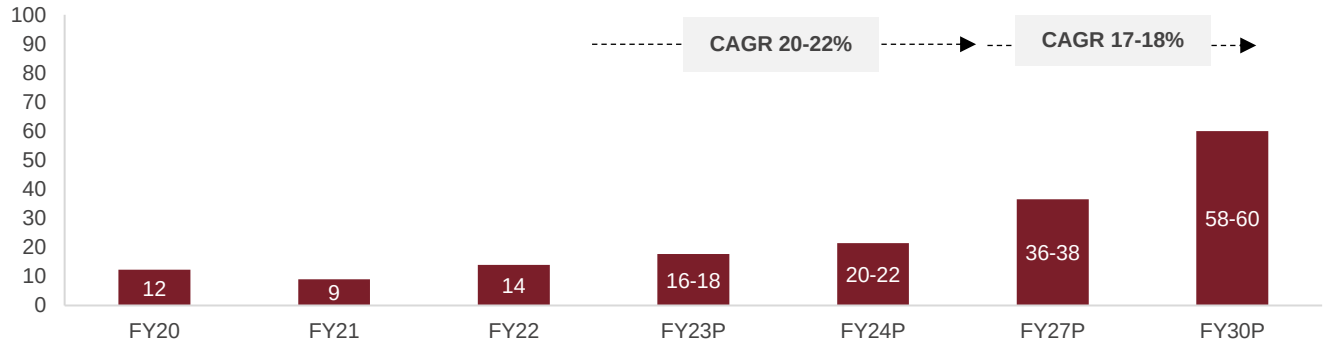
P: Projected

Source: MoPNG, PPAC, CRISIL MI&A Consulting

RLNG accounted for ~43% of CGD demand in fiscal 2022 and ~47% in fiscal 2021.

4.1.4 CGD demand outlook by segments

Figure 10: Outlook on CNG demand (mmscmd)

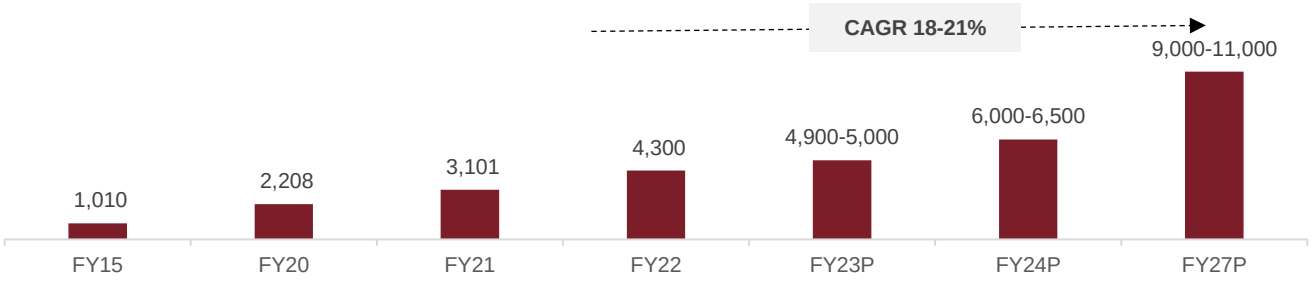


P: Projected

Source: CRISIL MI&A Consulting

The CNG segment is expected to register a healthy CAGR of 20-22% between fiscals 2022 and 2027, driven by cost competitiveness of CNG vis-à-vis petrol. As CNG directly competes with petrol in the vehicle segment, conversion from petrol to CNG would continue during the forecast period, given the cost advantage. CNG stations has increased at a healthy CAGR of 39.6% between fiscals 2020 and 2022, supporting faster adoption of CNG vehicles across various segments with OEM's launching CNG vehicles to address the demand. CNG adoption in three-wheelers is estimated to have almost doubled from 28% in fiscal 2021 to 54% in fiscal 2022. CNG adoption in light commercial vehicles (LCVs) is expected to increase to 19-21% in fiscal 2023 from 7% in fiscal 2021.

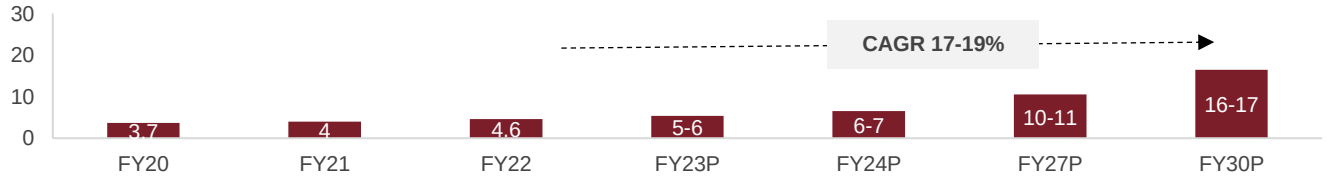
Figure 11: CNG stations development



P: Projected

Source: MoPNG, PPAC, CRISIL MI&A Consulting

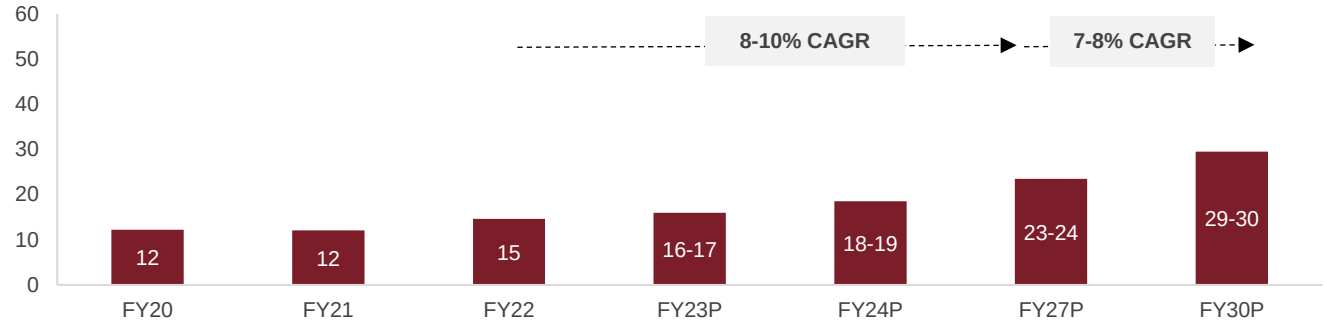
Figure 12: Outlook on domestic PNG demand (mmscmd)



P: Projected Source: CRISIL MI&A Consulting

Total household PNG connections are expected to surge from ~78.2 lakh as of fiscal 2021 to 190-200 lakh by fiscal 2026 due to increasing CGD penetration in newer areas and the government's push to increase gas consumption. This number will further multiply with the CGD network covering Andhra Pradesh, Tamil Nadu, Telangana, West Bengal, etc, between fiscals 2025 and 2030. Moreover, consumption per connection should increase due to rising disposable income and economic growth. Consequently, demand from the domestic segment is projected to log a 17-19% CAGR between fiscals 2022 and 2030.

Figure 13: Demand from industrial and commercial segments (mmscmd)



P: Projected

Source: CRISIL MI&A Consulting

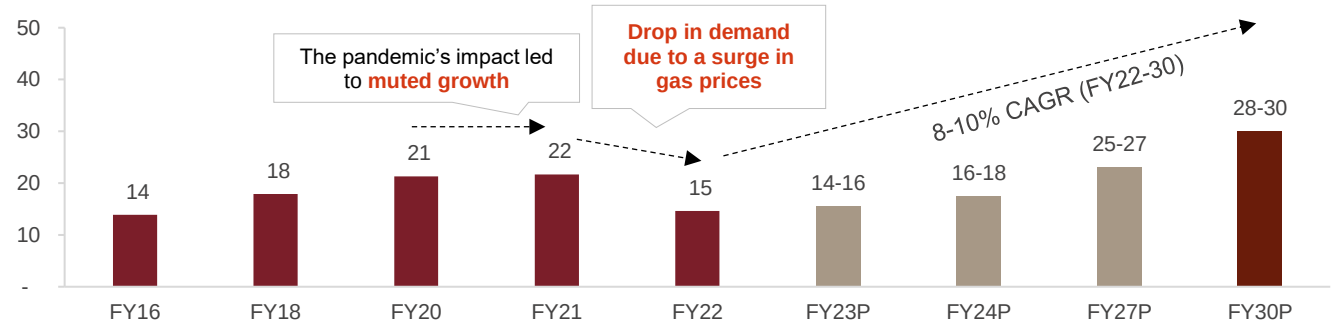
CRISIL MI&A Consulting expects industrial PNG demand to clock an 8-10% CAGR between fiscals 2022 and 2027, with demand stabilising at a 7-8% CAGR between fiscals 2027 and 2030. Newer geographical areas (GAs) will have a lower share in industrial demand over the long term, as the major industrial regions, such as Gujarat, Maharashtra, and Delhi, have already shifted to PNG. However, long-term demand growth from the commercial segment could remain healthy.

4.1.5 Availability of gas through new LNG terminals for priority sectors

Pipeline connectivity to LNG terminals provide CGD entities an opportunity to source LNG for providing natural gas to areas where laying infrastructure is a challenge. Further, CGD entities have revamped the gas distribution model to reach consumers faster by transporting and storing LNG in hubs and further distributing it onwards in the defined geographical area.

4.1.6 Refineries

Figure 14: Refineries: Natural gas demand outlook for FY22-30 (mmscmd)



P: Projected

Source: MoPNG, PPAC, CRISIL MI&A Consulting

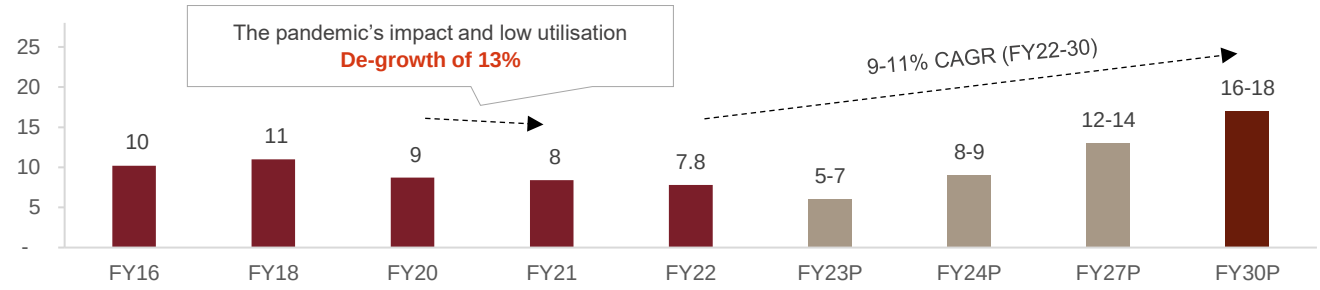
CRISIL MI&A Consulting expects gas demand to grow at a CAGR of 8-10% during fiscals 2022 and 2030. Natural gas competes with naphtha in hydrogen plants and liquid fuels (fuel oil and LNG) for power and heat generation. We expect natural

gas consumption by refineries to increase with new LNG import terminals, better pipeline infrastructure and last-mile connectivity to refineries. Going forward, CRISIL expects refineries such as Haldia and Paradip to be connected to gas pipeline infrastructure after commissioning of the regasification terminal in Dhamra.

4.1.7 Petrochemicals

The petrochemical sector is one of the fastest growing sectors primarily because of increasing use of plastics, which is also the major demand driver for the sector. A strong demand profile indicates robust gas demand potential from the sector. However, the sector does not receive any priority allocation of domestic gas production and hence primarily relies on LNG. CRISIL Research expects demand for natural gas from the petrochemical sector to increase 9-11% between fiscals 2022 and 2030, because of capacity addition at HMEL, Bhatinda (a dual-feed cracker with ethylene capacity, which is expected to come online by the end of fiscal 2023), and HPCL, Barmer (dual-feed capacity expected to be commissioned in fiscal 2025) during the forecast period.

Figure 15: Petrochemicals: Natural gas demand outlook for FY22-30 (mmscmd)



P: Projected

Source: MoPNG, PPAC, CRISIL MI&A Consulting

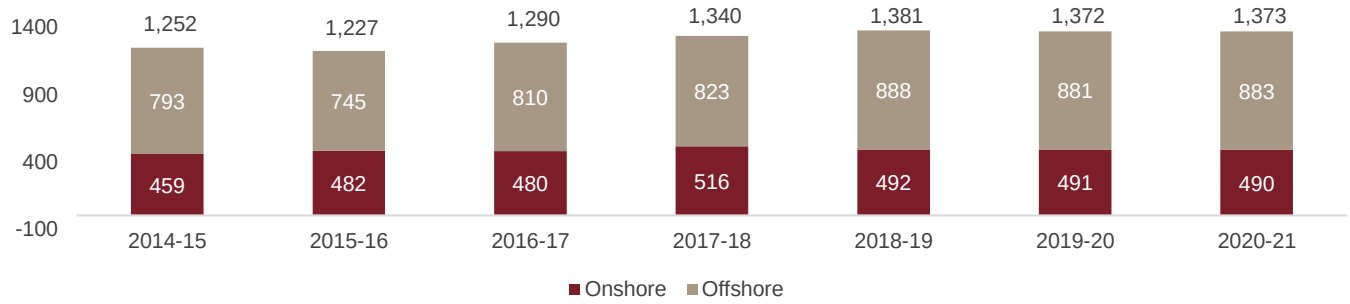
Over the next five years, capacity additions in petrochemicals and methanol by Assam Petro-Chemicals would support demand for natural gas from petrochemicals. In fiscal 2023, gas consumption is expected to decline 19-21% as higher gas prices will reduce gas competitiveness vis-à-vis naphtha, thereby restricting any steep rise in gas demand from the petrochemical segment. Since refineries come under non-priority sectors for domestic gas allocation, we believe gas demand from this sector will be entirely met through imports by fiscal 2030.

4.2 Gas supply and infrastructure

4.2.1 Domestic natural gas reserves

India's total proven reserves of natural gas were estimated at 1,373 billion cubic meters (bcm) as of fiscal 2021, with 64% located in offshore gas fields. Moreover, natural gas discoveries have been made by Reliance Industries Ltd. (RIL), ONGC and Gujarat State Petroleum Corporation Ltd (GSPC) in the offshore Krishna-Godavari (KG) basin area of Andhra Pradesh. Onshore reserves are primarily located in Rajasthan and the north-eastern states of Assam, Nagaland, Arunachal Pradesh, and Tripura.

Figure 16: Natural gas – domestic reserves (bcm)



Note: 1 bcm = 2.74 mmscmd

Source: PNG statistics 2020-21

4.2.2 Gas production review

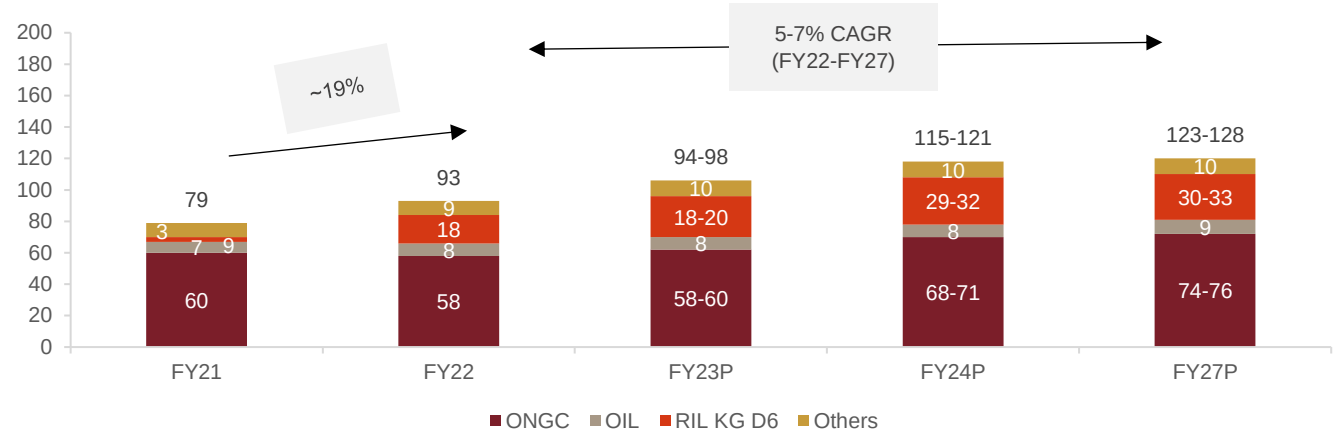
After the commencement of RIL's KG-D6 basin in April 2009, domestic natural gas production got a boost. However, with the closure of wells due to sand and water ingress, production from the basin has declined over the past few years. Consequently, domestic natural gas production fell to 92 mmscmd in fiscal 2015 from 130 mmscmd in fiscal 2012. Natural gas production has remained under pressure for 4-5 years, especially after a dramatic decline in production from the KG-D6 basin.

The output increased in fiscal 2022 because RIL commenced production from much-awaited projects on the offshore eastern basin of India, namely the R cluster (production commenced in December 2020) and the satellite cluster (production commenced in March 2021). Moreover, ONGC's KG 98/2 block also started production in August 2021. Therefore, domestic gas production increased ~19% to 93 mmscmd in fiscal 2022.

4.2.3 Outlook on domestic gas production

Domestic natural gas production is expected to rise 5-7% to 123-128 mmscmd during the forecast period of fiscals 2022 to 2027 driven by new production from the Daman and KG fields of ONGC and deep-water fields of ONGC and RIL on the eastern offshore. This will include production from the KG basin from Vashistha, KG-D5, R-cluster and satellite fields (a part of KG D6 field). The government's steps to attract investments and improve production through the new gas-pricing mechanism are expected to expedite the development of new fields. The mechanism provides pricing freedom for gas produced from HPHT deep-water and ultra-deep-water areas. New discoveries are expected in KG basin post fiscal 2027 from RIL (UDW1 block under exploration), as well as ONGC (Clusters 1 & 3 of 98 DWN/2 block). Despite new discoveries, production will stagnate post fiscal 2027 as existing fields peak and start declining in terms of output.

Figure 17: Outlook on gas production for FY22-27 (mmscmd)



P: Projected

Note: Production figures are for gross production (including flaring, internal consumption)

Source: MoPNG, PPAC, CRISIL MI&A Consulting

4.2.4 Classification of gas production based on the current allocation mix

Currently, domestic production primarily comes from pre-NELP fields i.e., onshore fields owned by ONGC and Oil India Ltd (OIL) which were awarded before the implementation of NELP. These fields have matured and hence are under consistent decline. Other gas producing fields are offshore fields owned by private players including HPHT fields.

Table 4: Domestic production by resource category

Field type	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22
Pre-NELP/APM	67.8	65.8	68.6	72.1	75.1	72.4	66.7	64.4
Difficult fields (HPHT)	24.4	22.6	18.8	17.4	15.0	13.1	11.8	28.8
Total	92.2	88.4	87.4	89.5	90.0	85.4	78.6	93.2

Source: PPAC

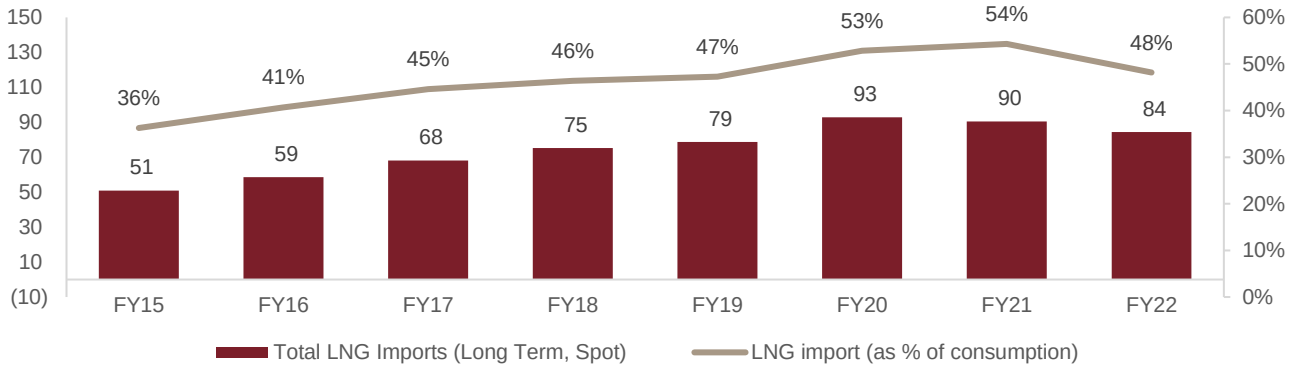
The government introduced new initiatives to incentivise operations in the domestic natural gas sector. The major reform includes the shift from NELP to HELP in 2017.

4.2.5 LNG import trends

LNG imports jumped from 18,607 mmscm[1] (51 mmscmd) in fiscal 2015 to 30,776 mmscm (84 mmscmd) in fiscal 2022, as domestic production was not enough to cater to rising gas demand. Despite an expected improvement in domestic gas supply, demand growth is expected to outpace supply and dependence on LNG imports is expected to continue in the long run but would be moderate.

[1] *For converting mmscm to mmscmd, we have considered 365 days*

Figure 18: Review of LNG imports in India (in mmscmd)

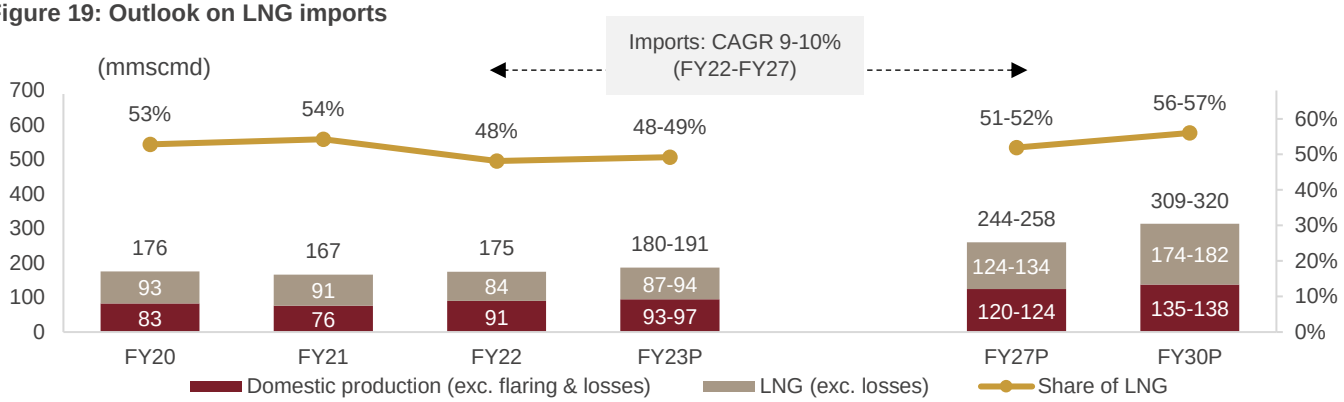


Source: PPAC, CRISIL MI&A Consulting

4.2.6 Dependence on LNG imports to continue

Despite an expected improvement in domestic gas supply, demand is expected to outpace supply and dependence on LNG imports is likely to continue, but the share in the supply mix will moderate. CRISIL MI&A Consulting estimates imports to increase at a 9-10% CAGR (over fiscals 2022 to 2027) to 124-134 mmscmd, constituting 51-52% of the total share of gas supply (including losses and flaring) in fiscal 2027.

Figure 19: Outlook on LNG imports



P: Projected

Note: Figures are for net production (excluding flaring, internal consumption)

Source: MoPNG, PPAC, CRISIL MI&A Consulting

4.2.7 Existing gas transmission pipelines and LNG terminals

4.2.7.1 Gas transmission pipelines

As of June 2022, the Petroleum & Natural Gas Regulatory Board (PNGRB) authorised a natural gas pipeline network of approximately 33,501 km across the country. Out of this, a network of 21,946 km including spur lines is operational and a total of 13,262 km is under various stages of construction and expected to be commissioned by fiscal 2026. GAIL is the leading player, accounting for >60% of the total pipeline infrastructure. Other leading network players include Gujarat State Petronet Ltd (GSPL), and Pipeline Infrastructure Ltd (PIL).

A majority of the GAs are either connected or proposed to be connected to the major front pipeline. Out of 295 GAs, the transmission pipeline passes through 258 because these GAs are located in hilly areas, such as Rajasthan, Uttarakhand, and Himanchal Pradesh, and are expected to be supplied via a virtual pipeline.

4.2.7.2 LNG terminals

The supply of LNG is dependent on LNG terminals since India relies heavily on imports to cover its natural gas needs, and this situation is anticipated to continue in the future. India has six operational LNG import facilities with a combined regasification capacity of 42.5 MTPA.

Table 5: Operational LNG terminals

Location	State	Capacity (MTPA)	Capacity utilisation, FY21 (%)	Capacity utilisation FY22 (%)	Company	Year of commissioning
Dahej	Gujarat	17.5	94	88	Petronet LNG	2004
Hazira	Gujarat	5	77	47	Shell Energy Private Ltd	2005
Dabhol*	Maharashtra	5	76	85	Ratnagiri Gas & Power Ltd (GAIL, NTPC)	2012
Kochi	Kerala	5	17	21	Petronet LNG	2013
Ennore	Tamil Nadu	5	13	14	IOCL	2019
Mundra	Gujarat	5	35	19	Adani, GSPC	2020
Total capacity		**42.5**				

*Note: * Dabhol terminal capacity with breakwater.*

Source: MoPNG, PPAC

4.2.8 The gas infrastructure outlook

CRISIL MI&A Consulting expects the installed regasification capacity to increase to 72-77 MTPA by fiscal 2027 from 43 MTPA in fiscal 2022 aided by the following capacity expansion projects.

Table 6: Upcoming LNG terminals

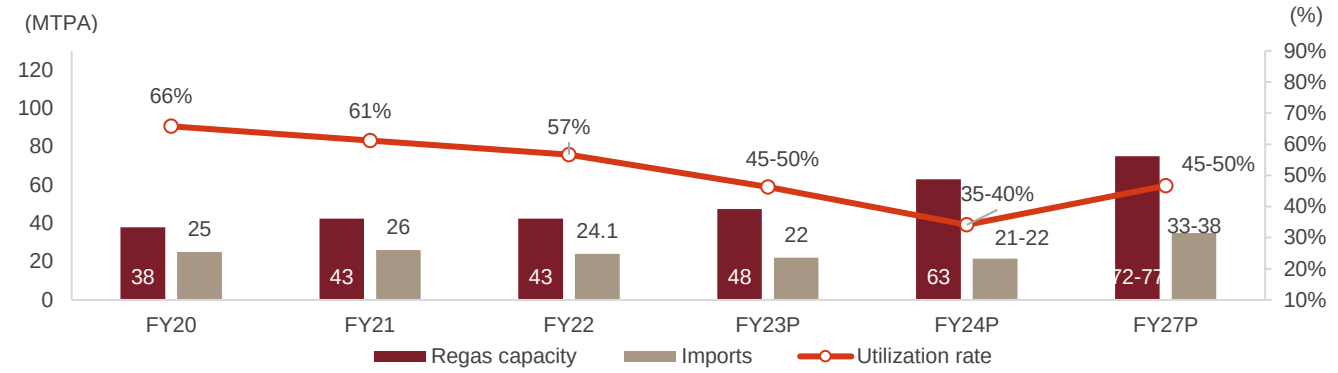
LNG terminal	Promoter	Capacity (MTPA)	Status	Expected commissioning
Dhamra, Odisha	Adani Total Group	5	Under construction	FY23
Jaigarh (FSRU), Maharashtra	H-Energy	5	Under construction	FY24
Jafrabad (FSRU), Gujarat	Swan Energy	5	Under construction	FY24
Chhara, Gujarat	HPCL and Shapoorji Energy Pvt Ltd	5	Under construction	FY24
Dahej, Gujarat	Petronet LNG	5	-	FY25

Note: Another 15 MT of capacity additions (Crown LNG – Kakinada (7.2 MT), Karikal LNG terminal (5 MT) and Kukrahati (3 MT) have been announced; we have not considered them as their commissioning remains critical amid lower utilisation levels

Source: MoPNG, PPAC, CRISIL MI&A Consulting

Over the next five years, we expect LNG terminals at Dhamra (5 MTPA capacity (developed by Adani) as well as Chhara (by the joint venture of HPCL and Shapoorji Energy) to be commissioned. Growth in the installed regasification capacity is expected to outpace LNG imports. Consequently, the average utilisation rate of LNG terminals is expected to be 45-50% in fiscal 2027.

Figure 20: Outlook on LNG terminal utilisation



P: Projected

Source: MoPNG, CRISIL MI&A Consulting

The thrust is on developing gas pipeline infrastructure to support gas offtake from new LNG terminals.

Table 7: Upcoming major gas pipelines

Pipeline	Authorised entity	Upcoming capacity (mmscmd)	Length (km) (upcoming/ under construction)	Status (as on June 30, 2022)	Expected completion	States through which the pipeline will pass
Jagdishpur-Haldia-Bokaro-Dhamra-Paradip-Barauni-Guwahati (JHBDPL)	GAIL	23	Authorised length -3,546 km, under construction – 1,903.01 km	1642.99 km operational	FY23	Uttar Pradesh, Bihar, Jharkhand, West Bengal, Odisha, Assam
Mallavaram - Bhopal Bhilwara - Vijaipur	GSPCs India Transco Ltd	78.25	Authorised length -1,811 km, under construction -1,446 km	365 km operational	FY24	Andhra Pradesh, Telangana, Madhya Pradesh, Rajasthan
Mehsana-Bhatinda	GSPC India Gasnet Ltd	80.11	Authorised length – 1,940 km, under construction - 7,87 km	1,153 km operational	FY23/FY24	Gujarat, Rajasthan, Haryana, Punjab
Kakinada-Vizag-Srikakulam	Andhra Pradesh Gas Distribution Corporation Ltd	90	Authorised length – 275 km	Under construction	FY23	Andhra Pradesh
Ennore-Tuticorin	IOCL	84.7	Authorised length -1,431 km, under construction - 1,265.18 km	Partially operational. Operating length of 165.82 km	FY24	Tamil Nadu, Karnataka, Andhra Pradesh, UT of Puducherry
Kakinada-Vijayawada-Nellore	IMC Ltd	18.00	Authorised length – 667 km	Under construction	Post FY25	Andhra Pradesh
North-East Natural Gas Pipeline Grid	Indradhanush Gas Grid Ltd	4.75	Authorised length - 1,656 km	Under construction	Nov 2023	North-eastern states
Srikakulam-Angul	GAIL	6.65	Authorised length -690 km	Under construction	July 2023	Andhra Pradesh, Odisha
Mumbai-Nagpur-Jharsuguda	GAIL	16.50	Authorised length - 1,755 km	Under construction	May 2023	Maharashtra, Madhya Pradesh, Chhattisgarh, Odisha

Source: MoPNG, PPAC

4.3 The impact of regulations/policies on demand and supply

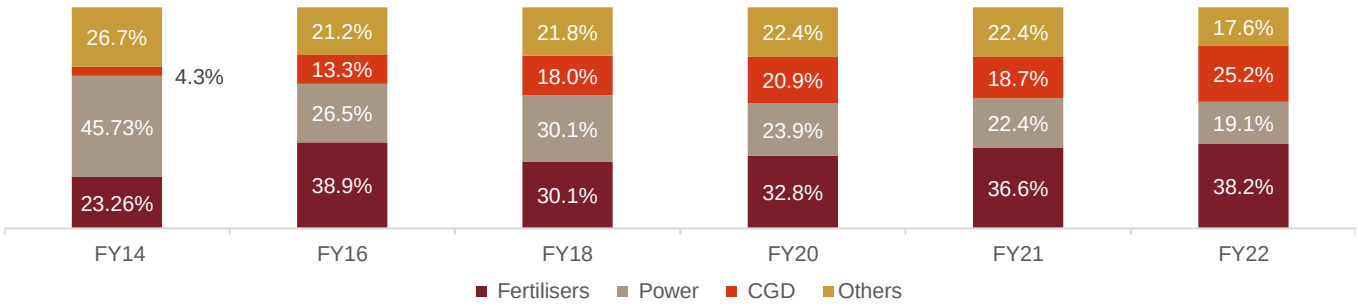
MoPNG is the primary central authority for oil and gas exploration, production, refining, distribution and marketing, import, export of gas, and other petroleum products. The downstream and midstream sectors are regulated by Petroleum and Natural Gas Regulatory Board (PNGRB) and the upstream sector is regulated by the Directorate General of Hydrocarbon (DGH).

4.3.1 The gas allocation policy

As the availability of domestically produced gas is limited, the government has revamped the gas allocation policy and accorded the highest priority the CGD sectors (domestic household - PNG and transport - CNG), followed by fertilisers and the power sector based on user affordability and the sector's priority. The allocation policy aims to ensure sustainable demand for the respective sectors. Demand for gas is set to increase due to development of the CGD network, and rising access to gas. This makes the case for making available a larger volume of gas for the priority sector and led to continuation of the CGD sector as the priority sector.

The CGD sector's share of gas allocation was only 4.3% in fiscal 2014 as power and fertilisers were priority sectors. Post fiscal 2014, the allocation to the CGD sector increased driven by new guidelines that accorded the highest priority to the CGD sector. The share of the CGD sector increased from 13.3% of the total domestic gas in fiscal 2016 to 25.2% by fiscal 2022, while the allocation to other sectors declined.

Figure 21: Domestic gas allocation development



Note: Others include refinery and petrochemical

Source: CRISIL MI&A Consulting

4.3.2 Latest developments in the gas allocation policy

Effective August 2022, MOPNG further amended the guidelines for allocation/supply of domestic natural gas to CGD entities for CNG and PNG (the domestic segment).

Key guidelines in the policy dated August 10, 2022 are listed below:

- GAIL has been mandated to procure and mix LNG in the CGD pool and supply at a uniform base price to all CGD entities. The CGD pool consist of APM (administered pricing mechanism)/Non-APM gas including HPHT (high pressure high temperature) domestic gas.
- Supply of domestic gas shall be made only up to the quantity available and allocated to GAIL for CNG and PNG (the domestic segment).
- The available compressed biogas (CBG) procured by GAIL as part of the synchronisation scheme shall form part of the supply pool.

4.4 Pricing mechanism for domestic natural gas

There are multiple price regimes for natural gas supplies, such as APM, non-APM and LNG. Currently, APM gas price is driven by New Domestic Natural Gas Pricing Guidelines, 2014, and HPHT (non-APM) gas price by the guidelines issued in 2016 for the gas to be produced from discoveries in deep-water, ultra-deep-water and HPHT areas. Domestic gas pricing guidelines are applicable mostly to APM gas from nominated fields of national oil companies and gas from certain NELP blocks where no pricing freedom is prescribed in product sharing contracts (PSCs). Most of the gas from such blocks is supplied to the CGD, fertiliser or power industries.

New Domestic Natural Gas Pricing Guidelines, 2014, are based on a volume-weighted average of gas prices at major international markets such as Henry Hub, National Balancing Point, Alberta, and Russia. Prices at the three trading hubs/Russian domestic prices will be deducted by $0.5/mmBtu to account for transportation and treatment charges.

4.4.1 Domestic gas prices

Domestic gas prices averaged $2.35/mmBtu in fiscal 2022, compared with $2.09/mmBtu in fiscal 2021. In the first half of fiscal 2022, i.e., from April to September 2021, domestic natural gas prices stood at $1.79/mmBtu, while in the second half, the prices settled at $2.9/mmBtu.

On March 31, 2022, the MoPNG increased domestic gas price to $6.10/mmBtu for the first half of fiscal 2023 (April-September 2022). This marked a hike of 110% over the previous price, driven by a steep rise in international Hub prices as seen in 2021 amid lower inventory levels, the energy crisis in Europe and China, and supply constraints. Subsequently, domestic gas prices were further revised to $8.57/mmBtu for the second half (October 2022-March 2023) following elevated international Hub prices owing to geopolitical tensions between Russia and Ukraine.

4.4.2 Spot LNG prices

Spot gas prices increased over 4x to ~$21.3/mmBtu in fiscal 2022 from $5.3/mmBtu in fiscal 2021, owing to healthy demand and low inventory. CRISIL MI&A Consultingexpects spot gas prices to rise a further 30-50% on-year to $27-$32/mmBtu in fiscal 2023, as the Russia-Ukraine conflict is expected to continue to have a major impact on the global gas sector. Under factors such as no major escalation in the Russia-Ukraine war situation, stable Chinese demand, no outages, expected Freeport LNG in late 2023, and some loss in price-sensitive demand, the contracted prices are expected to be in the range of $22-27/mmBtu.

4.4.3 Contracted LNG prices

Contracted LNG prices rose a significant ~63% year-on-year to ~$10.1/mmBtu in fiscal 2022 owing to a steep rise in crude oil prices. Long-term contracted LNG prices in India are either linked to Brent crude or Henry Hub gas. The geo-political tension has escalated LNG prices given the restrictions imposed by western countries on procurement of LNG from Russia. Moreover, because of higher crude prices, long-term LNG prices are expected to increase 30-40% on-year to $13-$14/mmBtu in fiscal 2023. Contracted LNG prices are expected to be in the range of $11-$13/mmBtu.

Table 8: Gas price outlook

Years	Crude ($ per barrel)	Spot LNG ($ per MMBtu)	Contracted LNG ($ per mmBtu)	Domestic gas ($ per mmBtu)
FY15	85.0	7.7	13.7	4.6
FY16	47.0	6.4	10.9	4.2
FY17	49.0	7.5	7.0	2.8
FY18	57.6	8.0	7.9	2.7
FY19	70.1	8.9	9.8	3.2

Years	Crude ($ per barrel)	Spot LNG ($ per MMBtu)	Contracted LNG ($ per mmBtu)	Domestic gas ($ per mmBtu)
FY20	61.2	4.6	9.0	3.5
FY21	44.4	5.3	6.2	2.1
FY22	80.5	21.3	10.1	2.35
FY23P	95-105	27-32	13-14	7.3
FY24P	85-95	22-27	11-13	6.5-7
FY26P	80-90	25-35	11.5-12.5	6.5-7.5

P: Projected

Source: CRISIL MI&A Consulting

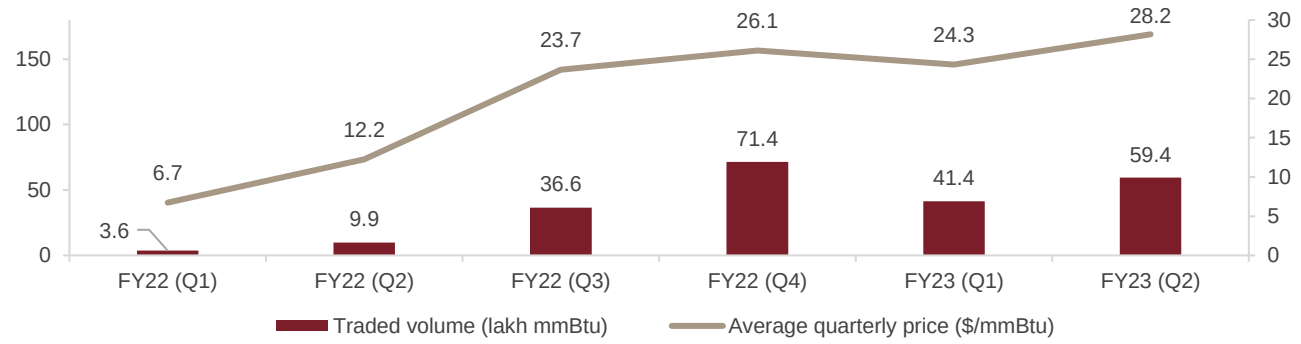
4.5 LNG contracts and their pricing structure

In India, LNG is procured under long-term contracts and on spot market rates. Most of the LNG importers in the country prefer long-term contracts as only a few players have sufficient liquidity for purchasing spot gas. Contract-based procurements are valuable to suppliers to secure the capital necessary to make large investments for production, liquefaction, and related infrastructure. On the other hand, buyers secure LNG supply through long-term contracts. The price of LNG under these contracts is based on linkages with Henry Hub and dated Brent crude.

4.6 Gas exchange platform

India launched its first automated national-level gas exchange (Indian Gas Exchange or IGX) in June 2020 to facilitate transparent price discovery in natural gas and increase the share of natural gas in India's energy basket. Gas exchange will enable the country to move towards free-market pricing of natural gas.

Figure 22: Volume of gas traded on gas exchange



Note: Average price indications for each quarter

Source: CRISIL MI&A Consulting, IGX (Indian Gas Exchange)

4.7 Review of gas pricing regimes

In September 2022, the Government of India (GoI) constituted an expert committee under former planning commission member Kirit S Parikh to examine the issues of domestic natural gas pricing regimes; ensure fair prices for end-consumers; suggest market-oriented transparent and reliable pricing regimes for India's long-term vision for ensuring a gas-based economy as per guidelines dated October 25, 2014 and March 21, 2016 (marketing and pricing freedom for the gas to be produced from difficult fields); and review existing natural gas pricing regimes. The committee is expected to submit its report to petroleum and natural gas ministry for review.

4.8 Regulations for transmission tariffs: RoE-linked (historical)/competitive bidding

Natural gas transmission tariffs are currently determined for 25 years through competitive bidding. A 70% weightage is given to the tariff bid by parties and 30% to the bid volume flow within the pipeline. A weighted average score of the lowest tariff and the highest volume is then calculated to determine the winning bid. While lower tariff is usually preferred in the competitive bidding process, bidders also must cover their cost of capital and generate a minimum return on the capex of the project. The tariff is decided by the operators based on discounted cash flow with minimum internal rate of return (IRR) considered and submitted as part of the bidding process.

4.8.1 Regulatory framework

According to Section 22 of the PNGRB Act, 2006, the Board is entrusted with the responsibility of determining the natural gas pipeline tariff to be charged by the entities laying, building, operating, or expanding a natural gas pipeline. The methodology for determining natural gas pipeline transportation tariff has been specified in the relevant provisions of the PNGRB (Determination of Natural Gas Pipeline Tariff) Regulations, 2008. Under the provisions of these regulations, the PNGRB is to determine the initial unit natural gas pipeline transportation tariff on a provisional basis (provisional tariff) and then finalise the same (final tariff) considering the actual cost and data at the end of the financial year based on audited accounts. Tariff review of the unit tariff (Rs/mmBtu) is undertaken every consecutive year by the Board. The first review starts five years after transporting the first unit.

4.8.2 Unified tariff policy for gas pipelines, viability, and timeline

The PNGRB, vide amendments dated 23.11.2020 and 18.11.2022, has notified unified tariff guidelines, which would be applicable from April 1, 2023. The regulator has emphasized that the amendments are aimed at improving natural gas accessibility in remote areas at competitive and affordable prices, to achieve the objective of one nation, one grid and one tariff. The unified tariff would be determined by the PNGRB for the natural gas grid system for each financial year before the start of such financial year.

Figure 23: Determination of unified tariff – as per new guidelines

01 UTP would be determined for the entire national gas grid as a single tariff and would be further sub-divided into 3 zones

- Zone 1: 300 km each along the route of the natural gas pipeline from the point of injection to the end point
- Zone 2: A length of more than 300 km and up to 1,200 km on either side of the first tariff zone of the national gas grid system
- Zone 3: The remaining length of the national gas grid system on either side of the second tariff zone for unified tariff

02 UTP for Zone 1 would be 45% of UTP for Zone 2, and Zone 2 would be 75% of Zone 3

- If PNGRB determines the UTP for pan-India national grid as Rs 111.4/MMBtu, then this would be split between Zones 1, 2 and 3 such that Zone 1 UTP would be Rs 18.02/MMBtu, Zone 2 UTP would be Rs 40.02/MMBtu and Zone 3 would be Rs 53.36/MMBtu

03 UTP for national gas grid will be determined by PNGRB by applying the following formula (in simplified terms):

- UTP = $\frac{\text{Sum of (Approved tariffs x Estimated volumes) for each pipeline forming part of the national grid + Adjustment factor*}}{\text{(Sum of estimated volumes for each pipeline forming part of the national grid) – (Duplicate volumes**)}}$

04 Example illustrating computation of UTP:

Pipeline	Approved Tariff (Rs/MMBTu) (a)	Estimated Volume (MMBTU) (b)	Expected Revenue (Rs) (c) = (a)*(b)
1	120	1,000	120,000
2	115	1,000	115,000
3	99.2	1,000	99,200
Total		**3,000**	**334,200**

- In this case, the UTP would be 3,34,200/3,000 = Rs 111.4/MMBtu
- For Zone 1, it will be Rs 18.02/MMBtu; for Zone 2, it will be Rs 40.02/MMBtu; and for Zone 3, it will be Rs 53.36/MMBtu

*Note: ***The Adjustment Factor** is a variable retained by the PNGRB in the formula to put in an amount it expects to normalize the UTP in case there is under recovery or over recovery of the Approved Tariffs by the pipeline companies owing to under or over estimation of expected volumes versus actual volumes. ****Duplicate volumes** are volumes counted twice in reckoning gas expected to be transported from one point of origin to another.*

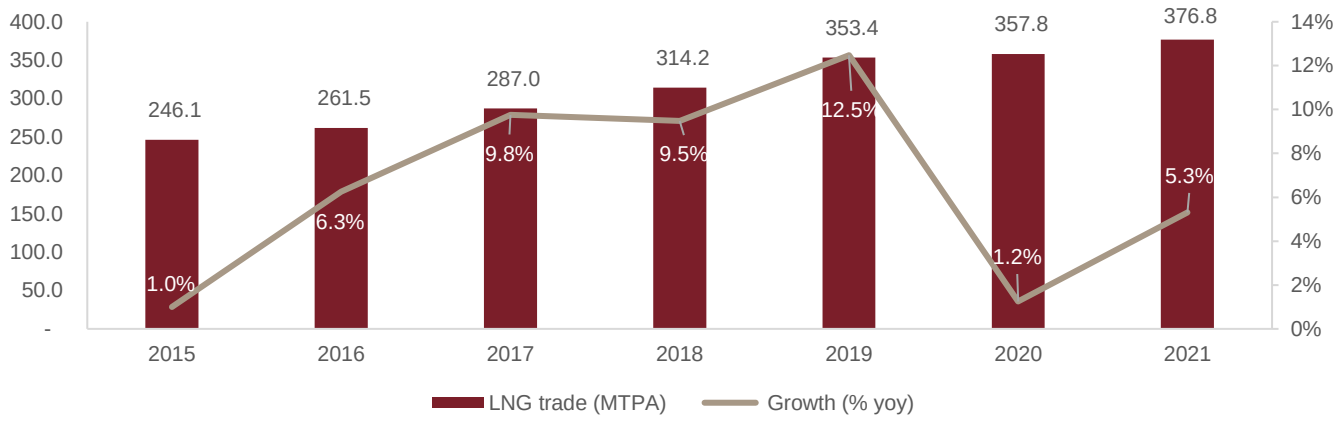
Source: PNGRB

5 Global gas demand-supply scenario

5.1 Global LNG demand review, 2015-21

Global LNG demand grew ~12% between calendar years 2018 and 2019 on account of high imports from the existing importers. Despite the Covid-19 pandemic's instability, demand increased marginally to ~358 MTPA (million tons per annum) in 2020. China, India, and South American countries such as Brazil and Chile saw a rise in imports, but imports declined in most other regions, with Europe and Japan registering a decline of ~3% and ~4%, respectively. In 2021, global LNG demand grew ~5% on the back of a strong economic recovery in Asia.

Figure 24: Review of global LNG consumption (CY2015-21)

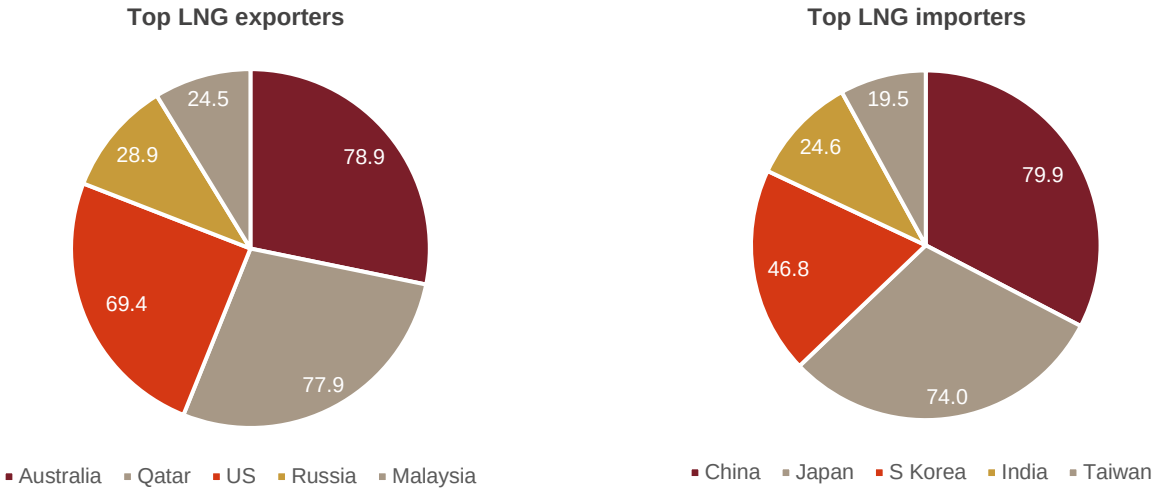


Source: BP Statistical Review 2015-2021, CRISIL MI&A Consulting

5.1.1 China became the largest LNG importer in 2021 by surpassing Japan

In 2021, China became the world's largest LNG importer, overtaking Japan as the world's top LNG importing country and recording 16% annual growth. This was in response to growing energy demand for economic growth, volatile energy costs and lower-than-expected domestic generation. China's imports of LNG totaled a record 79.9 MT in 2021, according to customs data, while Japan's imports of LNG fell 0.4% to ~74 MT. Australia was the main exporter of LNG in 2021 (78.9 MT), followed by Qatar (77.9 MT) and the US (69.4 MT). The US added 24.6 MT of new volumes to the market, recording a ~55% rise in exports and becoming Europe's leading LNG supplier.

Figure 25: Global LNG trade scenario, 2021 (MTPA)

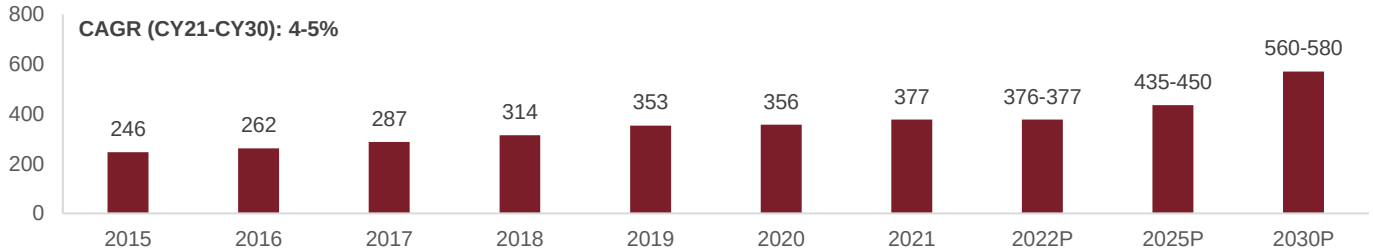


Source: BP Statistical Review 2022, CRISIL MI&A Consulting

5.2 Global LNG demand outlook, 2022-30

LNG demand increased ~5% in 2021, led by a combination of two factors: i) a rebound in economic activity after the lockdowns of 2020, boosting consumption in the industrial and power generation sectors; and ii) a succession of extreme weather events that led to higher-than-expected heating and power generation needs. Gas demand is set to turn negative in 2022 because of high prices and market uncertainty. It is expected to fall 0.3%. Supply tensions and high short-term prices are likely to have a negative impact on gas consumption in price-sensitive emerging markets. Natural gas consumption is expected to fall ~6% in Europe in 2022. In Asia, it is expected to grow 3%, a marked slowdown from growth of 7% in 2021. Regions such as the Americas, Africa and the Middle East are expected to be affected less directly by gas market volatility, as they principally rely on domestic gas production. But they are nonetheless being affected by the wider economic impacts of Russia's invasion of Ukraine, including rising commodity prices, weaker purchasing power and lower investment due to dented business confidence.

Figure 26: Global LNG demand outlook (MTPA)



P: Projected

Source: CRISIL MI&A Consulting

CRISIL MI&A Consulting expects global LNG demand to rise at a moderate pace up to 2025 as the push for cleaner fuels intensifies. Asian countries, especially China, are expected to be the key demand drivers. However, a gradual restart of nuclear capacities and commissioning of new coal-based power plants in Japan are expected to lower LNG demand in the country. CRISIL MI&A Consulting expects global LNG demand to log a moderate CAGR of 4–5% over the forecast period between 2021 and 2025, to reach 435–450 MTPA by 2025. Demand would mainly be driven by Asian economies, such as China, India, and South Korea, along with emerging demand centres, such as Bangladesh and Pakistan.

5.3 Global LNG supply

In 2020, 19.95 MTPA of liquefaction capacity was added, taking the total global installed capacity to ~450.5 MTPA. This included commissioning of States Freeport LNG and States Cameron LNG in the US. CRISIL expects significant new LNG export capacity additions over the next five years, leading to a surge in global LNG supply. In fact, between 2021 and 2025, we expect 7-8 MTPA of liquefaction terminals to be commissioned each year. These capacity additions will be led by the US. Over the next five years, we expect new terminals of ~140 MTPA capacity to start operations across the globe, mainly in the US.

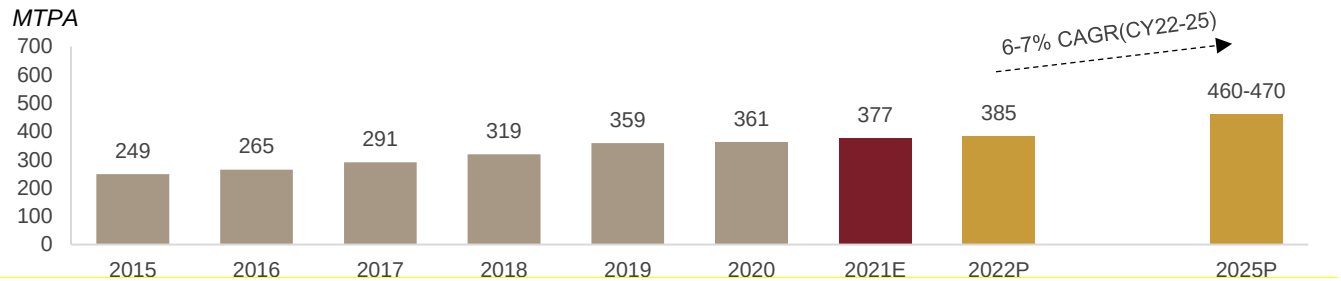
Table 9: Major upcoming liquefaction capacities

Country	Plant	Capacity (MTPA)	Commissioning year (tentative)
US	Calcasieu Pass LNG	10	2022
Indonesia	Tangguh LNG T3	3.8	2022
Mozambique	Coral-Sul FLNG	3.4	2022
Russia	Arctic LNG 2	6.6	2023
Mauritania	Tortue/Ahmeyim FLNG T1	2.5	2023
US	States Sabine Pass	5.0	2023
Russia	Arctic LNG 2 T2	6.6	2024
Mexico	Energía Costa Azul T1	3.3	2024
Nigeria	NLNG T7	8.0	2024
US	Golden Pass LNG T1-T2	10.4	2024
Canada	LNG Canada T1-T2	14.0	2025
Mozambique	Mozambique LNG (Area 1) T1-T2	12.9	2025
US	Golden Pass LNG T3	5.2	2025
Qatar	QatarGas North Field East Expansion (T1 – 4)	32.0	2025
Russia	Ust Luga LNG T1 – T2	13.0	2025

Source: CRISIL MI&A Consulting

Capacity additions in 2024, 2025 and 2026 may lead to a moderation in global LNG prices.

Figure 27: Global LNG supply outlook (CY2015-CY2025)



P: Projected, E: Estimated

Note: BP Statistics for 2015-20 and IEA estimates for 2021

Source: CRISIL MI&A Consulting

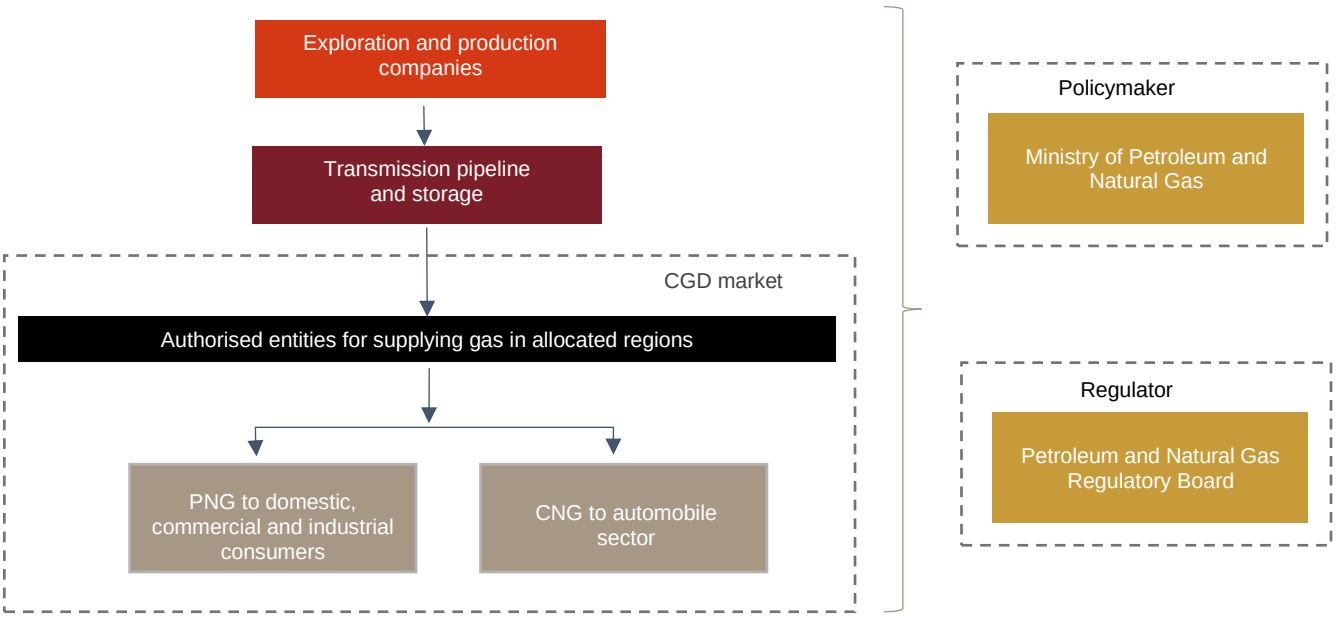
6 Overview of the Indian CGD market

Demand for natural gas is expected to rise in the future, propelled by environmental concerns, implementation of gas exchange and support from domestic energy companies to grow infrastructure. In 2009, Indian gas regulator PNGRB started authorising entities for laying, operating, and expanding CGD infrastructure for supplying gas to end-users in identified authorised GAs. To date, the PNGRB has granted authorisation to entities for developing CGD infrastructure in ~295 geographical areas through 12 rounds (including 11A) of auctions under competitive bidding. Over the years, private and public player participation has increased CGD coverage to 632 districts. Most of the northern and western states, and some parts along the coastal southern and eastern regions of the country have been covered under CGD infrastructure.

6.1 CGD market structure

The upstream sector, comprising oil and gas companies, explores gas from the country's available reserves. In the midstream and downstream sectors, domestic gas and imported LNG are available for fertiliser industries, power plants, refineries, petrochemical plants, and CGD networks in the gaseous form through natural gas pipelines. Gas pipeline infrastructure is an economical and safe mode of transporting natural gas by connecting gas sources to gas-consuming markets. The gas pipeline grid determines the gas market structure and its development. Therefore, an interconnected national gas grid will ensure adequate availability and equitable distribution of natural gas in India. Authorised CGD entities are permitted to sell domestic/imported gas directly.

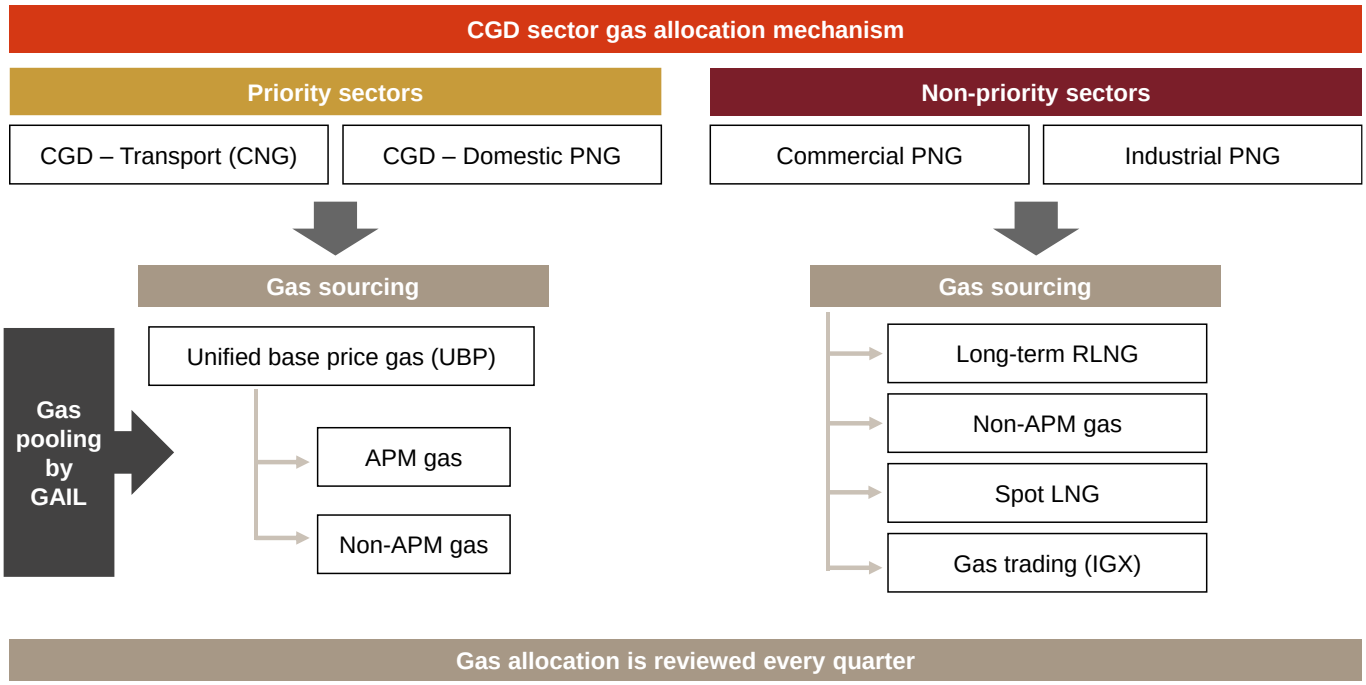
Figure 28: CGD market structure



Source: PNGRB, CRISIL MI&A Consulting

The Indian government has initiated a couple of programmes and schemes to develop CGD infrastructure and networks, to ensure gas supply to more areas.

Figure 29: CGD sector gas allocation (priority with CGD sector)



Source: PNGRB, CRISIL MI&A Consulting

6.1.1 Policy for gas allocation favours the CGD sector

The domestic piped natural gas (D-PNG) and CNG segments have received precedence in domestic gas allocation within the CGD sector from the government to support the development of CGD network. For the CNG and D-PNG segments of the CGD sector, the government has taken initiatives to increase the supply of domestic gas. Effective August 2022, all CGDs receive pooled gas to meet the demand for priority sectors (D-PNG and CNG) at a uniform price. Volume to be received by CGD will remain subject to quantity available and allocation to GAIL. Pooled gas is a mix of sources such as APM gas, non-APM gas and RLNG, which is imported. With CGD (domestic and transport) given the topmost priority in the government's allocation of domestic gas, dependence on RLNG in the CGD segment is largely driven by commercial and industrial demand.

6.2 Regulatory scenario in India

Midstream and downstream natural gas activities, including storage, transportation, distribution, marketing, and sale of natural gas, are regulated by the PNGRB. PNGRB authorises the areas that are categorised as GAs to an entity to lay, build, operate or expand the CGD network as per the PNGRB (Authorizing Entities to Lay, Build, Operate or Expand City or Local Natural Gas Distribution Networks) Regulations, 2008. The CGD sector has four distinct sub segments: CNG, predominantly used as auto fuel, and PNG, used in the domestic, commercial, and industrial segments. Since the commencement of CGD bidding rounds in 2008, several regulatory changes have been made in the CGD sector, improving investor confidence, and driving competition enabling development of CGD infrastructure in the country.

6.3 Major CGD regulations

Over the past few years, the PNGRB has taken several measures to drive investments in the CGD segment. Amendment of the bidding criteria for obtaining licences to supply natural gas in cities is a significant step.

Bidding criteria

The amended regulations, effective November 2018, place higher emphasis on infrastructure creation in the assigned geographical area, providing 80% weightage to domestic piped gas connections and number of CNG stations to be commissioned within the minimum work programme (MWP) period (eight years from the authorisation date). The remaining 20% weightage is given to the tariff proposed for city gas and CNG compression.

MWP

Till the fourth round of CGD auctions, there was no emphasis on MWP. However, from the fifth to eighth CGD auction rounds, the PNGRB introduced MWP, which laid out performance targets for successful bidders over five years from authorisation to complete specified targets of PNG connections and laying of steel pipeline network in awarded GAs. In the ninth and tenth rounds, the PNGRB included CNG connections target under MWP, and the targets were laid out for eight years from the authorisation date. It lays greater emphasis on infrastructure creation, giving it 80% weightage, compared with 0% applicable till the eighth CGD bidding round. The amended regulations also provide adequate checks through prescribed MWP targets for each year for all three measurable segments — steel pipeline length, CNG stations and domestic connections. The successful bidder will be required to achieve the year-wise work programme within eight contract years.

Penalty for not meeting performance targets

As per the norms of the sixth bidding round, if the CGD company fails to achieve its MWP target despite being notified by the regulator, and in case of failure to take remedial action after being allowed reasonable time, the regulator has a right to encash the PBG (performance bond guarantee) of the entity equal to the percentage shortfall in meeting targets of inch-km and/or domestic connections under Regulation 16 of the PNGRB Regulations, 2008. From the ninth bidding round onwards, the PNGRB has defined penalties for players who do not meet targets set for PNG, CNG connections, and inch km steel pipeline infrastructure under the MWP. The amended regulation has a provision for a pre-determined penalty to be levied on players within three months from the end of each contract year if the physical performance target provided by the player is not achieved at the end of one contract year. The regulator will impose a penalty of Rs 750 for shortfall in each piped gas connection, Rs 150,000 for not meeting the target of laying every inch km of pipeline, and Rs 20 lakh for each CNG station not installed.

Performance bond

The performance bond has been linked to the awarded GA's population. The bond is valid for three years initially and would be renewed subsequently after every three years until the period of authorisation. The performance bank guarantee amount would be reduced to 40% of the initial value if the successful bidder manages to achieve 100% of the work programme targets.

Exclusivity for city or local natural gas distribution network

- With a view to facilitating the development of a planned and integrated CGD network, the PNGRB grants an authorised entity exclusivity for laying, expanding, and operating the CGD network in a given geographical area, for a maximum period of 25 years from the date of grant of authorisation of the CGD network. At the end of the project's economic life, further extension of the exclusivity period can be considered by the PNGRB for a block of 10 years depending on the satisfactory compliance of service obligations and quality of service norms. The exclusivity allowed will be terminated, either for the entire authorised area or part thereof, in case the entity either refuses or fails to lay, build, or expand the CGD network to meet natural gas demand requirements

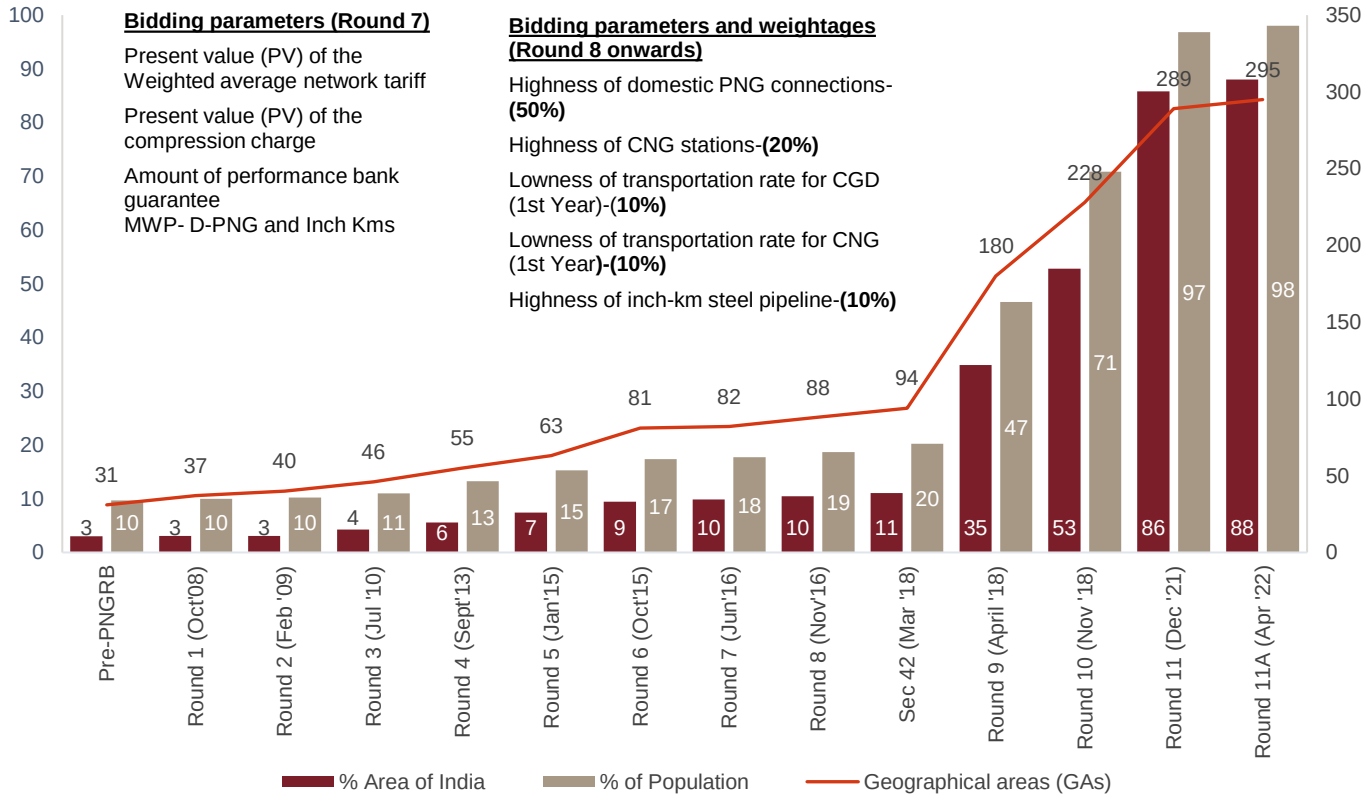
- Exclusivity from providing access to the CGD network on a common carrier or contract carrier basis (exclusive marketing rights for CGD), has also been increased from five to eight years from the date of authorisation for construction of the CGD network to incentivise participation of more players and provide greater stability to CGD operators. If the entity achieves the work programme in each of the eight contract years in a timely manner, the exclusivity period will be extended by two years. If the entity can achieve the work programme at the end of the eighth contract year on a cumulative basis and not yearly basis, then the exclusivity period would be extended by one year

- To protect consumer interest and enable competition in the CGD market after the end of the exclusivity period in some regions, the PNGRB notified Guiding Principles for Declaring City or Local Natural Gas Distribution Networks as Common Carrier or Contract Carrier Regulations in September 2020, which provide guiding principles and procedures for declaring the CGD network of an authorised area as a common carrier or contract carrier, allowing access to the network after expiry of the marketing exclusivity period

6.4 CGD network development

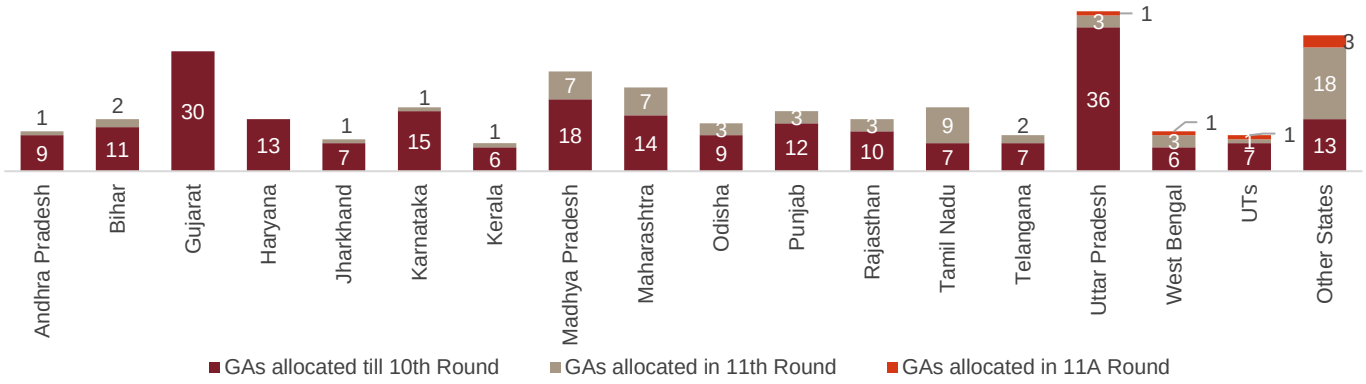
Looking to increase the share of gas in overall energy mix, the government had auctioned total 67 GAs in 11th and 11A CGD bidding rounds. After completion of the 11A CGD bidding round, 295 geographic areas (GAs) covering about 98% of the population and 88% of the total geographical area of the country, spread over around 630 districts in 28 states and UTs, have been covered under the CGD network.

Figure 30: CGD auction summary



Source: PNGRB, CRISIL

Figure 31: State-wise allocation of GAs



Note: Some of the GAs allocated cover district/regions in 2-3 states

Source: PNGRB, CRISIL MI&A Consulting

Some states, such as Gujarat, Maharashtra, Uttar Pradesh, Haryana, and Punjab, have more operational GAs due to the existing LNG terminals, gas pipeline infrastructure, and industrial and commercial demand growth.

Table 10: State-wise breakup of the CGD market

State	No of CNG stations (as on September 30, 2022)	No of PNG connections (as on September 30, 2022)		
		Domestic	Commercial	Industrial
Andhra Pradesh	144	239,712	397	31
Bihar	67	83,017	50	2
Gujarat	964	2,815,128	21,760	5,729
Haryana	284	280,164	728	1,319
Jharkhand	59	91,653	2	0
Karnataka	224	356,925	474	266
Kerala	91	21,041	18	14
Madhya Pradesh	190	173,495	292	388
Maharashtra	598	2,498,689	4,542	788
Odisha	42	72,933	4	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
Uttar Pradesh	672	1,255,075	2,003	2,365
West Bengal	41	0	0	0
UTs	472	1,328,529	3389	1841
Other states	313	367,420	2019	968
Total	**4,800**	**9,977,630**	**36,007**	**14,212**

Note: Some of the GAs allocated cover district/regions in 2-3 states

Source: PNGRB, PPAC, MOSPI, state government portals, CRISIL MI&A Consulting

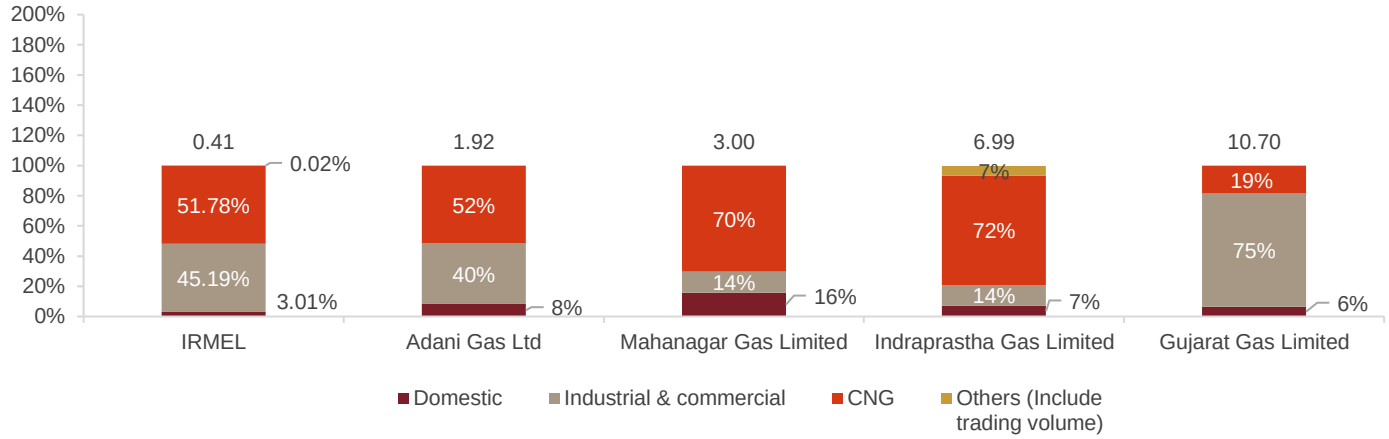
The development and commissioning of CGD infrastructure in the GAs allotted in the 11th and 11A rounds would be largely influenced by the development of natural gas pipeline infrastructure, LNG infrastructure in the region/ state, and capabilities of the players that won the bids.

6.5 Major entities in the CGD market

The number of entities participating in the CGD sector has increased over the past decade. CGD infrastructure is attracting not only domestic but also foreign investors. Singapore-headquartered companies such as Atlantic Gulf & Pacific Company (AG&P) and Think Gas have established CGD companies in India, while France-based Total Energies has partnered with Adani Gas to form Adani Total Gas Limited (ATGL). US-based I Squared Capital and Japanese Osaka Gas forayed into the CGD sector by investing in AG&P in 2021.

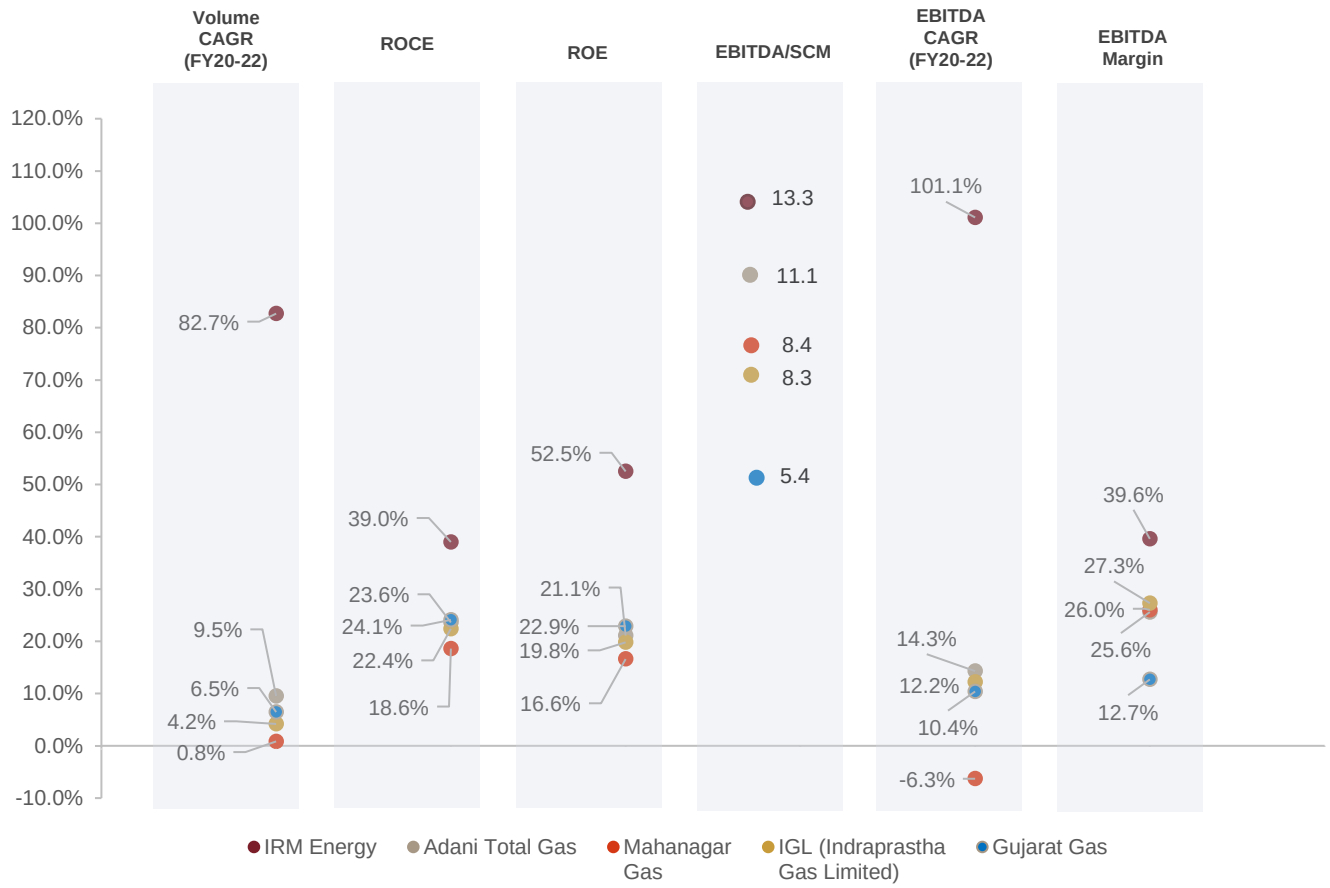
ATGL is the largest CGD player on a standalone basis (33 GAs), followed by IOCL with 28 GAs. Also, ATGL is the largest entity in terms of a combined GA count, at 52, including the GAs held through a JV with IOCL. The CGD market primarily comprises 10-15 players. Of these, the top five players hold 136 GAs (i.e., 46%) of the total 295 GAs allotted in all CGD bidding rounds until 11A.

Figure 32: Sales mix of major CGD players in FY22 (mmscmd)



Source: Company annual reports

Figure 33: IRMEL outperforming competitors in key metrics



Note: Financials on a consolidated basis have been considered.

Formula: ROCE: EBIT / Capital employed; Capital employed = Total asset - current liabilities

Formula: ROE: Profit after tax / shareholders equity

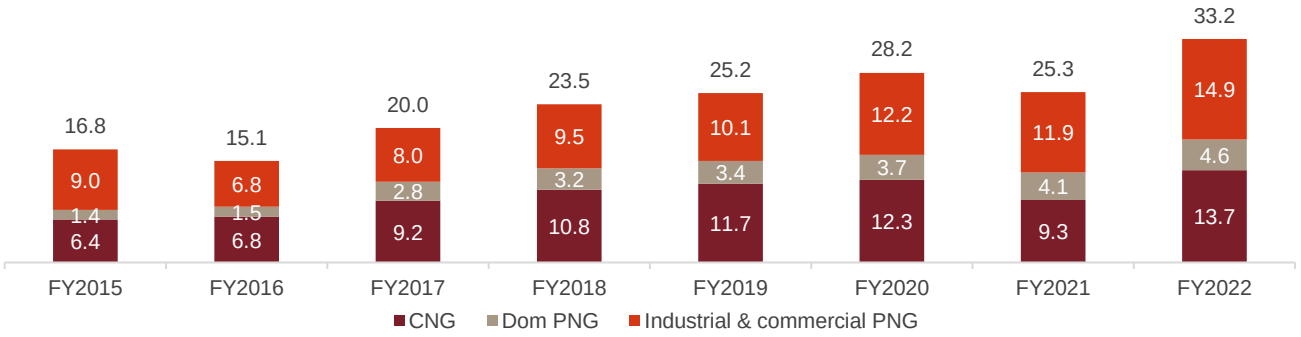
Formula: EBIDTA = Profit before tax+ depreciation+finance cost-other income+share of profit/loss from JV

Source: CRISIL MI&A Consulting, company annual reports

6.6 CGD demand over past fiscals

CGD gas consumption increased at 11% CAGR between fiscals 2015 and 2020, growing from 16.8 mmscmd to 28.2 mmscmd. However, demand dropped 11% to 25.3 mmscmd in fiscal 2021, mainly due to the impact of Covid-19.

Figure 34: CGD demand, FY15-22 (mmscmd)



Source: Company annual reports, CRISIL MI&A Consulting

In fiscal 2022, gas demand from the CGD sector increased 32% year-on-year. Although the second wave resulted in a lower-than-expected pickup in the CNG segment in the first quarter of the fiscal, there was a sharp recovery in the second quarter. In fiscal 2022, the share of industrial PNG and CNG consumption was ~45% and 42%, respectively, of the total CGD gas consumption.

6.6.1.1 Major states dominating the CGD market

Gujarat

Gujarat is the most developed gas market in the country. It is the first and only Indian state so far to be completely covered by the piped gas distribution network after the 11th round of bidding by PNGRB in 2022. The state contributed ~40.5% share (~14.0 mmscmd) towards India's overall market demand in the second half of fiscal 2022. It accounts for ~28% of India's total PNG consumer base. Prominent players, such as Gujarat Gas, the Adani group, Torrent, Petronet, and the Shell group, have invested in infrastructure facilities — from LNG terminals to CGD networks to pipeline infrastructure — creating an ecosystem for a gas-based economy. Gujarat also has three operational LNG terminals. These terminals have acted as a catalyst in enabling the state to position itself as a prominent gas corridor in the country. Around 40% of the 14,212 industrial PNG connections in the country are in Gujarat. The industrial segment, which accounted for ~61% of the state's total gas consumption in the second half of fiscal 2022, continues to be a major driver of gas consumption in Gujarat.

Maharashtra

Maharashtra accounted for ~14.4% share (~4.97 mmscmd) of India's gas demand in the second half of fiscal 2022. The CNG segment accounted for ~71% of the state's total gas consumption. Major demand centres include Mumbai, Thane and Raigarh districts.

Delhi/ NCR

Delhi had 14.4% share (~4.98 mmscmd) in India's gas demand in the second half of fiscal 2022. The state derives its gas demand from high CNG sales (~87% of total gas demand in the period). Increased sales of CNG cars and imposition of green tax for entry into the city are the main factors for CNG's demand growth in the area. With the Delhi Pollution Control Board banning use of industrial fuels other than PNG, overall gas consumption by industrial and commercial consumers in the region has grown over the past few years.

6.6.1.2 Other prospective markets

Southern region - Tamil Nadu, Andhra Pradesh, and Karnataka

Development of natural gas infrastructure gathered momentum in Tamil Nadu with IOCL's LNG terminal commencing operation in 2019 at Ennore; this is also the first LNG terminal on India's eastern coast. After the PNGRB tendered the 11th round of GAs,

all districts in Tamil Nadu have been covered under CGD. Key CGD players, such as Adani Total Gas, AGP CGD India, IOCL, and Torrent Gas, have a presence in the state and are investing in CGD infrastructure. Tamil Nadu has 146 CNG stations. IOCL is in the process of laying a 1,431 km pipeline for evacuation from Ennore terminal; the pipeline network is partially operational. Upon the complete RLNG evacuation pipeline network being commissioned (expected by November 2023), the Ennore terminal would cater to the gas requirement of customers located in several other parts of Tamil Nadu, Puducherry, southern parts of Andhra Pradesh, and Karnataka, including the region's fast-developing CGD networks.

Northern region - Punjab and Haryana

These two states are rapidly developing their CGD infrastructure because of their proximity to Delhi, a market with a robust CGD sector. The CNG traffic on the Delhi-Amritsar route has been very beneficial to the area. All major CGD players have a presence in the region. Connectivity with natural gas pipelines, such as the Dadri-Bawana-Nangal pipeline and the Mehsana Bhatinda pipeline, will support the development of a CGD network in the region. The number of CNG stations has increased ~5.8x to 473 by September 30, 2022, from 82 as on May 1, 2019, while PNG connections have increased ~3x. The region now accounts for ~10% of total CNG stations and ~3% of domestic PNG connections in India. The Punjab government reduced tax on natural gas from 14.3% to 3% in 2019. Favorable government policies will drive growth going forward.

6.7 Drivers of and constraints on CGD demand

6.7.1 Cost competitiveness of gas

Based on recent prices, domestic gas prices are averaging $7.4/ mmBtu in fiscal 2023. Despite this rise, CNG will remain more competitive than petrol, continuing to drive demand. As a result, the CNG segment is expected to register a healthy 20-22% CAGR between fiscals 2022 and 2027, driven by the cost-competitiveness of the fuel vis-à-vis petrol. Since CNG directly competes with petrol in the vehicle segment, conversion from petrol to CNG would continue during the forecast period given the cost advantage. Petrol and diesel prices are more volatile in nature given the dependence on crude oil; CNG prices are relatively stable.

6.7.2 Cost economics of CNG vehicles compared with petrol, diesel, auto LPG and EV

According to a CRISIL comparative assessment, CNG is expected to remain competitive vis-a-vis petrol/diesel even after reducing the spread with diesel and petrol[1]. The vehicle category considered is hatchback/compact sports utility vehicles. On-road prices of four different car models across the alternate fuels have been considered[2]. Please note that total cost of ownership (TCO) is a measure of ownership cost and ignores engine performance, vehicle range between refueling, emissions, etc., all of which are also critical factors for the average automobile buyer.

Table 11: Comparative overview of TCO

Parameters	EV[3]	Petrol	Diesel	CNG	Auto LPG[4]
On road price (Rs)	13,33,011	8,81,879	11,16,794	9,36,879	9,21,879
Cost of fuel (Rs / litre or Rs/ kg or Rs / kwh)	6	96.7	89.6	77.1	62.8
Fuel efficiency (km / unit fuel)	7.39	16.48	21	22	14.6
Cost per km	0.8	5.9	4.3	3.5	4.3
CNG running cost competitiveness %	77%	-67%	-22%	0%	23%
Life of vehicle (years)	8	8	8	8	8

Average distance per year (km)	12,000	12,000	12,000	12,000	12,000
Running cost	77,943	5,63,417	4,09,691	3,36,480	4,12,932
Maintenance cost / year	5,000	6,000	9,000	7,500	6,000
Salvage value after 8 years	1,06,641	70,550	89,344	74,950	73,750
TCO	13,44,313	14,22,746	15,09,142	12,58,409	13,09,060
CNG total cost competitiveness %	-7%	-13%	-20%		-4%

1. Present petrol and diesel prices (prevailing price in the month of November) for Delhi considered. CNG price considered is the average of the prevailing price and the price just before the hike in APM gas prices in October 2022.

2. Average price of hatchbacks such as TATA's Nexon, Tiago, Tigor and Maruti's Brezza considered. CNG retro-fitment cost Rs 55,000 considered over the on-road petrol price.

3. Price of LPG kit: Rs 40,000. Fuel efficiency considered based on Maruti Suzuki WagonR Duo model.

4. Salvage value: 8% of on-road price for all categories

Source: CRISIL MI&A Consulting

6.7.3 Government push towards adoption of cleaner fuels, pollution control policies

- The regulatory push for cleaner fuel and the government's plans to connect new cities to the CGD network are expected to drive demand from the industrial sector. Industries are expected to see a shift to PNG due to the regulatory push and favourable cost. A ban on coal gasifiers, pet coke and other fuels will boost gas volumes
  - The National Green Tribunal on July 2020 directed the Central Pollution Control Board (CPCB) to ensure that states and Union Territories (UTs) ban the use of petcoke and furnace oil as fuels in industries and switch to cleaner alternatives
- The Commission for Air Quality Management (CAQM) was formed under the Commission for Air Quality Management in National Capital Region and Adjoining Areas, Act 2021.
  - The statutory body has issued orders to ban the use of coal in industrial, domestic and other miscellaneous applications in the Delhi-NCR region from October 1 where PNG infrastructure is available and from January 1, 2023 where PNG infrastructure and supply is not available
- All state governments are implementing usage of clean fuel and putting restrictions on usage of polluting fuel
- The government's stance on limiting the usage of subsidised LPG cylinders and better gas infrastructure availability will improve the consumption of PNG (domestic)
- In large cities such as Delhi and Mumbai, the government is encouraging CNG use through regulations to combat pollution. More public transportation fleets are being shifted from conventional fuels to CNG. This includes state-owned transportation, auto rickshaws and national or local cab aggregators
- Many state governments, such as Punjab, have prohibited the usage of liquid fuels such as furnace oil for industrial consumption to control pollution.

6.8 CGD infrastructure and implementation

6.8.1 CGD infrastructure development

CGD network infrastructure is designed based on potential demand and the spread of the GA along with the PNGRB's minimum work programme. Total capex required to develop a GA depends upon factors such as demand and required infrastructure. The CGD network comprises the following facilities:

Pipeline network	CNG network	
District regulatory system (DRS)	Regulated	Unregulated
City gate station (CGS)	Online compressor- Mother station, Online stations, Daughter booster stations (DBS)	Cascades and dispensers
Steel pipeline		
MDPE pipeline		

Source: CRISIL MI&A Consulting

6.8.2 Implementation

The government plans the CGD network will cater to the estimated demand of natural gas for all the four segments (domestic, commercial, industrial, and auto) over 25 years. The network has been developed in a staggered manner. The phasing of the number of domestic connections has been carried out considering the target as prescribed by the PNGRB. Development of city gas stations and laying steel pipelines, installation of regulated CNG network and laying secondary PE network to connect domestic and commercial customers are the steps for project implementation. Considering the high capital investments involved, CGD players have been working on multiple business models to meet infrastructure commitments. Margin to partner is subject to the sharing of investment in any model, ensuring economical returns for all parties. Various methods of distribution in CGD operations are mentioned below

6.8.2.1 Conventional method

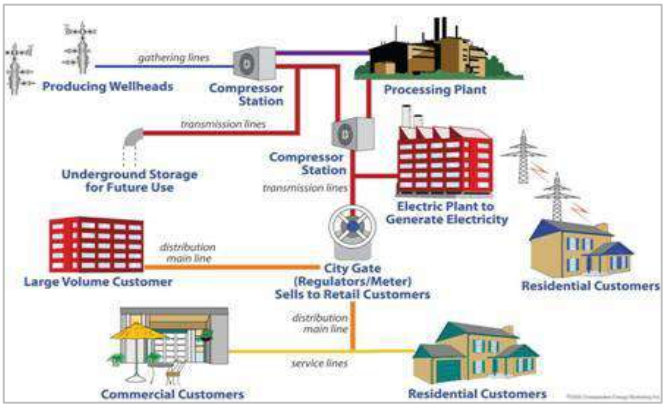
Gas is pumped over long distances using trunk gas pipelines; however, gas pipelines of a smaller diameter—gas distribution networks—are used to deliver gas to end consumers. There is low- (for gas supply to residential buildings), high- and medium-pressure networks designed for supplying industrial plants.

6.8.2.2 Virtual pipeline method (L-CNG)

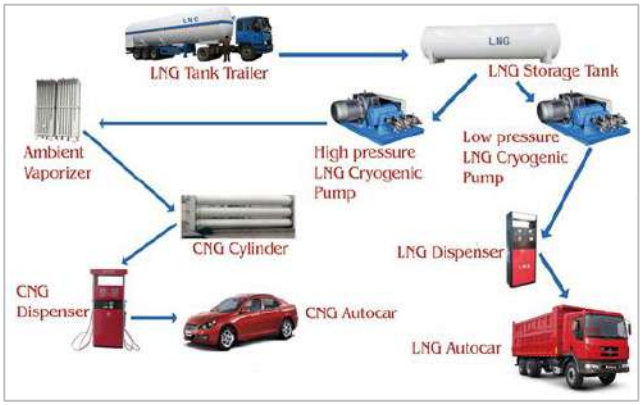
A virtual pipeline is an alternative method of transporting natural gas to places where there are no pipeline networks available. It is based on a modular system of compression or liquefaction, transport, and decompression and/or regasification of natural gas, which communities, industries, gas stations and others can use.

Figure 35: Conventional method and L-CNG (virtual pipeline delivery)

Conventional method



L-CNG (Virtual pipeline)



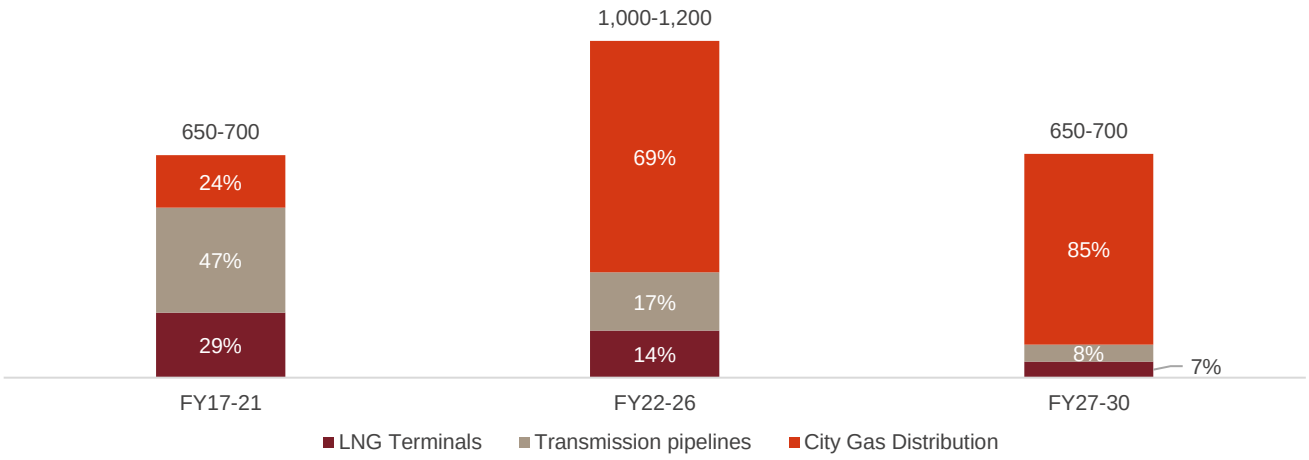
Source: CRISIL MI&A Consulting

7 Investment outlook through fiscal 2030

Investment in downstream natural gas transmission pipelines, LNG terminals and CGD projects remained subdued up to fiscal 2017 due to falling domestic gas production and surging LNG prices. However, investments started picking up from fiscal 2018 because of the government's push for infrastructure development and cleaner fuel. CRISIL expects investments in downstream gas infrastructure to improve in the medium term, with government initiatives for cleaner fuel leading to investment opportunities in the sector, visible in the recent CGD bid rounds, development in the gas trunk pipelines and new regasification capacities (planned and under-construction). Further, in line with the government's vision to increase gas share in the energy mix from the current ~6.5% to 15% by 2030, we expect the government's thrust on developing a gas infrastructure only to intensify.

Increasing competition in the CGD segment will attract ~70% of total investments expected in the gas value chain. The major players in the midstream segment of the oil and gas value chain are exploring opportunities to i) access new revenue streams, and ii) mitigate these market risks by establishing a presence in the CGD market segment through joint ventures or by partnering with global players with advanced technology, to facilitate the development of CGD projects won in auction rounds. Participation of foreign players in CGD auctions signifies strong market potential and is expected to drive investments in the sector.

Figure 36: Investment outlook for gas downstream infrastructure (Rs billion)



Note: The investments are estimations based on company investment plans for CGD infrastructure

Source: Company investment plans, CRISIL MI&A Consulting

The increasing share of gas consumption in the energy mix, opening of the CGD market post exclusivity period, and upcoming CGD auction rounds are expected to draw significant investments from major domestic players and global oil and gas players. The latter are looking to tap emerging markets such as India over the next 10 years.

8 International comparison

8.1 International benchmarks for efficient CGD ecosystem development

The US and Europe are the key benchmarks for the gas distribution business given the well-developed policy framework, business model, pricing hubs, liquidity, and highly developed access to end-users. Gas represents 21.5% of EU's energy gas consumption. In Europe, infrastructure development was supported by the high energy intensity of the economy given the heating requirement, advanced industrialisation, and pivotal role of transport/ logistics industry. Consequently, the United Kingdom, the Netherlands and Italy have majority of the households (70%-95%) connected to the gas network.

8.2 Evolution of the gas pricing mechanism

Gradual shift from oil- to hub-indexation pricing

The oil-indexation pricing mechanism dominated gas trade until 2009-2010. Since then, the model started to weaken due to several factors, such as liberalisation of gas markets, regulatory pressure, and oversupplied gas market, which led the expansion of spot-indexed gas supplies and especially gas-to-gas competition.

8.3 Business model – bundling of services for maximising gains

Historically, local distribution companies offered only bundled services; that is, they combined the cost of transportation, distribution, and the natural gas itself into one price for consumers. The specific services making up the bundled services include retail distribution, arranging pipeline transportation, storage, and other services.

8.4 Global models of development of CGD networks

Common carrier model

In Europe, CGD networks operate on complete separation of network operations and marketing activities. Experience from developed markets highlights that the ability to access any unutilised capacity on a non-discriminatory basis is the foundation for creating a liquid trading market with no price distortions and transparent price discovery mechanism.

Marketing and distribution exclusivity

The gas industries of North America and Europe were developed based on a varying degree of exclusive rights over high pressure transmission and supply/distribution. The initial investments may not have occurred without minimum protection and the possibility for gas utilities and producers earning an adequate return on investment. As markets mature, typically phased competition is introduced on supply/marketing.

9 GAs awarded to IRMEL

IRMEL is an integrated, value-driven energy enterprise that develops natural gas distribution projects in the GAs allotted to the company for industrial, commercial, domestic, and automobile customers. The company has built its competency as a CGD company by developing its existing GAs since 2017. The company is strengthening its roots in the existing authorised GAs covering Banaskantha, Gujarat; Fatehgarh Sahib, Punjab; and Diu and Gir Somnath, Gujarat. IRMEL has invested Rs 1,658.33 million for the period from fiscals 2020-22 which includes capital expenditure towards Plant and Machineries, Land and Building and SCADA and excludes capital work in progress, right of use, intangibles, office equipment, computers, and software, etc. Additionally, the company is on its way to expand the CGD network in Namakkal and Tiruchirappalli districts GA, awarded by the PNGRB under the 11th CGD bidding round. On cumulative basis, as on September 30,2022, the Company has gross block (inclusive of capital work in progress, intangible assets, right to use assets and intangible under developments) of Rs. 4,626.53 million.

Table 12: CGD bidding round overview for the GAs

GA name	CGD bidding round awarded in	Total no of bidders	Other bidders' names
Banaskantha	6th	3	Gujarat Gas Ltd; Sabarmati Gas Ltd
Fatehgarh Sahib	6th	4	Indian Oil-Adani Gas Pvt Ltd; GAIL Gas Ltd; Consortium of Mahesh Resources Pvt Ltd and others
Diu & Gir Somnath	9th	3	Adani Gas Ltd; Gujarat Gas Ltd.
Namakkal and Tiruchirappalli	11th	13	IOCL; Adani Total Gas Ltd; BPCL; M/s. Megha Engineering and Infrastructures Ltd; THINK Gas Distribution Pvt Ltd; HPCL; Torrent Gas Private Ltd; SHOLAGASCO Private Ltd; IGL; GAIL GAS Ltd; Sabarmati Gas Ltd; HCG (KCE) Pvt Ltd.

Source: PNGRB

9.1 IRMEL strongly positioned as reliable gas utility provider

In each of the aforementioned GAs, IRMEL has positioned itself as the provider of one of the safest, cleanest and most cost-effective fuels for households, commercial establishments, and industrial units, as well as for fuel requirements in the transport segment. Compared with competitive fuels, IRMEL provides a more reliable and environment-friendly alternative in all customer segments. Hence, it has been able to tap the potential customer segment in the respective GAs. The company is providing the following competitive offerings while maintaining a customer-centric approach and making continuous efforts to upgrade its services by leveraging technology across all its customer operations:

- As on September 30, the company is operating 2 COCO (company-owned, company-operated), 30 DODO (dealer-owned, dealer-operated) CNG stations (comprising 55% of its total CNG retail outlets), which include the IRM Energy branding to position and strengthen the company's corporate identity and 24 OMC (Oil marketing companies) CNG stations
- The company has connected 168 industrial customers (comprising ~95% of total PNG sales in the second quarter of fiscal 2023)
- Gas prices have been benchmarked with respective alternate fuel to offer an advantage to customers switching from alternate fuels. Due to company's competitive gas price and optimised operational expenditure, the company can offer the gas to its industrial PNG customers at a viable price in the market and enable the industrial PNG customers to switch from other alternate fuels (coal and FO) to natural gas

- Introduced various attractive registration plans, which makes it very affordable to switch to piped natural gas for domestic households, commercial establishments, and industries
- The company is jointly promoting the purchase of new CNG vehicles with original equipment manufacturers
- The company is jointly promoting with CNG retrofitters and incentivising vehicle owners to opt for CNG retrofitment for their cars, autos, buses, and trucks
- Uninterrupted CNG and PNG supply assuring ease of operations and availability of gas to the customers
- Strengthened digital payment options for customers in all segments
- Safety management systems to ensure safe, reliable, and uninterrupted distribution of gas
- Company has set up an L-CNG station in Veraval municipality which will aid in faster penetration in the Diu and Gir Somnath GA. It intends to set up more L-CNG stations in its other GAs

9.2 Market and infrastructure exclusivity

The company is established in the existing GAs, as there are significant entry barriers such as marketing and infrastructure exclusivity granted pursuant to the PNGRB authorisation for the respective GAs, and the requirement of large investments to establish a natural gas distribution network for competitors to enter its area of operations. The marketing and infrastructure exclusivity period is mentioned in the below table for the GAs awarded to IRMEL.

Table 13: Market and infrastructure exclusivity

GAs	Infrastructure exclusivity expiry date	Market exclusivity expiry date	Revised market exclusivity expiry date**
Banaskantha	30-Jun-2041	30-Jun-2021	30-Jun-2023
Fatehgarh Sahib	04-Jul-2041	04-Jul-2021	30-Sep-2023
Diu and Gir Somnath	24-Sep-2043	24-Sep-2026	30-Sep-2028
Namakkal and Tiruchirappalli	14-Mar-2047	14-Mar-2030	-

*Note: *Eight years for GAs awarded during the 9th and 11th rounds, while five years for GAs awarded during the 6th round. **Market exclusivity date has been revised for all the GAs due to pandemic-related restrictions.*

Source: IRMEL-PNGRB authorisation document

9.3 Profiles of GAs

9.3.1 Banaskantha GA

9.3.1.1 Overview

Geographical location

- The district is in the northeast of Gujarat
- It is the second largest district by area and fifth largest by population in the state
- Major adjoining GAs are Patan District and Kutch West, operated by Sabarmati Gas Ltd and Gujarat Gas Ltd, respectively

Connectivity

- The region possesses excellent road and rail connectivity as it falls on the Delhi Mumbai Industrial Corridor (DMIC), thus linking it with four major cities of India
- Palanpur and Deesa, the two key cities of this district, are connected to National Capital Delhi and Jaipur, capital of neighbouring Rajasthan, through National Highway (NH) 27
- Connected to the Kandla Port via NH 15

Economic factors

- Key industries include agro, food processing, tourism, textile, and ceramics
- The district ranks first in the country in milk production, with Banaskantha District Cooperative Milk Producers' Union Ltd under the brand name AMUL
- Tourist destinations such as Ambaji Temple and Balaram-Ambaji Sanctuary draw visitors all year long, potentially increasing demand for the commercial and CNG segments
- A new defence airbase is slated to come up by the last quarter of 2023 for which 4,500 acre of land has been earmarked

Table 14: Banaskantha GA

Snapshot			
Area (sq km)	12,703	Literacy rate	65.3%
Population (as per Census 2011)	3,120,506	No. of retail outlets of oil OMCs (oil marketing companies)	152
Charge areas	12	National and state highways	NH 27, SH 54
Households (as per 2011 Census)	81,793 (urban) and 478,438 (rural)		
Industrial clusters	Palanpur and Deesa		
Industrial profile	Agro & food processing, textile, mineral, diamond, and ceramic industries		
Key tourist attractions	Ambaji & Kumbharia (pilgrimages), Balaram-Ambaji and Jessore Sloth Bear (sanctuary)		
Tap-off point	Takarwada, Jagana Village		
Pipeline connectivity	GSPL NGPL Network		
VAT (Gujarat) on CNG & PNG	CNG, D-PNG:5%, I-PNG: 6.00%		
No. of registered vehicles, (excluding two wheelers) *	309,255 (FY23, as of December 8, 2022)		

*Source: District Profile Report, *Vahan dashboard, CRISIL MI&A Consulting*

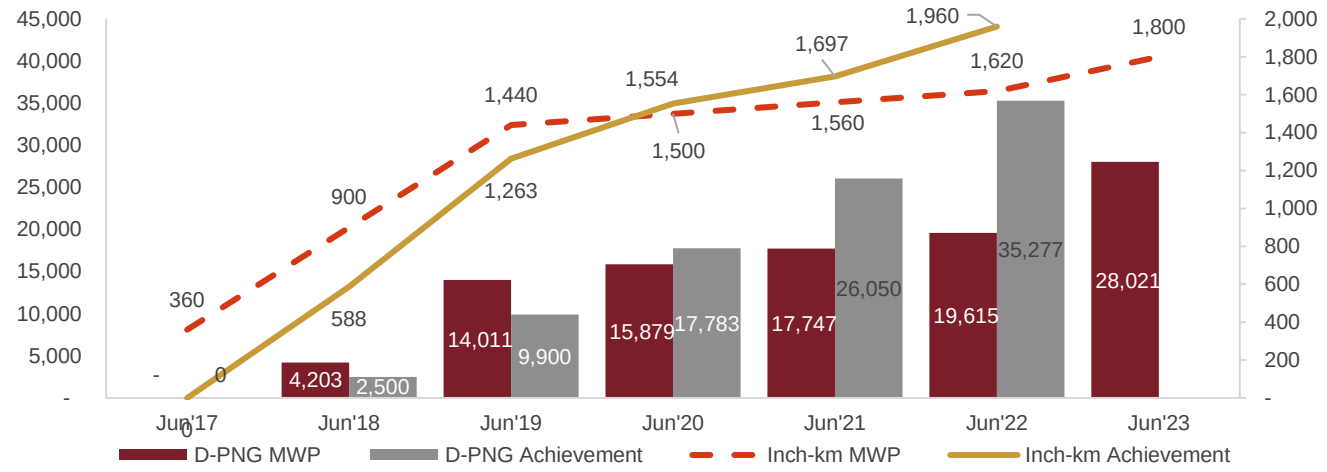
9.3.1.2 IRMEL's roll out in Banaskantha

The company has strategically located 35 CNG stations (mix: DODO-27 and OMC-8), in which eight are online and 27 are daughter booster stations, catering to the CNG requirement of local vehicles as well as floating vehicles commuting from neighbouring districts and states. The company has strongly positioned itself in the PNG- commercial segment, supplying natural gas to ~160 customers in Banaskantha.

As on September 30, 2022, more than 38,000 households are connected through PNG in Banaskantha, while another 5,000 have registered to avail the supply of natural gas. Out of 38,000 connected customers, Palanpur City contributed to more than 30,000 customers and Deesa City the balance. IRMEL was awarded the GA under the sixth CGD bidding round, wherein it has already achieved the MWP targets for both the parameters. It has already laid 1,960 inch-km of the pipeline against the target of 1,620 inch-km till the fourth contract year. Similarly, the MWP target for domestic households has also been achieved by converting 35,277 households against the target of 19,615 households in the same period.

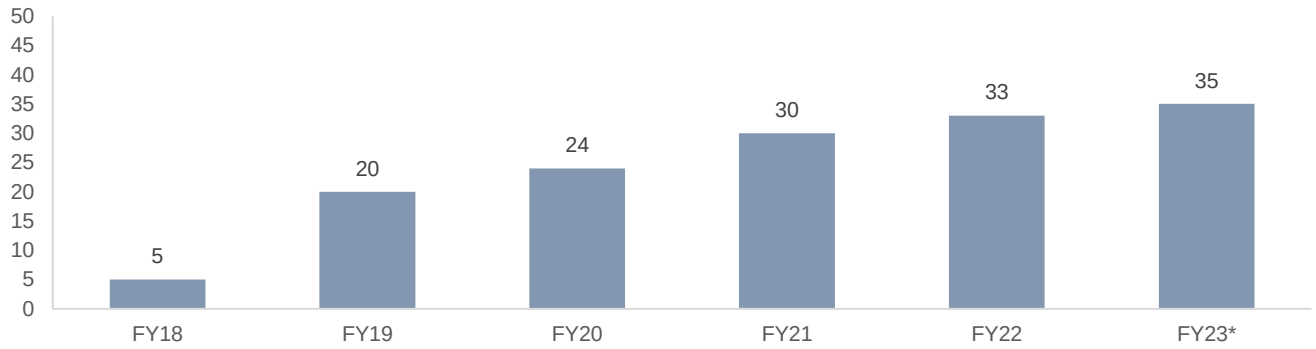
IRMEL had furnished Rs ~62 Crores as PBG (performance bond guarantee) to PNGRB for timely commissioning of the project as per the prescribed targets in the bid and for meeting the service obligation during the operating phase of the project. The company has already achieved its both MWP targets for D-PNG and inch-km. The PNGRB has extended the MWP period by another two years for all CGD entities as it has declared force majeure due to the pandemic's impact. As a result, the MWP expiry for the Banaskantha GA has been extended until June 30, 2023, from June 30, 2021.

Figure 37: MWP achievement in Banaskantha GA



Source: IRMEL company report

Figure 38: Number of CNG stations set up by IRMEL in Banaskantha



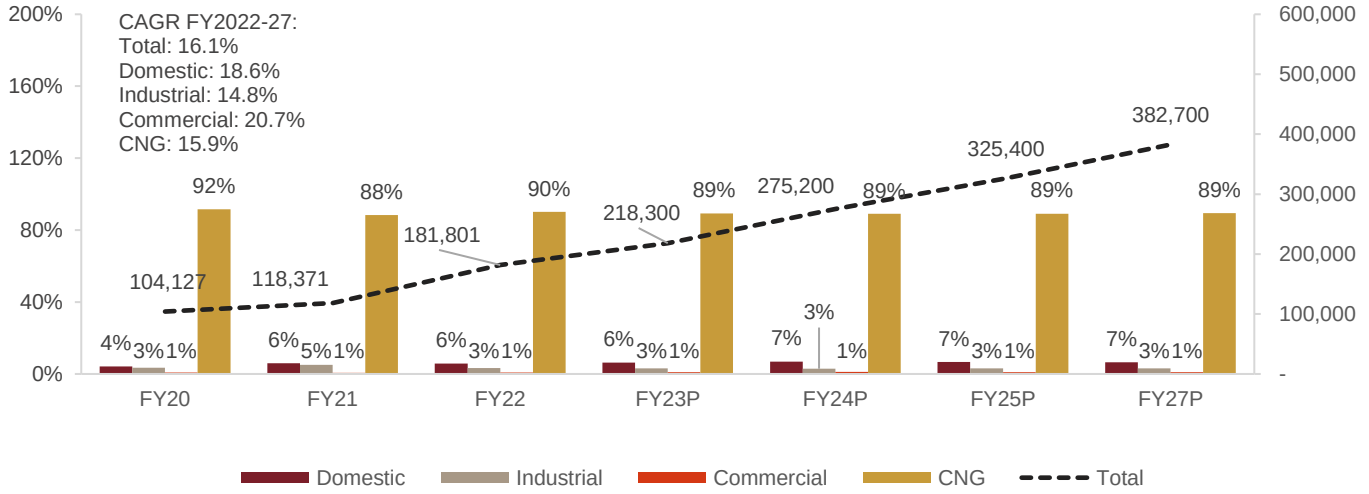
** Data till September 30, 2022*

Source: IRMEL company report

9.3.1.3 Demand outlook

The geographical area caters to the CNG demand originating from ~54,000 CNG vehicles (as of December 2022). Given the strategic location of the GA along with the presence of a robust CNG network in the state, the GA has witnessed steady growth in CNG demand. This is expected to continue as more vehicles are expected to adopt CNG in the GA. Bulk of the demand (~90% for FY22) in the GA is from the CNG transport segment and from floating traffic because of the strategic location of the GA. Considering the augmentation in the CNG station network along with push from the OEM/retro fitment segment, CNG demand is expected to continue to grow over the next few years.

Figure 39: Demand in Banaskantha GA (in scmd)



P: Projected

Source: IRMEL company report

Note: Demand projections for the period FY23-FY27 have been taken from the company report, which has been validated by CRISIL MI&A Consulting.

9.3.1.4 Financials

IRMEL had undertaken a capex of Rs 793 million in Banaskantha for fiscals 2020-22, mainly for pipelines, CNG stations and domestic connections.

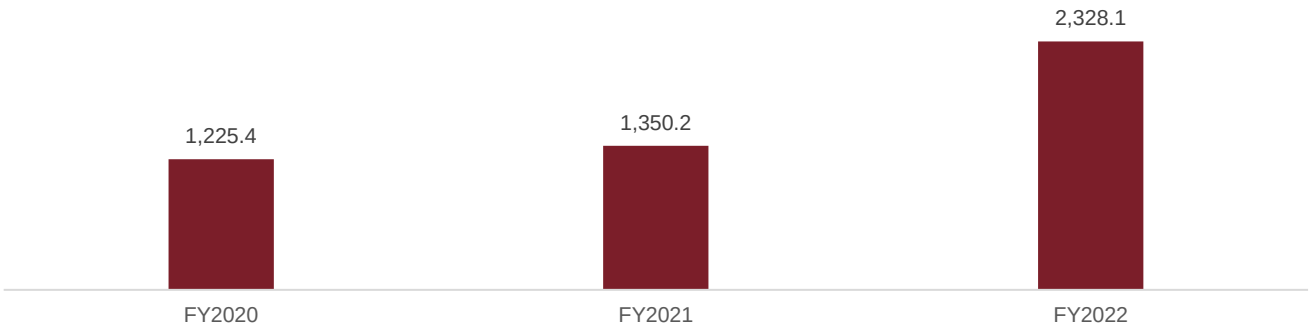
Table 15: Capex phasing (Rs million)

Particulars	FY20	FY21	FY22
Capex	296.89	275.02	221.11

Source: Company report

The company exhibited high revenue growth driven by demand generated from all the CGD segments. Based on the historical sales, revenue increased at a CAGR of 37.80% from Rs 1,225.43 million in fiscal 2020 to Rs 2,328.13 million in fiscal 2022.

Figure 40: Revenue of Banaskantha GA (Rs million)



Source: IRMEL company report

9.3.2 Fatehgarh Sahib

9.3.2.1 Overview

Geographical location

- District is bound by Ludhiana and Rupnagar (Ropar) in the north; Patiala in the south; SAS Nagar (Mohali), Rupnagar (Ropar) and Patiala in the east; and Ludhiana and Sangrur in the west. These GAs are major commercial and industrial hubs, and have considerable transit traffic leading to potential CNG demand
- The main towns of the district are Sirhind, Bassi Pathana, Amloh, Khamano and Mandi Gobindgarh. Mandi Gobindgarh is also known as the steel town of India

Connectivity

- Fatehgarh Sahib is 250 km from Delhi
- The GA has good CNG potential, especially in the heavy commercial vehicle segment, as NH 44 is passing through Fatehgarh Sahib district, which caters to the vehicle movement between Delhi and Jammu

Economic factors

- The district's economy depends mainly on agriculture, industries, and allied activities
- Mandi Gobindgarh has more than 400 industries, out of which more than 200 industries are steel re-rolling mills, as it is a major hub of steel re-rolling in India
- PSIEC (Punjab Small Industries & Export Corporation) plans to set up greenfield pharma park across 130 acres, for which land acquisition have been completed. The Punjab government plans to set up a mega textile park under PM Mitra scheme in the near term
- Tourist attractions include two historic gurdwaras

Table 16: Fatehgarh Sahib GA

Snapshot			
Area (sq km)	1,146	Literacy rate	79.35%
Population (as per Census 2011)	599,814	No. of retail outlets of oil OMCs	76
Charge areas	4	National highways	NH44, NH95
Households	39,103 (urban) and 78,997 (rural)		
Industrial clusters	Mandi Gobindgarh, Sirhind, Nabipur		
Industrial profile	Agriculture, allied activities, steel rolling units, mining, and manufacturing		
Key tourist attractions	Gurudwaras, temples, ancient monuments, and museums		
Key residential areas	Mandi Gobindgarh, Sirhind, Bassi Pathana, Amloh and Khamano		
Tap-off point	Focal Point Mandi Gobindgarh		
Pipeline connectivity	Dadri-Bawana-Nangal NGPL		
VAT (Punjab) on CNG & PNG	PNG: 3.30% and CNG: 14.30%		
No. of registered vehicles (excluding two wheelers) *	56,235 (FY23, as of December 8, 2022)		

*Source: District Profile Report, *Vahan dashboard, CRISIL MI&A Consulting*

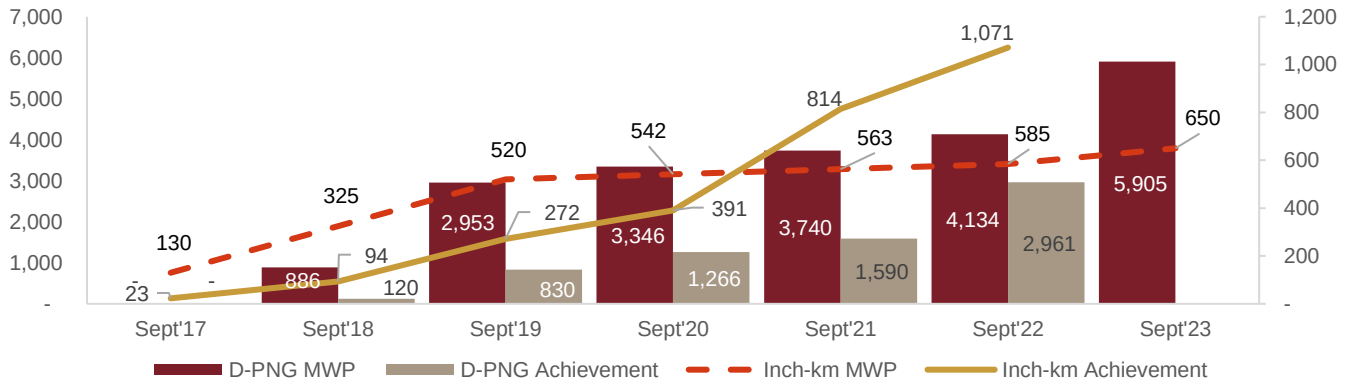
9.3.2.2 IRMEL's roll out in Fatehgarh Sahib

In Fatehgarh Sahib urban area, more than 2,000 domestic customers have received natural gas connections by the company and ~1,400 registrations are yet to be connected. The company recently commissioned pipeline till Sirhind city and started giving PNG domestic and commercial connections in Sirhind town of Fatehgarh Sahib district, which is an important location since there are good schools and colleges, offering good domestic, commercial and CNG prospects.

The company has also set up eight CNG stations (COCO-1, OMC-7), with four online and four daughter booster stations, which are strategically located mostly on NH to cater to CNG demand of local vehicles as well as floating heavy commercial vehicles. The company has been targeting the commercial segment. As on September 30, 2022, it has connected more than 30 commercial customers with its gas network. There are 444 industries operating while IRMEL has already converted more than 150 industries to natural gas, which were running on coal, furnace oil and coal gasifier. Out of more than 150 industries connected in Fatehgarh Sahib, over 100 are steel re-rolling mills. Apart from this, the company has more than 90 registrations from industrial customers that are yet to be connected (work is under execution at different stages).

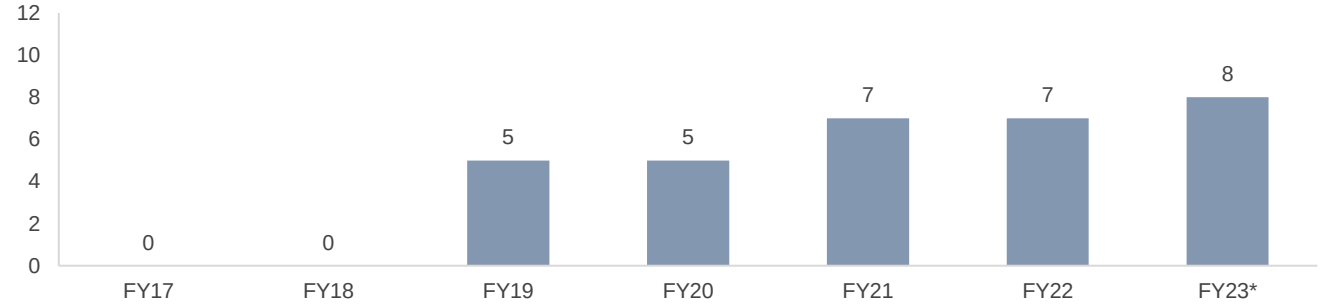
IRMEL had furnished Rs 38 crores as a PBG (performance bond guarantee) to PNGRB for the timely commissioning of the project as per the prescribed targets and for meeting the service obligations during the operating phase of the project. As per the norms of the sixth bidding round, if the company fails to achieve its MWP target, PNGRB has a right to encash PBG under Regulation 16 of the PNGRB Regulations, 2008. The company has already achieved its MWP target for the parameter inch-km pipeline. The PNGRB has extended the MWP period by another two years for all CGD entities as it has declared force majeure due to the pandemic's impact. As a result, the MWP expiry date for the Fatehgarh Sahib GA has been extended until September 30th, 2023, from July 4th, 2021.

Figure 41: MWP achievement in Fatehgarh Sahib GA



Source: IRMEL company report

Figure 42: Number of CNG stations set up by IRMEL in Fatehgarh Sahib GA



**Data till September 30, 2022*

Source: IRMEL company report

9.3.2.3 Demand outlook

In fiscal 2023 (till September), the company's CNG sales in the GA have grown to 29,452 scmd, which is 47.5% growth compared to fiscal 2022, and with the new CNG stations planned and the increasing diesel heavy vehicle conversions taking place, the CNG sales can be estimated to grow at a CAGR of 26.5% during the projected period. With the opening of new areas in the GA, demand for natural gas from the domestic segment is also estimated to grow at a CAGR of 25.4% from fiscal 2022 to fiscal 2027.

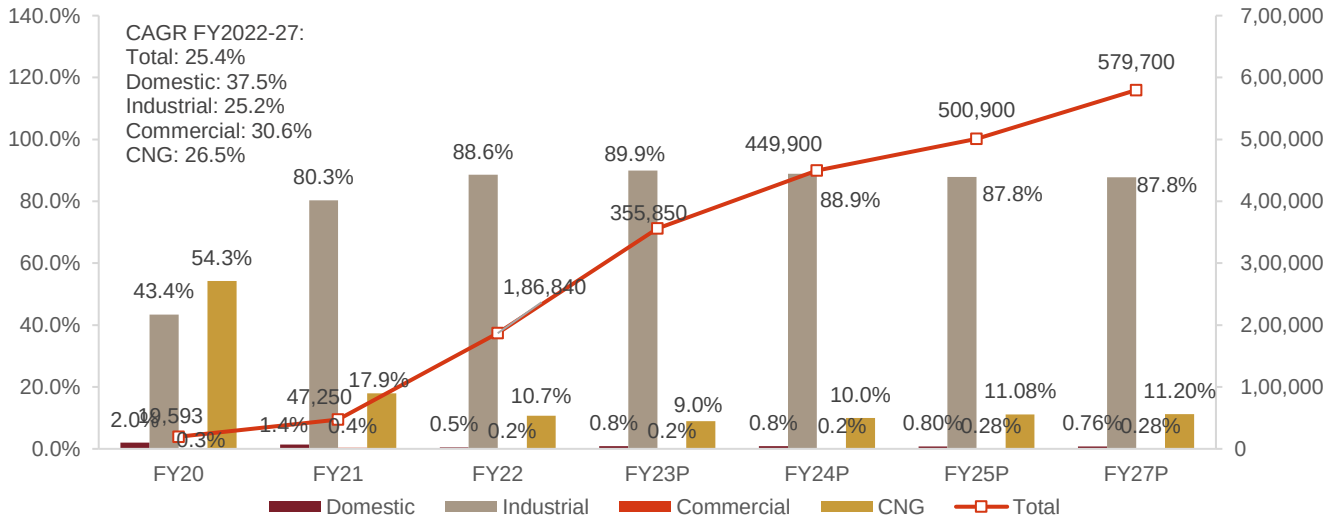
Industrial demand outlook

In Fatehgarh Sahib GA, demand for natural gas is primarily industrial; ~89% as of fiscal 2022. On October 20, 2020, the National Green Tribunal (NGT), while considering the issue of polluting activities in Mandi Gobindgarh, located in Fatehgarh Sahib district, in the matter of O.A. (original application) number (924/2019), issued directives for shifting steel rolling mills and all similarly placed industries from coal to PNG and directed the Punjab Pollution Control Board to ensure that if such shifting does not take place, the non-compliant units shall be closed till compliance. Because of rising pollution levels, the Punjab government has emphasized the need to switch to clean fuels for industrial applications and directed for a quick transition to clean fuels such as CNG. This initiative bodes well for the company as it leads to easier conversions.

- Industrial demand is expected to increase in the GA because of upcoming industrial clusters. For instance, the Punjab Small Industries and Export Corporation (PSIEC) has acquired 133-acre land in Wazirabad village of Fatehgarh Sahib district to set up a greenfield pharma park. The Punjab government plans to set up mega a textile park as well in near term in Fatehgarh Sahib under the PM Mitra scheme.

The regulatory push for green fuels and the expanding industrial footprint is likely to deliver a healthy demand for natural gas in the coming years.

Figure 43: Demand in Fatehgarh Sahib (in scmd)



P: Projected

Source: IRMEL company report

Note: Demand projections for the period FY23-FY27 have been taken from the company report, which has been validated by CRISIL MI&A Consulting.

9.3.2.4 Financials

IRMEL undertook a capex of Rs 497.74 million in Fatehgarh Sahib over fiscals 2020-22 which includes amount spent towards plant and machineries (mainly for pipelines, CNG stations and domestic connections), land and buildings and SCADA.

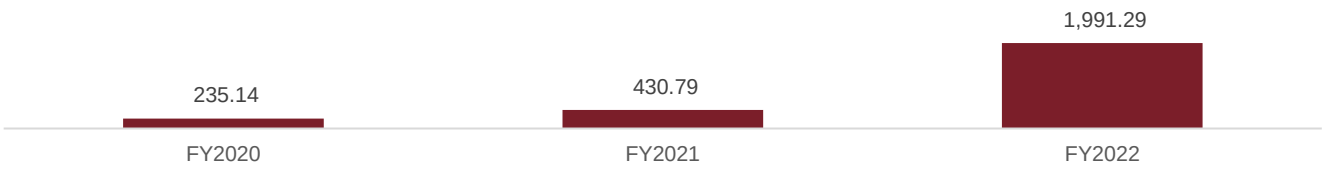
Table 17: Capex phasing (Rs million)

Particulars	FY20	FY21	FY22	FY23 (Till September 30, 2022)
Capex	73.76	133.00	290.98	144.16

Source: Company report

The company exhibited high revenue growth, driven by demand generated from all the CGD segments. Based on historical sales, revenue increased at a CAGR of 191.0% from Rs 235.14 million in fiscal 2020 to Rs 1,991.29 million in fiscal 2022.

Figure 44: Revenue of Fatehgarh Sahib (Rs million)



Source: IRMEL company report

9.3.3 Diu and Gir Somnath

9.3.3.1 Overview

Geographical location

- Gir Somnath is in Saurastra, Gujarat. Veraval is headquarters of Gir Somnath district. Diu is located near the Port of Veraval
- Junagadh and Amreli districts are the two major neighbouring GAs that have many tourist places, leading to high inflow of tourists throughout the year, which should create prospective demand in the commercial segment

Connectivity

- Gir Somnath is linked to the rest of the country through a good road network
- Demand in the CNG segment is expected to be robust because of high movement of floating vehicles since major highways such as NH51 and NH 8E pass through the GA

Economic factors

- Major tourist attraction is due to the presence of Gir sanctuary, the only home of Asiatic lions, and the famous Somnath Temple. As a result, the area sees a lot of transit traffic
- Diu is known for its white sand beaches that attract tourists throughout the year
- Presence of marquee companies such as Ambuja Cement, Gujarat Siddhi Cement and Aditya Birla Nuvo Ltd around Veraval lead to the heavy vehicle traffic

Table 18: Diu and Gir Somnath GA

Snapshot			
Area (sq km)	3,786	Literacy rate	72.7%
Population (as per Census 2011)	1,269,551	No. of retail outlets of oil OMCs	74
Charge areas	7	National highways	NH 51, NH 8E
Households	81,793 (urban) and 478,438 (rural)		
Industrial clusters	Veraval		
Industrial profile	Fisheries, chemicals, cement, textile, and boat making industries		
Key tourist attractions	Nagao beach, offshore lighthouse (in Diu), Gir forest, Somnath Temple		
Key residential areas	Veraval, Kodinar and Una		
Tap-off point	Survey No 254/p2, Zudvadli, Gir Gadhda Road, Una		
Pipeline connectivity	GSPL NGPL Network		
VAT (Gujarat) on CNG and PNG	CNG, D-PNG:5%, I-PNG: 6.00%		
No. of registered vehicles, transport vehicles (excluding two-wheelers) *	55,417 (FY23, as of December 8, 2022)		

Note: Vehicle registrations with Diu and Veraval RTOs

*Source: District Profile Report, *Vahan dashboard, CRISIL MI&A Consulting*

9.3.3.2 IRMEL's rollout in Diu and Gir Somnath

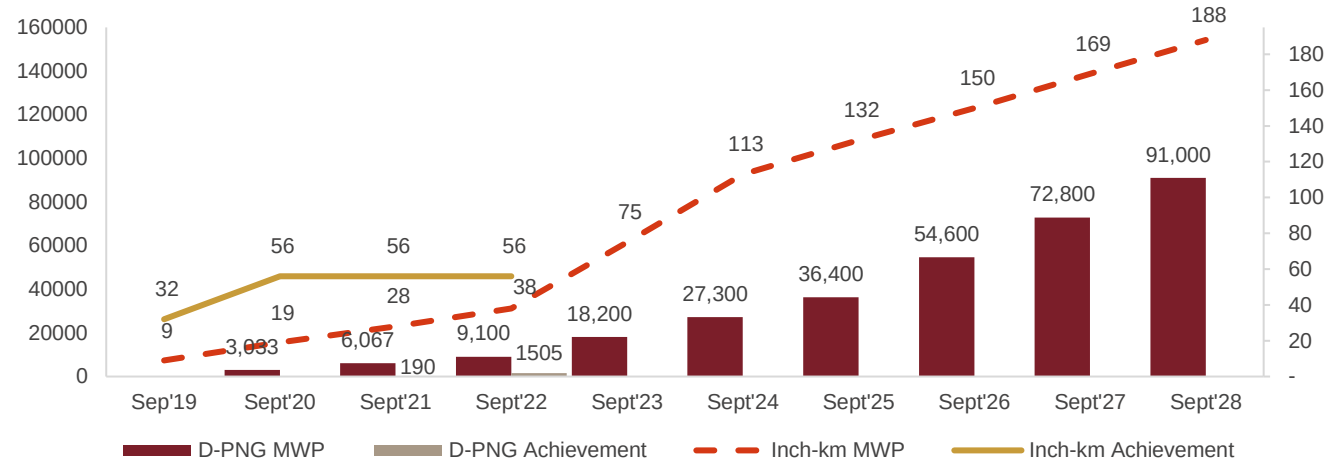
IRMEL has set up 13 CNG stations, of which two are online and 11 are daughter booster stations, in all key areas of the GA. To optimise the project capex and improve natural gas reach within the geographical area, the company has set up an L-CNG station in Veraval, through which it caters to the demand of nearby areas without laying of steel pipelines. The innovative distribution model ensures IRMEL's commitment to distribute natural gas in the region.

IRMEL has been targeting alternate fuels by creating a strong customer value proposition, i.e., affordable PNG and CNG retail prices, encouraging natural gas adoption, uninterrupted CNG and PNG supply, and ease of operations. IRMEL has developed some good retro fitment agencies for converting diesel HCVs to CNG, and which can become a major CNG customer segment in the near future. The company already caters to close to 1,000 PNG domestic customers in Una. Recently, it also rolled out its domestic PNG services in Veraval district and has enrolled more than 1,500 customers.

The GA has 11 (all sizes) harbours that consist of more than 8,000 boats (running on petrol and kerosene). To boost volumes and deepen the penetration of CNG, the company carried out a pilot project of converting a petrol-operated boat to CNG and successfully converted one boat (fishing).

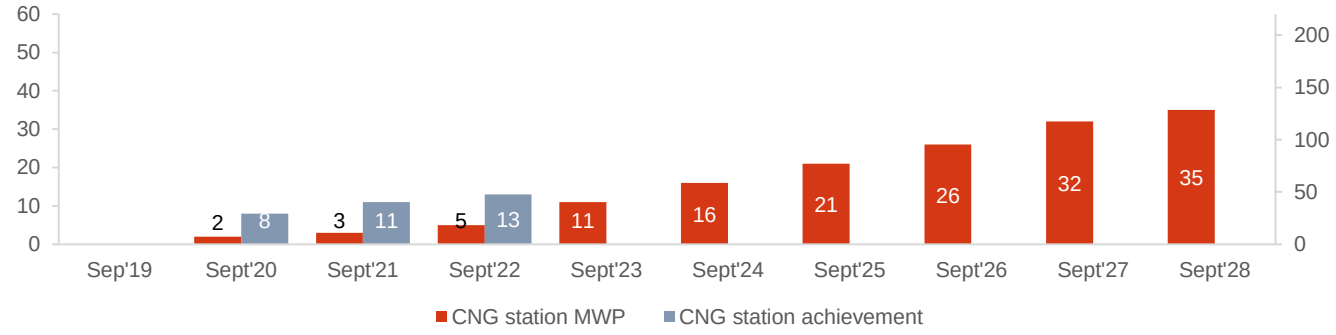
IRMEL had furnished PBG of Rs 25 crores to PNGRB for the timely commissioning of the project as per the prescribed work programme in the bid and for meeting the service obligations during the operating phase of the project. The company met its MWP yearly targets for inch-km pipeline and CNG stations in September 2022 but fell short of the D-PNG yearly MWP target. The PNGRB can levy penalty charges for not meeting performance targets as mentioned in Section 6.3. The PNGRB has extended the MWP period by another two years for all CGD entities as it has declared force majeure due to the pandemic's impact. As a result, the MWP expiry date for the Diu and Gir Somnath GA has been extended until September 30, 2028, from September 24, 2026.

Figure 45: MWP achievement in Diu and Gir Somnath GA



Source: IRMEL company report

Figure 46: CNG station achievement in Diu and Gir Somnath GA

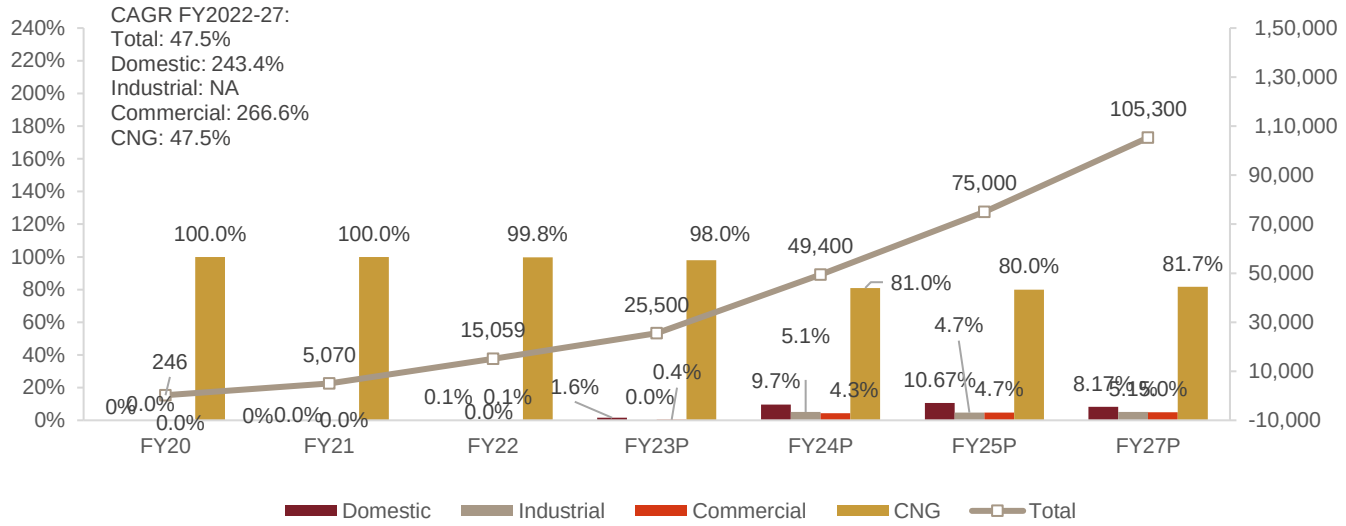


Source: IRMEL company report

9.3.3.3 Demand outlook

CNG sales in the GA are estimated to grow owing to factors such as preference for CNG among cars and auto owners, CNG usage in heavy commercial vehicles and boats. As the company is operating Una town for PNG and has recently started Veraval, it will be gradually entering other prospect areas in the GA, good demand potential is envisaged in commercial and residential segments in the GA. In the industrial segment, locations such as Veraval and Kodinar are also expected to contribute to growth in industrial gas demand. The company can also have an advantage as an LNG port is currently under construction in Chhara, Gir Somnath district, which will ensure gas security as well as increase traffic and other prospects. The company has also successfully converted one boat (fishing) in the coastal area to CNG. There are more than 8,000 boats in the GA that can add huge demand potential.

Figure 47: Demand in Diu and Gir Somnath GA (in scmd)



P: Projected

Source: IRMEL company report

Note: Demand projections for the period FY23-FY27 have been taken from the company report, which has been validated by CRISIL MI&A Consulting.

9.3.3.4 Financials

IRMEL undertook capex of Rs 507.02 million in Diu and Gir Somnath over fiscals 2020-22 which includes amount spent towards plant and machineries (mainly for pipelines, CNG stations and domestic connections), land and buildings and SCADA.

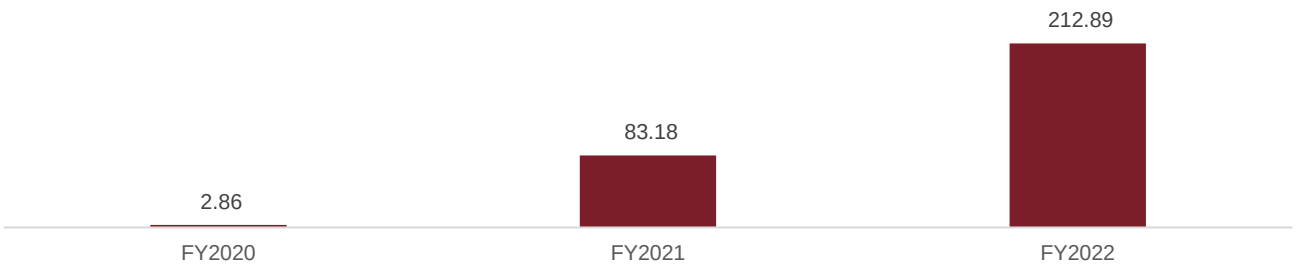
Table 19: Capex phasing (Rs million)

Particulars	FY20	FY21	FY22	FY23 (Till September 30, 2022)
Capex	269.77	101.36	135.89	147.60

Source: Company report

The company exhibited high revenue growth, driven by demand generated from all the CGD segments. Based on historical sales, revenue increased at a CAGR of 792.6% from Rs 2.86 million in fiscal 2020 to Rs 212.89 million in fiscal 2022.

Figure 48: Revenue of Diu and Gir Somnath GA (Rs million)



Source: IRMEL company report

9.3.4 Namakkal and Tiruchirappalli

9.3.4.1 Overview

Geographical location

- Tiruchirappalli is situated at the centre of Tamil Nadu. It is the fourth largest city after Chennai, Madurai, and Coimbatore
- Namakkal and Tiruchirappalli districts share their borders with Thanjavur, Pudukkottai, Perambalur and Karur districts, which are authorised to Megha Gas, and with Selam and Erode districts authorised to IOCL and BPCL, respectively

Connectivity

- Namakkal is well connected with major cities such as Bengaluru, Salem, and Kanyakumari via NH44 and rail, which connects to various parts of Tamil Nadu
- Tiruchirappalli is connected by five national and seven state highways

Economic factors

- Tiruchirappalli is a major engineering hub in Tamil Nadu. It is home to BHEL, ordinance factories, golden rock railway workshop, six industrial estates (SIDCO[1]), one industrial complex (SIPCOT), and other industries include cotton and textile, milling, tanning, cement, filigree, and tobacco products
- Major tourist attraction places are Namakkal fort, Kolli hills and various temples

Note: 1) Small Industries Development Corporation of Tamil Nadu (SIDCO),

Source: CRISIL MI&A Consulting

Table 20: Namakkal and Tiruchirappali GA

Snapshot			
Area (sq km)	Total - 7,929	Literacy rate	79.9%
Population (as per Census 2011)	4,448,891	No. of retail outlets of oil OMCs	320
Charge areas	6	National highways	NH44, NH 45, NH81, NH210, NH227 and NH 67
Households (as per Census 2011)	533,423 (urban) and 640,492 (rural)		
Industrial clusters	Tiruchi, Musiri, Pallipalayam, Rasipuram		
Industrial profile	Engineering goods, textiles, tobacco, paper & paper products		
Key tourist attractions	Namagiri Amman temple, Kolli Hills, Namakkal Fort, RockFort temple		
Key residential areas	Sendamangalam, Kumarapalayam, Mohanur, Thottiyam		
Tap-off point	SV -123 Ennore Tuticorin NGPL at Velur Village & SV 124 Ennore Tuticorin NGPL at Surayur Village		
Pipeline connectivity	Ennore Tuticorin NGPL		
VAT (Tamil Nadu) on CNG & PNG	5%		
No. of registered vehicles (excluding two wheelers) *	238,389 (FY23, as of December 8, 2022)		

Note: Vehicle registrations with Namakkal and Tiruchirappalli RTOs

*Source: *Vahan dashboard, District Profile Report, CRISIL MI&A Consulting*

9.3.4.2 IRMEL's growth plans

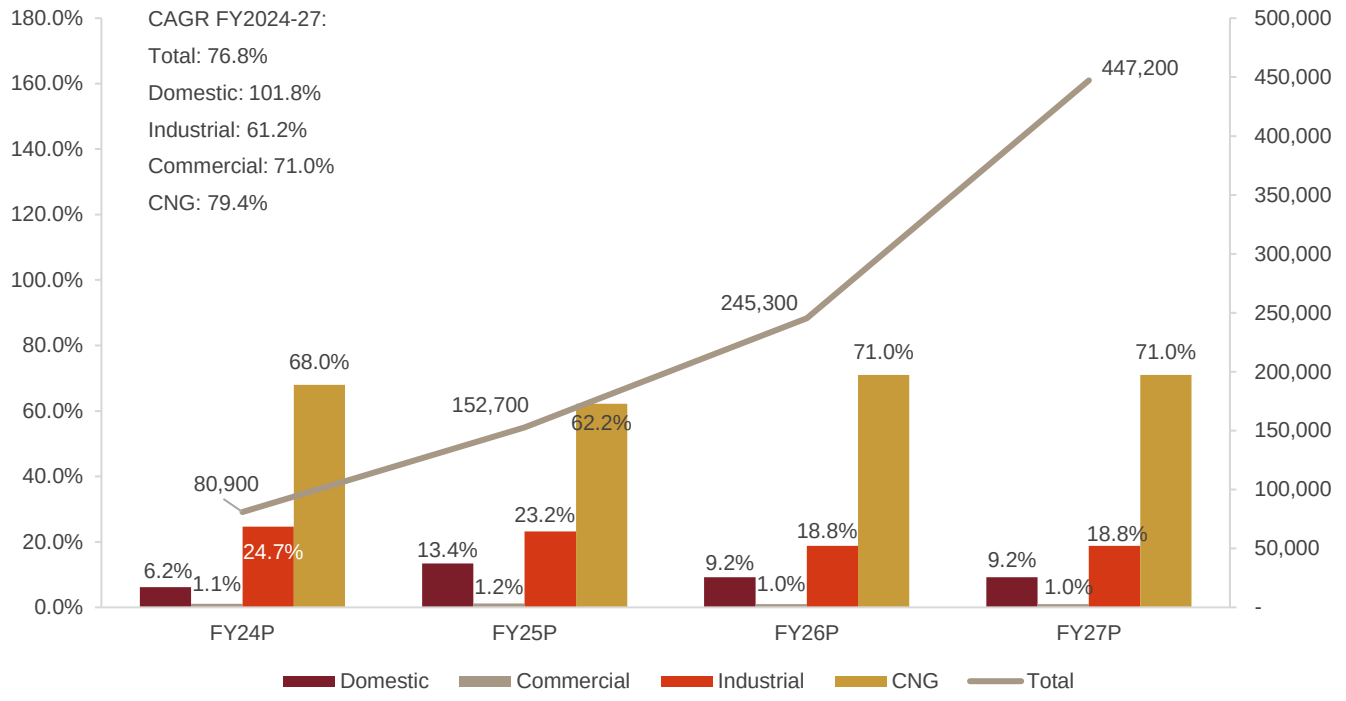
IRMEL has got the GA allocated in the 11th PNGRB bidding round in March 2022. IRMEL had furnished PBG of Rs 33 crores to PNGRB for the timely commissioning of the project as per the prescribed work programme in the bid and for meeting the service obligations during the operating phase of the project.

The company has been planning its network and other infrastructure to cater to the gradually increasing demand. The company has acquired land for construction of 2 City Gate Stations around Tiruchirappalli. Additionally, the company has entered into a long-term lease for land near Namakkal to set up an LCNG cum LNG dispensing station cum mother station on Salem Namakkal high NH 44 which has heavy traffic.

9.3.4.3 Demand outlook

The geographic area has a large urban population, which provides an excellent opportunity for IRMEL to convert prospective customers from other alternative fuels such as LPG to natural gas. For commercial and domestic segments, the GA can be very prospective, as Tiruchirappalli is an urban market housing significant residential and commercial demand centres. There is a lot of potential for residential customers to switch to PNG by fiscal 2024. Demand projections for the period fiscal 2024 to fiscal 2027 have been carried out by Mecon Limited considering multiple factors such as consumption norms, switchover factors, growth rates per segment, present competing fuel consumption, and others. Demand for natural gas from the industrial segment can be estimated at 20,000 scmd and from the commercial segment at around 900 scmd by fiscal 2024. CNG demand is estimated at around 55,000 scmd by the end of fiscal 2024, considering the large number of national and state highways connecting the districts of the GA with the major districts of Tamil Nadu and Karnataka.

Figure 49: Demand outlook of Namakkal and Tiruchirappalli GA (in scmd)



P: Projected

Source: IRMEL company report, MECON Report

Note: Demand projections for the period FY23-FY27 have been taken from the MECON report

10 IRMEL market positioning

IRMEL is engaged in the city gas distribution business in GAs allocated to it such as Banaskantha, Fatehgarh Sahib, Diu & Gir Somnath and Namakkal & Tiruchirappalli. The company is at present operational in all GAs except Namakkal & Tiruchirappalli, where the work in under way. IRMEL supplies natural gas through an extensive CGD network and is an authorised distributor of compressed natural gas (CNG) and piped natural gas (PNG) in these areas. The company has successfully built a customer distribution network for PNG and CNG. As on September 30, 2022, it had 43,183 domestic customers, 217 commercial customers and 168 industrial customers. Thus, the company has established its creditability in terms of efficient operational management, stakeholder management and supply-chain risk management.

10.1 IRMEL has expanded its presence to four GAs

After receiving authorisation for Diu and Gir Somnath GA in Gujarat in the ninth round and Namakkal and Tiruchirappalli districts in the 11th round, the company expanded its presence from two to four GAs.

10.2 GA connectivity to gas trunk pipeline

All the GAs that has been allocated to IRMEL are connected through the gas trunk pipeline. The GSPL pipeline connects Banaskantha GA and Diu & Gir Somnath GA, the Dadri-Bawana-Nangal pipeline connects Fatehgarh Sahib GA, and the Encore-Tuticorin pipeline connects Namakkal & Tiruchirappalli GA.

10.3 Lucrative and underpenetrated GAs

The company sees potential growth in and around the GAs it operates. Demand for natural gas in the GAs where the company operates is expected to grow healthily going forward driven by various factors. At present, consumption of natural gas is still in the nascent stage in all the GAs.

Key growth drivers for the natural gas demand are mentioned below:

- Potential growth in the number of households in its areas of operation
- Expected growth in the number of CNG-equipped vehicles, as CNG is more cost effective than other fuels
- Located on the Delhi Mumbai Industrial Corridor (DMIC), Banaskantha to benefit from substantial floating demand
- Diu & Gir Somnath to benefit from the floating demand, especially tourist traffic to Gir sanctuary and Somnath temple
- PNG demand in Fatehgarh Sahib to increase with the National Green Tribunal (NGT) banning polluting fuels such as furnace oil (FO) and pet coke. Upcoming 130-acre pharma park also to drive demand
- The presence of industrial clusters in Mandi Gobindgarh (Fatehgarh Sahib) and Namakkal and Tiruchirappalli (Tamil Nadu).
- Trichy is a well-known hub for transportation and manufacturing of engineering goods. High adoption of LPG in the region provides conversion chance

10.4 IRMEL’s value-chain integration

IRMEL has set up JV firms, such as Farm Gas Pvt Ltd (FGPL), Venuka Polymers Pvt Ltd (VPPL) and NI-Hon Cylinders Pvt Ltd (Ni-Hon), which would strengthen IRMEL’s presence across the CGD value chain. These companies would complement IRMEL’s strategy to achieve business synergies by producing effective and economically viable solutions. They will also reduce its reliance on third-party vendors as the JVs develop allied business products in-house.

Farm Gas to operate as backward integration for IRMEL and provide access to neighbouring GAs

Farm Gas, a biomass and waste-to-energy solution company, is in the process of establishing a compressed biogas (CBG) facility, which will be in Ludhiana. The facility will use paddy straw as feedstock and help reduce pollution. The CBG produced in the facility would be sold in the neighbouring GAs of Ludhiana and Jalandhar. Farm Gas will be strategically advantageous to IRMEL as the CBG produced in-house will reduce the company's dependence on LNG procurements. It would also help IRMEL venture into GAs via Farm Gas where other CGD companies have marketing exclusivity.

Venuka Polymers to enable internal procurement of PE pipes cost effectively

Incorporated on December 19, 2019, Venuka Polymers is engaged in the production of polyethylene (PE) pipes required to lay the infrastructure for gas and water distribution. This helps IRMEL to meet its requirement for PE pipes cost effectively.

The company also has a healthy order book from all the leading CGD entities such as IGL (Indraprastha Gas Limited), GGL (Gujarat Gas Limited), AG&P (Atlantic Gulf & Pacific) and HP Oil.

NI HON to supply type-1 cylinders

Ni-Hon Cylinders is engaged in the supply of imported type-1 cylinders for retro fitment of CNG cylinders. would manufacture cylinder cascades for sale to other CGD companies.

10.5 Partnership with ShizGas

Shizuoka Gas Co. Ltd (ShizGas), the fourth largest gas company in Japan by natural gas sales volume in 2021 and with vast experience in the CGD sector, has formed a strategic business alliance with IRMEL. ShizGas infused equity into IRMEL in March 2022. IRMEL aims to capitalise on synergetic business opportunities the partnership provides. The company is evaluating opportunities with ShizGas to import and wholesale R-LNG to India through bilateral contracts on a gas exchange platform. This will not only help the company source R-LNG at competitive price, but also open new growth opportunities to tap the natural gas market in India. ShizGas will also bring its expertise in industrial burner technology, increasing benefits for IRMEL's industrial customers. Leveraging the technical knowhow of ShizGas in system engineering and application, IRMEL intends to offer solutions to industrial customers, especially in the new GA of Namakkal and Tiruchirappalli, for seamless transition from other fuels to natural gas. This will help the company optimise the consumption of natural gas.

10.6 Balancing CNG and PNG

IRMEL has managed to achieve a balanced exposure to CNG and PNG as penetration of PNG quickened in these GAs of late. The company is expected to maintain the balance going forward:

Table 21: CNG, PNG mix

Segment	FY20	FY21	FY22	FY23 (Q2)
CNG	86%	69%	52%	43%
PNG	14%	31%	48%	57%

Note: Ratio has been calculated based on demand witnessed in Banaskantha, Fatehgarh Sahib and Diu & Gir Somnath GAs.

Source: IRMEL company report

10.7 Strategic gas sourcing arrangements enable efficient cost management

IRMEL is focused on procuring gas at the best competitive price and lowering its weighted gas cost without compromising supply. The company's natural gas sourcing strategy aims to mitigate the impact of price volatility and follow a calibrated pricing approach to ensure sales volume growth while maintaining healthy margins. The policy of the company includes index linkages; gas procurement from high pressure, high temperature (HPHT) fields; and relying on a diverse portfolio of gas contracts. These

help the company efficiently manage input gas costs. It has also entered into mid to long-term gas sourcing agreements with Gas Authority of India Limited (GAIL), Reliance India Limited (RIL) and BP Exploration (Alpha) Limited (BPEAL). IRMEL's gas procurement strategy helps it mitigate the effects of volatility in gas availability and pricing. IRMEL has cumulative gas contracts of 238,692 SCM (standard cubic meter)/day from RIL, GAIL, and India Gas Solutions and, in addition, has a gas contract of 35,709 SCM/day with Farm Gas, (joint control entity of IRMEL). The company is constantly planning for gas procurement, which provides a time advantage in the volatile gas market.

10.7.1 Strategical sourcing of gas

Index linkage of gas contracts

IRMEL has sourcing arrangement for gas, which includes Brent-linked, Japan/Korea Marker (JKM) LNG-linked, Japan Crude Cocktail (JCC) and Henry Hub-linked contracts of various validity period. It has got the benefit of lower RLNG cost in past (Refer figure 50).

JKM-linked contract in 2020

IRMEL strategically entered into a JKM-linked contract in calendar 2020 for one year. The decision proved prudent gas, of all benchmarks, JKM was the lowest during the year.

R–series gas from RIL

When RIL offered its domestic HPHT (high pressure high temperature) gas through bidding, IRMEL strategically switched to R-series gas and took benefit of lower cost.

IGX (Indian Gas Exchange) platform

IRMEL for its Fatehgarh Sahib GA in Punjab, was the first CGD company to execute purchase and sale transaction at IGX platform. The company also was the first CGD entity to undertake a transaction (through a trading partner) on the IGX to source RLNG. It was also the first CGD company to sell its surplus gas on IGX.

Gas sourcing arrangement with ShizGas for hedging against price risk

IRMEL has signed a memorandum of understanding (MoU) with ShizGas. IRMEL is now weighing options to import LNG and wholesale R-LNG from ShizGas to India through bilateral contracts and through gas exchanges.

10.7.2 Diversified portfolio approach

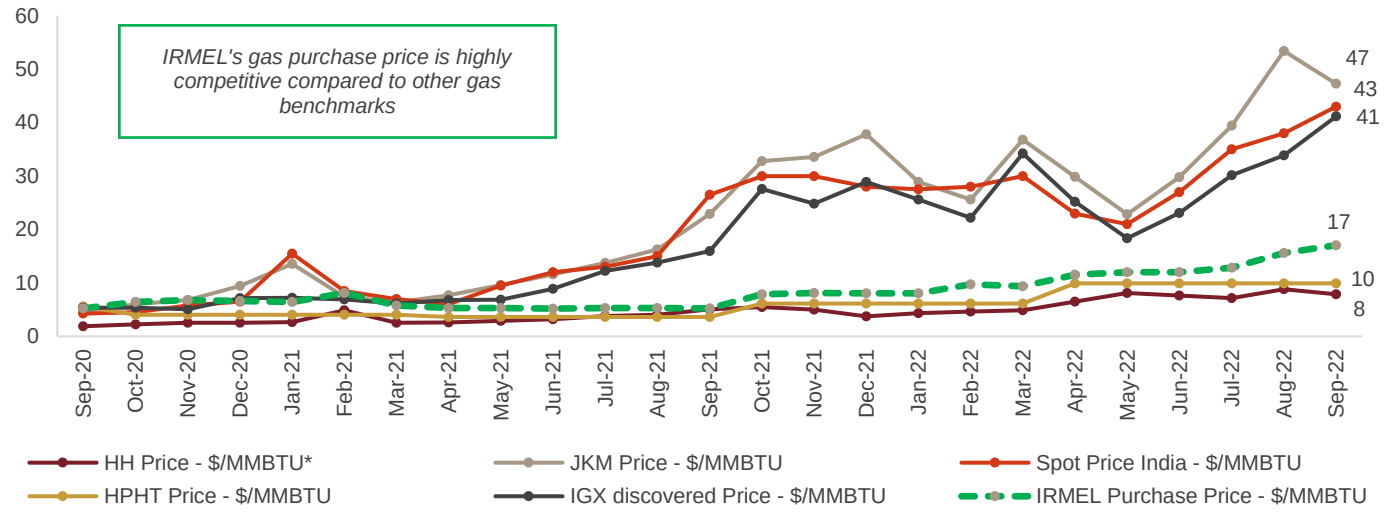
IRMEL has a diversified portfolio of gas contracts to mitigate the risk of reliance on any single contract. The contracts are linked to various global benchmarks to reduce the risk of any unprecedented market scenario.

10.7.3 Effectively managing gas purchase and gas sales

At IRMEL, the commercial and marketing teams endeavour for efficient gas sourcing by anticipating market conditions with an aim not only to ensure maximum benefit to customers by ensuring affordability but also to achieve sustainable demand growth. The company will continue to monitor the cost of natural gas and source natural gas in the most cost-effective manner from various vendors.

10.7.4 Strategic gas sourcing arrangements enable efficient cost management

Figure 50: Gas benchmarks vs IRMEL purchase price



Note: HH price is US gas benchmark which excludes transportation, spot LNG prices are delivered ex-ship and does not include customs and other taxes

Source: CRISIL MI&A Consulting

10.8 Use of technology to optimise opex, enhance customer experience

IRMEL's endeavour is to operate the CGD network complying with the best practices in the industry. It uses digitalisation and automation in keeping with the regulatory requirements. The company has rolled out a series of initiatives, such as digital payment solutions, spot billings, usage of GIS for planning, network design, asset integrity, incident/third-party activity/emergency communication support, preventive maintenance planning, gas reconciliation and reporting and 24*7 customer support. The company is a pioneer in implementing technology (SCADA) for unmanned operations of CNG compressors and dispensers. It has implemented SCADA at CNG stations for meter reading, which helps improve efficiency and accuracy of the systems, thereby leading to savings in operational costs. In addition to this, it has implemented automated meter reading (AMR) system for all its industrial customers (along with DRS performance monitoring) and intend to implement AMR system for all commercial customers going forward. All these initiatives help the company optimise the business operations, improve customer experience and service.

10.9 Strong focus on safety

IRMEL focusses meeting energy needs of its customers in its GAs through its pipelines and CNG station network at a competitive price, while maintaining high safety standards. It has a well-defined health safety and environment (HSE) policy, which gives an overall direction to its approach to its HSE management. There has not been any fatal incident in any of the company's operational facility after it started gas supply which shows its adherence to the best safety practices. All its facilities/equipment are designed, constructed, and operated in line with the regulatory requirement of the PNGRB. To strengthen safety and technical competency, a cross functional team conducts internal safety audit every year. External technical and safety audit has been conducted by the PNGRB-empaneled third-party agency every three years.

10.10 Strong parentage

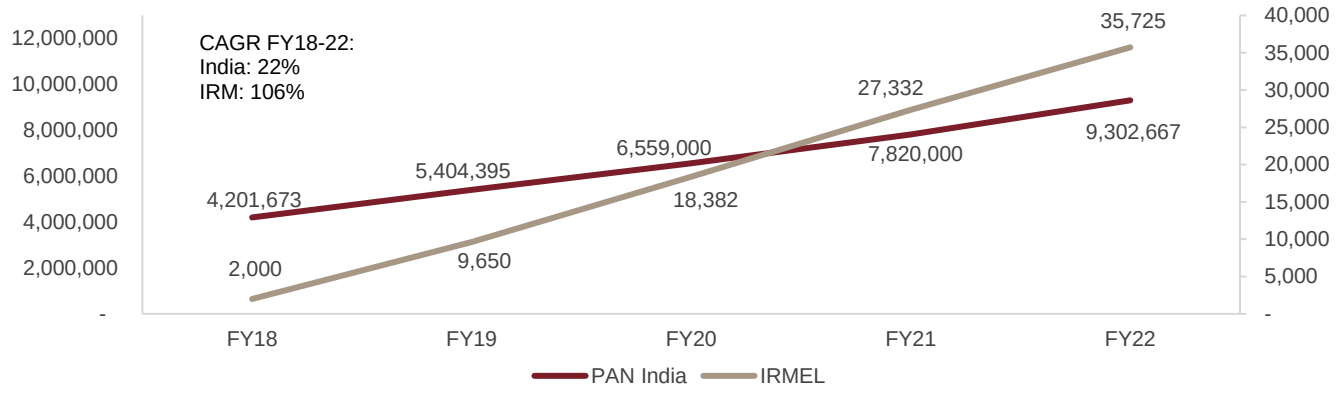
IRMEL is backed by the strong parentage of an Indian multinational company, Cadila Pharmaceuticals Ltd (CPL), which has been in operation for more than three decades in the domestic pharmaceutical industry. CPL along with the promoter group

holds around 67.94% equity in IRMEL. CPL has supported the company in overcoming entry barriers such as the need for large investments. IRMEL has got help from an experienced management in devising a sound business strategy and successful implementation of expansion initiatives, among others. The company is led by a highly qualified, experienced, and professional management team having relevant experience and expertise in the CGD/ natural gas sector.

10.11 IRMEL CGD infrastructure development

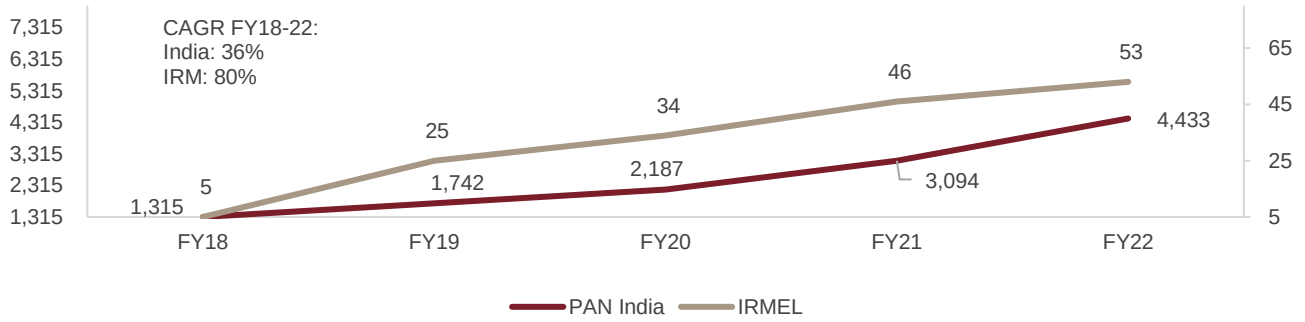
Over the fiscals 2018 to 2022, IRMEL developed its CGD infrastructure in its GAs much faster than the pan-India average for both PNG and CNG. While gas distribution infrastructure logged 22% CAGR pan-India during the period, IRMEL clocked 106% CAGR. IRMEL is in sync with other major players and have consistently invested in capex ensuring deeper market penetration. This is reflected in the achievement of its MWP targets for Banaskantha. The company has also met its MWP targets for the inch-km parameter in Fatehgarh Sahib GA. Moreover, it has successfully completed the inch-km and CNG stations target for Diu & Gir Somnath GA.

Figure 51: Domestic PNG connection growth of IRMEL vs pan-India average



Source: IRMEL company report, PNGRB

Figure 52: CNG stations growth of IRMEL vs pan- India average



Source: IRMEL company report, PNGRB

11 SWOT analysis of GAs

Table 22: Swot analysis of GAs

GA name	Strengths	Weaknesses	Opportunities	Threats
Banaskantha	• The region is situated on the Delhi-Mumbai Expressway and has large-scale industries. The district is the second largest by area and fifth largest by population in Gujarat. • Highly developed CNG ecosystem in Gujarat.	• 85% rural demographic; there may be a slower penetration of PNG in rural clusters	• Uptick in CNG demand from floating vehicles as the GA has notable tourist destination attracting visitors from neighbouring states • The Indian Air Force is coming up with one of the biggest air bases in Deesa • The Western Dedicated Freight Corridor (WDFC) to pass through Banaskantha	• Once the marketing exclusivity period ends, other CGD entities may enter the GA. However, IRMEL will continue to have infrastructure exclusivity for 25 years thereby having inherent advantages against possible competition. Moreover, the PNGRB regulations for common carrier or contract carrier mandates only 20% of the capacity allocation for the new players
Fatehgarh Sahib	• In the GA, there are several industries, such as steel-rolling mills, many of which have switched to natural gas from coal and FO in order to comply with the NGT order • Excellent road network, which supports the growth of the CNG segment	• Limited presence of commercial establishments may have an impact on addressing the natural gas demand from the commercial segment	The NGT (National Green Tribunal) has enforced a blanket ban on the usage of polluting fuels in the industrial segment, quickening the adaptation of natural gas • As per the Punjab Bureau of Investment promotion (PBIP), a pharma industrial park is to be established at Wazirabad. The Punjab government also proposes to set up a textile park in the coming years providing natural gas demand escalations in the Industrial segment	• After the marketing exclusivity period, rivals may enter the market. However, IRMEL will continue to have infrastructure exclusivity for 25 years, which is advantageous for the company. Moreover, the PNGRB regulations for common carrier or contract carrier mandates only 20% of the capacity allocation for the new players • The use of alternative fuels such as propane poses a threat, but natural gas has advantages in terms of safety and supply reliability
Diu & Gir Somnath	• Gir Wildlife Sanctuary, Somnath temple and beaches of Diu draw tourist crowds. These places witness round-the-year floating traffic, which will support natural gas demand originating from the CNG and commercial segments	• Limited presence of large and medium sized industries	• Upcoming Chhara LNG terminal will have an added advantage as proximity to the LNG terminal will reduce the transportation cost of LNG from the terminal to the GA	• After the marketing exclusivity period, rivals may enter the market. However, IRMEL will continue to have infrastructure exclusivity for 25 years, which is advantageous for the company. Moreover, the PNGRB regulations for common carrier or contract carrier mandates only 20% of the capacity allocation for the new players

GA name	Strengths	Weaknesses	Opportunities	Threats
Namakkal & Tiruchirappalli	• The GA is located at the centre of Tamil Nadu and has excellent road connectivity. It is connected via five national and seven state highways • Presence of medium and small-scale industries (manufacturing hub of engineering goods industries)	• The total land area is 7,929 square kilometres, with the majority of the population concentrated in a few pockets and the rest spread out, necessitating more infrastructure rollout for complete coverage	• Availability of cross-country pipeline passing through the GA for hook-up of gas sourcing • Trichy is known as the transportation hub of Tamil Nadu having well developed transport infrastructure	• After the marketing exclusivity period, rivals may enter the market. However, IRMEL will continue to have infrastructure exclusivity for 25 years, which is advantageous for the company. Moreover, the PNGRB regulations for common carrier or contract carrier mandates only 20% of the capacity allocation for the new players

Source: CRISIL MI&A Consulting

12 Risk assessment and mitigation strategies

This section discusses the potential risks of investing in the CGD business, the magnitude of impact they can have and possible mitigation measures. Remarks on the probability of the risks materializing and their impact are also made based on the experience of the IRMEL in the oil and gas industry. The section below summarizes the risks and recommended mitigation strategies to handle those risks.

Table 23: Risk assessment and mitigation strategies

Risk type	Risk description	Potential mitigation measures
Risk of securing gas	Limited availability of domestic supplies of natural gas. The alternative is lower-margin LNG	• The company will be on the lookout for tying up volumes from the LNG market coming as a result of capacity addition. • Additional volume shall also come up for bidding under HPHT and the company will be aggressive in tying up the volumes
Margin risk	**Purchase prices:** IRMEL does not have control on price of gas. However, while distributing the gas, the end-use segments, such as domestic and CNG, remain sensitive	• Historically till date, the CGD companies have been able to pass on the increase in cost to the customers across segments
	Infrastructure margin: The non-regulated or regulated costs could increase much more than envisaged thereby putting a downward pressure on the margins	• IRMEL could benchmark costs and establish robust procurement policies and efficient management of operations to improve/maintain margins
Market risk	**Domestic:** Risk of conversion from LPG owing to subsidies on the fuel Issue of non-payment (applicable across segments, but can be higher in domestic owing to issues such as relocation etc)	• Communication plans to be in place for imparting information related to safety related aspects of gas usage to consumers • Deposits (already in place) • Diligence before connections • In the domestic segment, piped connection is more convenient and safer than LPG
	CNG: Risk of low conversion owing to • Less savings (especially of input gas price increases) • Barriers owing to purchase of kits • No major difference on environment considering Euro-IV norms	• Assistance in conversion, communication on conversion benefits, streamlining operations to eliminate inconvenience to converting consumers • Marketing campaigns and incentives for conversions • Stakeholder engagements with state transport corporations/fleet operators/ taxi aggregators to promote the usage of CNG
	Commercial/ industries: Risk of customer transition to alternative fuels	• Advocacy about the usage of fuel cleaner and greener than coal, FO, pet coke, LSHS and LPG • Regulatory restrictions, growing awareness of cleaner fuel to aid in fuel conversion in the industrial segment • Focus on ESG commitments to drive adoption if natural gas as the preferred fuel in large and medium scale industries
Regulatory/ policy/ statutory risk	**Imposition of penalties:** Risk of not meeting desired MWP targets as committed to the regulator	• Robust plan for laying the network in the areas awarded for establishing the CGD network • Plan for securing land for the implementation of CGD networks • Appropriate documentation on reasons for delay/ slippages • Process for addressing consumer delays

Risk type	Risk description	Potential mitigation measures
	Changes in regulations: Changes in regulations that impact margins, right to infrastructure exclusivity or put unexpected burden	• Strong regulatory team that responds to public consultations and with awareness of international regulations
	Competition laws risk: Any adverse application or interpretation of the competition law or the PNGRB Act could adversely affect the CGD business	• Complying strictly with the existing regulations will eliminate the risk
Consumer liabilities	**Reputation, publicity:** Any accident involving gas and loss (including loss of life) could be attributed to IRMEL and can result in litigation	• Conduct periodic safety audits to mitigate any possible accidents • Taking public liability policy and commercial general liability policy
Gas price risk	The existing scenario of high gas prices ($8.57/mmBtu in the first half of the current fiscal) pose challenge to maintaining healthy margins in the CGD businesss	• IRMEL has been successful in passing gas price escalations to consumers • Prices of alternative fuel mainly for the transport sector is linked to crude prices. Hence, the prices of those fuels are expected to move in tandem with the high prices of natural gas
Financing risk	The CGD business involves significant capital outlay, which is funded by a mix of equity and debt. The ease of securing borrowings depends on the creditworthiness of the borrowers	• IRMEL comes with high creditworthiness with a strong parentage. Hence, it will be able to secure borrowings from lenders
Competition risk after exclusivity period	Once the marketing exclusivity in a GA ends, there is risk of competition with the other CGD players.	• Potential long-term relations with customers to eliminate entry of potential players in future. • After the expiration of the marketing exclusivity period in other GAs, IRMEL would also be able to enter other GAs.
Demand risk	Demand realisation risk on account of emerging new energy, such as solar power	• Assured domestic gas supply to aid competitiveness, drive gas demand for CNG and domestic PNG • Expanding geographical coverage, improving cost competitiveness of gas to drive growth • Market awareness on natural gas as a cleaner fuel should increase demand realisation

Source: CRISIL MI&A Consulting

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