CAN INDIA DELIVER ON ITS PROMISE OF LNG DEMAND GROWTH?

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India is seen as a key player leading the next phase of global LNG demand growth. This is primarily due to government’s goal to increase the share of natural gas in its primary energy mix from the current 6% to 15% by 2030 and a pessimistic outlook of domestic gas production. In addition, environmental regulations restricting use of furnace oil to control air pollution in various Indian cities are expected to unlock demand for LNG in the commercial and industrial sectors. However, competition from renewables and alternative fuels, the pace of infrastructure expansion, and affordability of LNG imports raise a question on India’s long-term LNG demand growth. This paper assesses the major demand drivers of gas/LNG in the power, transport and industrial sectors and suggests that India’s LNG demand growth will be primarily driven by refinery, fertilizer and other industries using gas for heating.
Industry is the largest off-taker of gas and LNG in India

India is rapidly emerging on the global LNG trade map as its demand for the super chilled fuel has more than doubled since 2010. The government has expressed its intention to transition India to a gas based economy which indicates that India could provide the much needed growth to the fast expanding global LNG industry.

The share of gas in India’s primary energy mix was only 6% in 2017, much lower than the global average of 24%. The Indian government plans to increase the share of gas to 15% by 2030, but faces hurdles, such as a lack of investment in indigenous gas exploration, increasing cost competition from renewables in the power sector, and insufficient pipeline infrastructure to deliver gas to consumers.

India consumed 53Bcm of gas in FY2018 (April 2017 – March 2018), which is 5% higher than FY2017. Gas demand decreased during FY2012-15 as domestic gas production fell (Figure 1). Power sector gas demand was hit most due to the gas allocation mechanism. Before 2014, the government allocated most of the domestic gas to fertilizers and power. As fertilizers have a higher priority than power for domestic gas, a production decline resulted in a gas shortage for the power sector.

As power sector gas demand fell, the industrial and fertilizer sectors took over to become the largest gas consumers. Since FY2012, the total gas demand from the two sectors has amounted to 31-32bcm, accounting for >60% of the national total. Around 75% of India’s total LNG imports in FY2018 went to fertilizer and industries (Figure 2).

Gas demand growth hinges on gas grid expansion, regulation and price

Infrastructure expansion, anti-pollution drive and securing affordable LNG will be the key demand drivers for LNG in India. We elaborate and assess these major demand drivers for various sectors in this section.

1. Power

Gas remains the most expensive form of power generation due to low capacity factors and a shortage of cheap domestic gas supplies (Figure 3). In the absence of policy support, gas is likely to play only a small role in India’s power sector to 2050, making up just 10% of the capacity mix in 2050, compared to 7% in 2017 (Figure 4). Existing

Figure 1: Gas demand in India

![Gas demand in India](image)

Source: Petroleum Planning and Analysis Cell

Figure 2: LNG demand by sector, FY2018

![LNG demand by sector, FY2018](image)
Combined-cycle gas plants (CCGTs) will continue to run at low capacity factors as they struggle to procure gas cheaply due to a decline in local production. Using LNG imports significantly increases the cost of gas power generation, and is not a viable option.

**Figure 3: Levelized cost of electricity (LCOE) for India – 2H 2018**

New CCGTs can’t compete with coal or renewables for bulk electricity and we don’t anticipate more CCGTs beyond the 400MW currently in the pipeline. Building a new solar or wind plant is currently cheaper than building a new gas plant (Figure 6). Onshore wind and PV plants are the cheapest sources of new bulk generation in India. Intense competition, high capacity factors available via the newest turbine technology and lower costs of financing have cut our levelized cost of electricity (LCOE) estimate for onshore wind. Our LCOE estimate for PV in India has also dropped significantly as aggressive competition for projects has lowered capex and O&M costs, and squeezed profit margins across the supply chain. By early 2020s, we expect running all existing gas plants to become more expensive than building new solar or wind (Figure 7).

As the share of wind and solar increases and old coal plants retire, India will also see a greater role for flexible capacity. India will add around 250GW of new peaking gas plant to 2050 (Figure 5). We expect total flexible capacity to reach 421GW in 2050, or 17% of total installed capacity, up from just 5GW today. Batteries will challenge the growth of peaker gas as their cost declines, particularly after 2025. Batteries would be able to beat new gas on price for the narrowest peaks, reducing the market size for new gas peaking plants. However, after filling these short duration peaks, batteries may again give way to gas to fill the remaining wider peaks.

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1 The LCOE range represents a range of costs and capacity factors. Battery storage systems (co-located and stand-alone) presented here have four-hour storage. In the case of solar- and wind-plus-battery systems, the range is a combination of capacity factors and size of the battery relative to the power generating asset (25% to 100% of total installed capacity). For stand-alone battery we include charging cost, calculated as 60% of the wholesale power price. INR-USD exchange rate at the time of the analysis was 67.1. All LCOE calculations are unsubsidized. Categorization of technologies is based on their primary use case.
2. Transport

The growth of compressed natural gas (CNG) vehicles in India has been fast in the recent years, placing the country as the third largest CNG vehicle market in 2017 with 3 million CNG vehicle on the road. The fast growth was largely attributed to supportive environmental regulations, expanding city gas network and cost competitiveness of CNG vehicles thanks to preferential domestic gas supply provided via government policies. However, India faces rising challenges in continuing to grow its CNG market. Table 1 shows the main drivers of gas demand in transport sector and associated challenges.
Table 1: Drivers and challenges to natural gas demand in transport

<table>
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<tr>
<th>Drivers</th>
<th>Challenges</th>
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<tbody>
<tr>
<td>Cost competitiveness</td>
<td>CNG vehicle is more economical than petrol, diesel and electric vehicle (EV) now in terms of Total Cost of Ownership (TCO), but EV will increase its cost competitiveness with CNG in various vehicle segments throughout the coming decade.</td>
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<tr>
<td>Consumer preference</td>
<td>Passenger car owners may choose practicality and convenience of petrol and diesel vehicles over economic benefits of CNG</td>
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<tr>
<td>Fuel supply infrastructure</td>
<td>More gas distribution networks and CNG fuelling stations are needed</td>
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<tr>
<td>Government regulations</td>
<td>Pollution control measures likely promote use of CNG till 2020, but lose effect once EV becomes affordable and new fuel quality norms are in place.</td>
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Figure 8: CNG consumption by vehicle type in India, 2017

Three-wheeler: 31%  
Passenger car: 25%  
Bus: 24%  
Taxi: 20%

3.1Bcm

Figure 9: Timeline of EV cost parity in India versus CNG

Year when EV reaches total cost of ownership parity with CNG

Year when EV reaches purchase price parity with CNG

Source: BloombergNEF, Petroleum Planning and Analysis Cell, India

Indian government aims to increase the share of EVs in total vehicle sales which poses a threat to gas demand in transport. CNG vehicles will stay competitive with petrol and diesel vehicles in terms of TCO to 2030, but have started to feel the competition from EVs in the three-wheeler segment (Figure 9). In the taxi segment, where CNG have relatively high penetration for now (Figure 8), EVs will likely result in lower growth of CNG after the mid-2020’s. CNG hold in the bus segment will be threatened by EVs in 2025. EV’s threat to CNG in the passenger car segment will come later towards 2030.

The total demand for gas in the transport sector is estimated to reach 7.5bcm by 2030. Expected expansion of city gas networks and growing number of CNG fueling stations will drive up demand till 2025. As EVs start to become cost competitive, we expect gas demand growth to slow down post 2025.

3. Industry (including fertilizer)

Gas is used in industries in three main ways: as a feedstock to produce chemicals, as an energy source to produce heat, and as a fuel to generate electricity at industrial plants. Currently, the largest industrial gas consuming sector is the fertilizer sector with 15Bcmpa of consumption accounting for roughly half of the industry’s total gas consumption (Figure 10). We expect future demand in the industry sector will be driven by refineries, fertilizer and other industries as new pipelines are commissioned, more urea plants come online and government implements regulations restricting the use of fuel oil to control pollution.
Figure 10: Gas consumption by type of industrial use

Source: Petroleum Planning and Analysis Cell

Figure 11: Gas infrastructure and refinery map of India

Source: BloombergNEF, Petroleum Planning and Analysis Cell, Ministry of Petroleum and Natural Gas
3.1. Refineries
Using gas as a fuel and feedstock can improve the profit margins of refineries as compared to using internally generated fuels such as naphtha, fuel oil and fuel gas. Refineries in eastern India are currently off-grid from the gas network and largely rely on self-produced refined products for fuel. Once the pipelines under construction are completed (Figure 11), more refineries will switch to gas and drive up gas demand in the region.

3.2. Other Industry for heating
Industrial users like ceramic makers use gas to produce the energy needed for furnaces, heaters etc. Lower priority in domestic gas allocation means that industries depend on imported LNG to meet their gas demand. LNG competes with fuel oil for such applications in the industry. Delivered regasified LNG (via pipeline) was roughly $1.5/MMBtu higher than fuel oil in FY2018.

As LNG faces tough competition from fuel oil to produce industrial heat, we expect that environmental regulations restricting the use of fuel oil will be needed to drive the demand for gas in industrial heating applications.

3.3. Fertilizer
As of 2018, there are 30 urea production plants in the country. Of these, 27 use gas and three use naphtha as a feedstock. Using naphtha as feedstock is much more expensive than using gas in urea production plants and hence government has been pushing the fertilizer industry to switch to gas-based urea plants as it lowers the production costs. All the fuel oil based urea units have been converted to gas.

Government intends to eliminate urea imports by increasing production and maximize domestic urea production to achieve 100% self-sufficiency by 2022. To achieve this, the government plans to restart some closed urea units.

We expect the gas demand in fertilizer to be driven mainly by the planned conversion of naphtha based urea units to gas and government’s target to increase urea production to eliminate imports.

Figure 12: Gas demand for industrial heat and delivered fuel prices

Figure 13: Urea production plants by fuel type, 2018

Source: BloombergNEF, Petroleum Planning and Analysis Cell.

3.4. Petrochemicals
Gas-based feedstocks are more economical than petroleum-based feedstocks such as naphtha for petrochemical products. However, gas demand growth in the petrochemical sector will be limited due to cheaper imports of intermediates such as ethane and a lack of investments in new ethane crackers.

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LNG demand outlook

Some 23MMtpa of import terminals are set to come online in 2019-22, but downstream infrastructure such as pipelines is yet to be developed to enable high utilization of these terminals. Mundra terminal is the latest addition to India’s regasification fleet, but we expect its full operation will be delayed to 2020-21 as the evacuation pipeline from Mundra to regional gas grid is still to be finished. Indian Oil Corporation Ltd. (IOCL) is likely to commission Ennore terminal in 1Q2019 but it will also face low utilization as the pipeline connecting the terminal to users is far from completion.

India’s long-term LNG demand will depend on its industrial growth, transmission pipeline and city gas network expansion, and domestic gas production outlook. LNG prices are also an important consideration since Indian buyers claim low price affordability.

We expect a modest demand outlook for LNG during 2019-22 in which only 4MMt of demand will be added (Figure 15). Demand will see lower growth from industry sector as Reliance’s new pet coke gasifier reduces LNG demand at the Jamnagar refinery. Domestic production could also rise from the KG basin as ONGC and Reliance are developing new gas fields. By 2030, India’s LNG demand could rise to 42MMtpa as more pipelines are commissioned, regulations against fuel oil use are strengthened and new city gas networks are added.
Figure 15: India’s LNG demand, contracts and import terminals

Source: BloombergNEF