

Future of Natural Gas: An Overview

Mr. Manas BN*

Abstract

Natural gas in India today represents a mere 6-7 per cent of the total energy consumption compared to a global average of 25 per cent. There has been little to no growth to establish gas as a key fuel for the growth of the economy, to augment domestic production and to create conditions further downstream to allow the sector to bloom. This paper seeks to analyse the natural gas industry through global developments, the policies hindering the rise of natural gas share in the energy basket and provide a holistic view of the problems and solutions. The paper also attempts to address why natural gas should be considered as the 'bridge fuel' when India transitions from a fossil fuel-based economy to a more decarbonized and renewable-based energy system.

Keywords: *Natural Gas, Sustainable Development, Energy Basket, Decarbonisation.*

* 5th Year, BBA LLB (Honours)

Introduction

India is one of the fastest-growing economies, estimated to touch the \$5 trillion mark by 2025. Alongside this cannibalizing growth of the Indian economy, India's energy consumption pattern will also dramatically change over the coming years. Estimates suggest that India's energy demand will double by 2040¹ and is touted to become an important constituent in the global energy market and the third-largest energy consumer. However, according to the British Petroleum (BP) Energy Outlook: 2020 Edition², 70% of India's primary energy demand is met by fossil fuels such as coal and oil.

Coal takes a dominant 45% share, oil trailing in the second place with 20% and natural gas remaining stagnant at 6%. This has been one of the major impediments to India's decarbonization objectives and meeting the climate change goals. Through the Climate Change Summit Paris 2015, India has committed to reducing its greenhouse gas emissions by 35% over the 2005 levels. Even though India has made significant advancements to meet those goals, India remains the third-largest emitter of greenhouse gas emissions. According to the World Bank², the estimated cost of air pollution in 2016-17 is equivalent to 8% of India's GDP.

Being caught in the unhealthy nexus of energy demand and environmental concerns, India has recognized these issues and has taken a multipronged approach to reducing carbon emissions by diversifying the energy mix to lesser carbon-emitting energy sources such as natural gas and renewables. According to the Press Information Bureau (PIB)³ 2020 Goal, India envisions increasing the share of natural gas from 6% to 13% by the year 2030.

Natural gas is one of the least carbon dioxide-emitting sources of energy compared to other fossil fuels and has the capacity to reduce carbon emissions by five times. However, the natural gas in India's energy mix is not being efficiently utilized and thereby not reaching its full potential. The

¹ EA, *India 2020: Energy Policy Review (2020)*, IEA, Paris <https://www.iea.org/reports/india-2020> (Last accessed 21 Sep 2022)

² BP, *BP Statistical Review 2020-India: India's Energy Market in 2020*, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2020-india-insights.pdf>, (Last accessed 21 Sep 2022)

² World Bank; Institute for Health Metrics and Evaluation, *The Cost of Air Pollution: Strengthening the Economic Case for Action (2016)*, World Bank, Washington DC, <https://openknowledge.worldbank.org/handle/10986/25013> License (Last accessed 21 Sep 2022)

³ Ministry of Petroleum & Natural Gas (Govt. of India), *Year-end Review: 2020 of the Ministry of Petroleum & Natural Gas (2020)*, <https://pib.gov.in/PressReleaseDetail.aspx?PRID=1685110> (Last accessed 21 Sep 2022)

growth of natural gas in India's energy mix is much slower than anticipated from 5.6 per cent in 2012–13 to 6.2 per cent in 2018–19.

Why Natural Gas

According to the International Energy Agency⁴ and its latest forecast for India, India's energy demand could double by 2040, with electricity demand tripling due to increased availability and ownership of appliances for heating, cooking and cooling. This is a result of India transitioning from a low-income country to a middle-income country. The new India envisioned by the leaders of this country is well on its way. In order to meet such rising energy demand while taking into account the economic size and stage of development along with the anticipated urban and rural population growth is not an easy feat; it requires strategic planning, resource allocation and framing achievable goals keeping in mind the climate agenda at the forefront.

As the country is in a period where the dependence on fossil fuels must decrease while also matching supply to energy demand, economic growth and sustainability ambitions, it will require a fundamental shift in energy generation and usage technologies. Energy sources like natural gas needs to be underpinned to ensure the sustainable progress of the country.

In the context of the United Nations 2030 agenda for Sustainable Development⁵, which India has duly signed and committed to achieving the 17 Sustainable Development Goals, it is important to understand that each of these goals is interconnected and mustn't be treated as mutually exclusive. Goal 7 of SDG primarily talks about making affordable and clean energy available to all, SDG 9 promotes sustainable infrastructure and SDG 13, i.e. climate action states how different forms of energy can complement each other with the lowest emissions. Natural gas in this scenario complements very well with renewable energy and therefore supports the transition to a low carbon future.

- **Versatility and Efficiency of Use**

Natural gas has been unanimously accepted as one of the cleanest hydrocarbons & the most efficient form of usable energy. Natural gas has the advantage of easy storage and transportation; it addresses all kinds of energy demands for industrial purposes, electricity generation, and

⁴ *Supra* 1

⁵ UN General Assembly, *Transforming our world : the 2030 Agenda for Sustainable Development*, (2015), A/RES/70/1, <https://www.refworld.org/docid/57b6e3e44.html> (Last accessed 21 Sep 2022)

transportation fuel. Power for industrial activities is set to take charge in the coming years for energy consumption. Natural gas as a source of energy in India's energy basket proves to be a vital option as it can be used in bulk for the chemical industry as a feedstock, production of organic chemicals, petrochemicals & agricultural chemicals that are fertilizers. The industrial sector will act as the main driver for growth in the demand for natural gas. Concerning natural gas as a substitute for transportation has been growing considerably. Emissions from a car by the usage of LNG or CNG is five times lesser than those by petrol or diesel cars. In regards to the Automotive industry, 28 million vehicles worldwide have switched to natural gas usage. This so-called blue fuel is also considerably cheaper than petrol or diesel⁶. Natural Gas is perfectly compliant with Euro six standards and is a smooth transition from the fossil fuel era to the renewable/hydrogen era. A gas-based system for electricity generation heating, cooling, and power has significant financial, economic, and efficiency advantages over traditional methods. It is the best suitable option with the added benefit of climate protection.

- **Environmental Benefits**

As for the new emission standards set by the Ministry of environment, forest and climate change, gas is comparably the more efficient and cleaner fuel than any other fossil fuel. Another key advantage of the usage of gas is that gas plants require less water than compared to coal plants approximately, and the water usage is reduced by 50% with the generation of energy from gas-based power plants.

While coal remains the cheapest form of energy and given its abundant availability, it is the most widely used form of energy. However, the external cost of coal imposed on the economy, environment and the people which is an important aspect that is often overlooked. There is obvious cost such as pollution, flooding and degradation. Other indirect or sometimes hidden costs include the cost of cancer, asthma for the workers or the impact of rising sea levels. Even though these costs are real and ever-present, they are hardly considered, but the damage is being done. Once the cost of externalities is considered, natural gas emerges as a more favourable option than coal.

However, one of the criticisms faced by natural gas usage is the emission of methane associated with it. Even though it is an established fact that methane is several times more potent than CO₂, a point of difference is that while CO₂ remains in the atmosphere for generations, methane emitted

⁶ NGV Global Knowledge Base, *Current Natural Gas Vehicle Statistics*, (2021), <http://www.iangy.org/current-ngv-stats/>, (Last accessed 21 Sep 2022)

only lasts for a decade at the most⁷. Programs like the *Oil and Gas Climate Initiative*⁸, *Natural Gas Star*⁹ aim to reduce methane emissions from the gas value chain and thereby reduce its carbon footprint. Global efforts are also being made to ensure the reduction of methane.

- **Transition to a Clean Future**

Renewable energy such as Wind and Solar energy are intermittent sources of energy, meaning the energy sources vary in nature and are difficult to predict. For example, a sudden cloudy atmosphere will drastically reduce solar generation. Similarly, a reduction in the wind speed will cut off the wind turbines. There are instances when the cooling needs are lesser during the monsoon season but only during the monsoon season, the wind breeze is at its peak. This indicates that the supply and demand chain fluctuates as per the seasons.

In order to achieve an uninterrupted supply of renewables, it must be balanced with other sources of energy. Coal and Hydropower plants find it difficult to drastically increase or reduce the power generation capacity as an optimal 40% to 50% minimum capacity is required for these plants. When considering an open-cycle gas plant, this can operate at a range of 0% to 95% output generation. Thus, Gas Plants provide a very elegant solution in this situation and can be ramped up and down effectively to complement energy from renewable sources.

- **Availability & Energy Security**

According to recent global developments, the availability of natural gas has increased manifold due to the advancement of technologies, i.e., the production of shale gas through horizontal drilling in North America. In addition to that, the price of natural gas has been delinked from crude oil, making natural gas even more cost-effective compared to most crude products. India has been provided with a great opportunity to reduce its imports of Crude and Petroleum products and diversify its energy sources to natural gas. Geopolitically, the major exporting nations of natural gas (North America, Australia) have stable regimes/governments compared to traditional oil-

⁷ UNFCCC, *Global Warming Potentials: IPCC Second Assessment Report* (2021), <https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global-warming-potentials> (Last accessed 21 Sep 2022)

⁸ OGCI, *OGCI position on policies to reduce methane emissions and CO2* (2021), <https://www.ogci.com/about-us/ogci-position-papers/>, (Last accessed 21 Sep 2022)

⁹ Roger Fernandez, *EPA's Natural Gas STAR Program Overview* (2014), UNT Digital Library, <https://digital.library.unt.edu/>; (Last accessed 21 Sep 2022)

supplying countries. Thus providing flexibility and several options to secure reliable and affordable energy sources.

International Scenario

- **UK**

During the 1990s, there was a strategic shift in the gas market in the UK. The famously known phrase, i.e. “Dash for gas”, meant a shift in the power generation sector through newly privatized electricity generation companies by using natural gas. The key reasons for the shift to gas consumption were due to regulatory changes that allowed gas to be used as fuel for electricity generation, the privatization of gas companies led to increased trading of natural gas, new technology (combined cycle gas turbine plant or CCGT) which was much more efficient and required lesser capital costs compared to coal. The availability of gas from the North Sea also led to a reduced wholesale gas price. The UK government energy mix currently consists of 37.5% of energy being produced through natural gas.

- **USA**

Gas consumption in the US has seen significant increases mainly due to the abundant supply of shale resources at attractive prices. However, before the availability of shale gas, the US heavily relied on importing natural gas. Due to this reason, they built import terminals, but with the advancement of technology such as hydraulic fracturing and horizontal drilling, shale gas was so widely available the US became one of the largest exporters of gas. The import terminals which were being built were converted into export terminals. The gas prices at Henry hub significantly reduced from \$8 to \$9 per MMBtu to below \$3 per MMBtu. This has led to gas-based power generation becoming more cost-effective than coal-based power.

- **China**

China is one of the major beneficiaries due to the liberalization and market reforms of the gas industry. Realizing the potential of natural gas, with its added benefit of clean energy and in order to meet its rapidly growing demand, China did not hesitate to go all-in on natural gas. China has been steadily increasing its share of natural gas in its energy mix with a 13.5% compound annual growth rate over the last ten years. Natural gas has been at the forefront of China’s energy basket

to fight climate change with its policies, such as *Blue Sky* and banning the use of coal boilers. China accounts for 75 bCM of the global gas demand, which is equivalent to the UK gas market.

- **Brazil**

The Brazilian government has also taken significant steps to increase the share of natural gas during the last decade, led by the desire to increase gas-based power generation and to reduce dependence on sources of energy such as Hydropower because, during the drought season, it becomes vulnerable to maintain energy security. The share of natural gas in Brazil reached 13% in 2017, and certain key measures have been taken up by the government to increase the share further in the coming years. These measures include the privatization of natural gas companies and distribution companies so as to increase natural gas distribution. A priority power generation project has been established, which led to the construction of infrastructure for better utilization of natural gas for power generation, and with the increase of consumption of natural gas through vehicles and strategic investments in Gas Pipelines and LNG terminals.

Obstacles facing India

- **Gas Availability**

The issue of gas availability is one of the prominent reasons why gas has not grown in India compared to other countries. With limited availability of domestic gas, India is at the mercy of imports and international supply chains to meet the country's gas needs. This sort of scenario brings into play concerns about energy security, and thereby thoughts start to turn back to the abundantly available coal. Another factor impeding domestic availability is the lack of incentive for gas exploration; this is because prices have been tightly regulated, and companies are not willing to take a risk on speculative endeavours.

- **Infrastructure Gap**

Another obstacle faced by India's gas development program is infrastructure. Infrastructure concerning gas pipelines has been a constraint for the effective development of gas usage, i.e. linking production to consumption. As of now, there is only 15,000 km of pipeline infrastructure

transporting gas to limited regions of India¹⁰; this is considered very low when compared to the US, which has approximately 1,980,000kms laid out for natural gas transportation. Funding gas pipelines and storage facilities is a highly capital-intensive task; without proper strategies to mitigate the risks associated, this can prove disastrous. In order to facilitate the movement of gas from the source of import or production, deep into the market close to the end customer, it is necessary to develop an infrastructure investment plan and explore viable models for its implementation.

- **Renewables**

India has made aggressive plans to increase the share of renewable energy from 10% to 40% by 2030¹¹ even though it is a good initiative on the face of it, the most damaging aspect of it is the focused and favourable principles for the renewable sector while natural gas hasn't been on the receiving end of such aggressive plans and favourable outcomes. It is important to note that renewable has its own set of problems; one of the biggest problems is that renewable energy is unpredictable, and it is not going to deliver 100% energy for quite some time, but on the other end, it dramatically helps by establishing gas readiness to complement with renewable energy, and it is the most effective and realistic strategy. By doing so, it proves valuable for the need of balancing energies. Another issue with renewables is silicon pollution associated with the disposal of solar panels at the end of their usable life.

- **Pricing Mechanism**

Historically, gas prices have been linked with oil and in competition with coal, whose supplies have been abundantly available and at low cost. On top of this, the domestic gas price has been set under an administered pricing regime. This has kept the domestic gas price below import level parity. Due to these reasons, the consumer has found it difficult to buy a high priced and volatile

¹⁰ Ministry of Petroleum & Natural Gas (Govt. of India), *Year-end Review: 2020 of the Ministry of Petroleum & Natural Gas* (2020), <https://pib.gov.in/PressReleaseDetail.aspx?PRID=1685110> (Last accessed 21 Sep 2022)

¹¹ Aman Y Thakker, *By the Numbers: India's Progress on its Renewable Energy Target* (2020), CSIS Asia Policy Blog, CogitAsia, <http://www.cogitasia.com/by-the-numbers-indias-progress-on-its-renewable-energy-target/> (Last accessed 21 Sep 2022)

fuel like imported natural gas. Policymakers have been focused on ensuring low-cost energy supplies, but it is also necessary to ensure that a reliable and sustainable energy source is supplied.

- **Lack of Integrated Energy Approach**

Even though the government of India has set a clear vision of achieving a 15% Natural Gas share in India's energy basket, there is no clear roadmap or an implementation strategy laid out for reaching this target. There is no unifying framework, and as a result, the rules and responsibilities of various stakeholders have become blurred. This has also given rise to a conflict of interest between organizations such as GAIL, Coal Authority Of India and ONGC due to contradictory objectives by adding the political agendas at the forefront. Gas has succumbed to a standstill. The government hasn't been effective at putting in place policies for banning polluting fuels, creating demand, supporting infrastructure development of pipelines, faster approvals etc. The lack of such unifying measures has put a hold on achieving its potential in India so far.

Conclusion and Recommendations

As India moves to a sustainable economy, focused and persistent efforts are required to ensure that everyone, from policymakers to consumers to industry players, acknowledges the major benefits of natural gas. Natural Gas undoubtedly inculcates a positive role in the future, keeping in mind the social costs of old fuels that it can undercut. It is safe to say that with all the factors and opportunities highlighted, an attempt at resolving the drawbacks hindering the growth of natural gas can be seen as a versatile and valuable energy source that is yet to unleash its full potential in India. It is an energy source on the brink of acting as a perfect partner for renewable energy, safe and sustainable fuel for the industry, and transport purposes. With the help of natural gas, it is an effective way for India to reach its renewable energy goals by helping balance and stabilize the fluctuating power supply of renewables and thereby enabling easy integration into the power grid.

Some of the key areas in which Indian needs to take action for the next five years to not jeopardize the prospects of the natural gas sector are as follows

- **Supporting the Development of Infrastructure**

To turn natural gas into reality, India first needs to concentrate on building sufficient infrastructure to provide consumers with timely availability of gas with the help of a national gas grid. Doing so

ensures the ecosystem surrounding gas is developed, enabling easy gas movement, which is the biggest roadblock.

- **Ensuring Competitive Markets**

Opening up a trading hub for gas brings many opportunities for independent players and private entities to participate in the gas market, thereby facilitating the ecosystem. It ensures harmonization of the rules and processes, making way for a free and fair market without unfair advantages for certain big players. Implementation of such institutional structures and ensuring competitive markets for gas is a must for its successful growth in the long term.

- **Supporting Exploration and Production Policies**

India is still lacking in exploration and production capacities; it must ensure that exploration and production policies are favourable. Encourage domestic and international firms to invest capital in exploring the largely unexplored Indian basins. This also requires supportive arrangements from Central and State agencies for environmental clearance, defence clearance and also various approvals from individual bodies.

- **Policies to put a Cost to Externalities and Carbon footprint**

The above measures will be in vain if there are no mechanisms such as Emission Trading Systems to put a cost to the externalities like environmental degradation, carbon footprint, health impacts and other associated public costs. This is perhaps the most important aspect of all; with such a system in place, it enables a level playing field. Thereby, cleaner fuels such as natural gas get the recognition and edge it deserves over other fuels.