Analyzing India's Natural Gas Policy: Reforms Required

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1. Abstract

This research paper examines India's evolving natural gas policy, focusing on the recent government approval of Natural Gas Marketing Reforms. These reforms aim to establish transparent and competitive market pricing. With a global shift towards cleaner energy sources, natural gas is emerging as a key alternative fuel, positioning India for a transition to a gas-based economy. To facilitate a functional gas market, India requires a supportive regulatory framework to address entry and exit barriers, balance pricing and delivery concerns, and align with sustainable development goals. India's current gas pipeline infrastructure spans approximately 16,000 km, with plans to double capacity in the next 2-3 years. With proper policy and regulatory support, India can accelerate its transition to a market-driven gas economy. Policies promoting gas production from new wells through economic incentives like premium pricing, stringent monitoring, and reporting measures are expected to boost domestic gas output significantly. This study highlights India's natural gas sector's potential to drive the nation's energy transition and economic development.

2. Introduction

a. Overview of natural gas in India

Within the complex fabric of the Indian Economy, the gas industry shines as a prominent sector, enlightening various industries with its significance. Apart from serving as a fundamental energy source for Indian households, it plays a vital role in the intricate web of global trade, influencing import and export dynamics. India, distinguished as the world's third-largest consumer of energy and oil, also ranks fourth in the international market for liquefied natural gas (LNG). In April-May 2024, India welcomed 40.3 MMT of petroleum products and 11.3 BCM of natural gas, marking an incremental growth of 2.4% and 3.66% respectively from the previous year. These substantial consumptions reflect the nation's expanding economy intertwined with a growing energy demand. Consequently, the future holds promise with significant investments enriching India's oil and gas sector.

Bharat Petroleum projects a twofold surge in India's energy requirements and a fivefold upsurge in the demand for natural gas by the year 2050. India has 26 sedimentary basins covering an expanse of 3.4 million square kilometers, encompassing onshore areas, shallow waters up to 400 meters deep, and deepwater regions extending to the Exclusive Economic Zone (EEZ). As of May 2024, the cumulative production of crude oil had reached 23 million metric tons (MMT), while natural gas production stood at 3.15 billion cubic meters (BCM).

From April 1st to July 31st, 2022, eight blocks were assigned through the Open Acreage Licensing Policy (OALP). The government aims to increase the country's exploration acreage by 0.5 million sq. km by 2025 and by 1.0 million sq. km by 2030.

b. Importance in India's energy mix

Natural gas is pivotal in India's transition towards more sustainable energy sources. The Indian government has set a target to elevate the natural gas share in the primary energy mix from 6% in 2021 to 15% by 2030. This shift is essential for diminishing the country's dependence on carbon-intensive fuels like coal and aligns with global efforts to reduce emissions.

Adopting natural gas advances environmental objectives and presents substantial economic benefits. Research indicates that by pursuing a low-gas scenario in line with a 1.5°C trajectory, India could realize savings ranging from USD 9-24 billion in imports by 2030. To achieve this transition successfully, it is imperative to reassess energy policies and investment strategies to enhance the trade balance and diminish import reliance.

In India, the industrial sector is anticipated to be the primary driver of natural gas demand. Crucial industries such as ammonia production for fertilizers and the expanding oil refining sector are expected to account for approximately 80% of natural gas consumption by 2050. This underscores the growing significance of natural gas in ensuring self-sufficiency in critical sectors.

Natural gas plays a role in ensuring energy security and reliability within the power sector. Despite accounting for just 4% of the electricity generation mix in 2020, its prominence is anticipated to rise, driven by current policies prioritising cleaner energy alternatives over coal. The adaptability of natural gas plants to swiftly adjust generation levels is essential for meeting fluctuating electricity demands.

India's ambitious targets to boost natural gas utilization face challenges due to its heavy reliance on imported liquefied natural gas (LNG). This dependence exposes vulnerabilities in energy security, susceptibility to price fluctuations, and geopolitical complexities. Furthermore, substantial investments in gas infrastructure could result in stranded assets if the shift toward renewable energy is not carefully orchestrated within the context of a global decarbonization effort.

3. Historical Context and Evolution

a. Milestones in the development of natural gas

The history of natural gas development in India dates back to the late 19th century, with the drilling of the first well in 1866. **The country's inaugural commercial discovery of natural gas occurred in 1889 at Digboi, Assam**. The introduction of gas distribution can be traced back to the British colonial era of the 1860s, marked by the establishment of entities like the **Bombay Gas Company and the Oriental Gas Company Ltd**. These foundational steps played a pivotal role in shaping India's natural gas industry.

The production of natural gas began to take form with Oil India Limited (OIL) in Assam in 1959, followed by the Oil and Natural Gas Corporation (ONGC) in Gujarat in 1964. As production activities expanded, the development of the gas value chain became imperative. This period saw significant endeavors in constructing infrastructure for refining, transportation, and distribution, laying the groundwork for a more organized natural gas sector.

India's natural gas sector has seen notable policy advancements in recent decades to boost domestic production and infrastructure. The introduction of the New Exploration and Licensing Policy (NELP) in 1997 was a pivotal moment, enabling increased private sector involvement in exploration activities and sector liberalization.

In 2016, the Indian Government set a challenging target to raise the share of natural gas in the country's primary energy mix from 6.14% to 15% by 2030, aligning with a vision for a cleaner and sustainable energy future. Despite positive initial trends, achieving this goal has proven complex due to the intricacies of the national energy strategy.

Infrastructure developments post-2010, notably the expansion of city gas distribution networks, have significantly boosted natural gas consumption in urban areas. By 2020, these networks had extended across multiple states, facilitating wider adoption of piped natural gas (PNG) and compressed natural gas (CNG) to meet the rising energy demands of urban India.

India's natural gas demand is forecasted to increase by 6% by 2024, driven by industrial needs and infrastructure enhancements. The introduction of a unified pipeline tariff system in April 2023 aims to establish a stable pricing structure, boosting consumption and aligning gas supply with demand for sector growth.

To bolster energy security and address price volatility risks, the Indian government is exploring the creation of gas storage facilities, recognizing the strategic value of gas reserves. This initiative, coupled with market reforms, underscores the government's dedication to fortifying and advancing the natural gas sector.

c. Previous reforms and Impacts

India has undertaken significant reforms in the natural gas sector over the years, with the goals of boosting domestic production, attracting private and foreign investments, and ensuring stable pricing for consumers. The key reforms include:

i. New Exploration Licensing Policy (NELP):

Introduced in 1997, NELP aimed to attract private and foreign investments into India's oil and gas exploration and production sector.

The policy aimed to create a level playing field for public and private companies, fostering competition and boosting production capabilities in the hydrocarbon sector.

ii. **Gas Pricing Reforms:**

In 2014, India implemented a new gas pricing mechanism tying domestic prices to international benchmarks, later revised in 2023.

The revised framework pegs domestic gas prices to 10% of the monthly average of the Indian crude basket, with price limits to stabilize consumer costs and protect producers.

iii. **Open Acreage Licensing Policy (OALP):**

Launched in 2016 as a successor to NELP, OALP allows companies to select exploration blocks independently instead of waiting for government bidding rounds.

The policy streamlines the licensing process, encourages exploration activities, and enhances domestic natural gas production.

iv. **Expansion of LNG Infrastructure:**

India has promoted the growth of liquefied natural gas (LNG) terminals to overcome supply shortages.

Increasing the number of terminals has bolstered the country's LNG import capacity, supplementing domestic production and ensuring a consistent gas supply.

v. **National Gas Grid:**

The National Gas Grid initiative aims to expand India's pipeline infrastructure for widespread access to natural gas nationwide.

This expansion is crucial for increasing natural gas consumption in India, supporting both industrial and residential needs.

3. Current policy framework

a. Key features

The Indian government has implemented initiatives aimed at enhancing and acknowledging natural gas production through new wells or interventions within the specified fields of Oil and Natural Gas Corporation (ONGC) and Oil India Limited (OIL). These efforts are designed to elevate domestic gas production levels and ensure accurate extraction documentation.

Key components of the policy include:

i. Authorizing ONGC and OIL to apply a 20% premium above the Administered Pricing Mechanism (APM) price for gas extracted from these new sources to incentivize further investments in gas extraction.

ii. Recognizing gas production through cumulative production metrics across all assets within the designated fields to provide a comprehensive evaluation of gas output.

iii. Mandating ONGC and OIL to utilize approved methodologies and equipment, including industry-standard gas meters, to precisely measure

gas production. This ensures transparency and compliance in reporting production quantities.

iv. Support from the Hydrocarbon Exploration and Licensing Policy (HELP) through revenue-sharing mechanisms and incentives to enhance the operational framework for national oil companies such as ONGC and OIL.

v. Furthermore, ONGC employs effective intervention strategies such as redevelopment plans for mature fields and new drilling operations to sustain and improve production levels.

vi. The latest reforms are with the intent to keep to the letter and spirit of ensuring marketing and pricing freedom for gas pricing in India.

vii. This is to bring uniformity to the bidding process across various contractual regimes and policies to avoid ambiguity.

viii. Such a platform will aid in expanding the gas industry by providing competitive and transparent pricing, flexibility in procurement, and payment security.

b. Stakeholders of the policy

The natural gas industry in India involves private and government entities managing gas conduits and resources under governmental stewardship. Governance dictates pricing and accessibility, with a history of regulations like the NELP. Private enterprise was allowed in the industry from 1992, with laws governing exploration, production, and offshore activities. Entities must obtain licenses and leases, with oversight from organizations like the Directorate General of Hydrocarbons and the Petroleum and Explosives Safety Organisation. Disputes are resolved through arbitration or High Courts, while foreign interests are protected by bilateral investment treaties.

4. BJP manifesto and initiatives

a. Overview of the Proposals

Bharatiya Janata Party (BJP) had laid out a comprehensive plan to **ensure energy security and enhance energy access** in India. The proposals focused on expanding existing programs, introducing new initiatives, and promoting clean energy solutions. Key components of the energy sector strategy include:

i. The BJP intends to **extend the flagship PMUY** program, which offers clean cooking fuel (LPG) to rural and underprivileged households. Launched in May 2016, the initiative aims to decrease the use of traditional fuels such as firewood, coal, and cow dung. The government has prolonged the program until 2026, intending to add 7.5 million new connections, increasing the total number of connections to 103.5 million.

ii. The BJP aims to broaden piped gas connections beyond the current 11 million households. This proposal aligns with the government's objective of raising the proportion of natural gas in India's energy mix from 6.8% to 15% by 2030.

iii. In line with its clean energy initiative, the BJP strives to offer free electricity to impoverished households through solar rooftop installations. This effort supports the shift to renewable energy sources and seeks to provide sustainable energy solutions to economically disadvantaged communities.

iv. The BJP plans a substantial expansion of the CGD (city gas distribution) network to enhance access to piped natural gas (PNG) for households. The PNGRB has granted licenses for PNG supply across India, except for Andaman and Lakshadweep. The CGD network expansion is part of the broader strategy to promote natural gas usage as a cleaner alternative to other fossil fuels.

v. The government's drive to expand natural gas utilization is anticipated to benefit various companies in the sector, including GAIL, Petronet LNG (PLNG), Indraprastha Gas Limited (IGL), Mahanagar Gas Limited (MGL), Gujarat Gas, and Adani Total Gas. This emphasis on natural gas is projected to stimulate growth and profitability in the sector, as evidenced by recent stock price increases.

b. Objectives and Expected Outcomes

The BJP's energy sector proposals are driven by several key objectives aimed at ensuring energy security, promoting clean energy, and enhancing energy access for all Indian households:

i. The primary objective is to strengthen India's energy security by diversifying the energy mix, increasing the use of clean and renewable energy sources, and reducing dependence on imported fuels. This involves expanding domestic energy infrastructure and ensuring a stable supply of energy to meet the growing demand.

ii. BJP aims to enhance energy access for all citizens, particularly those in rural and economically weaker sections. The expansion of the PMUY and piped gas connections is intended to provide clean and affordable cooking fuel to households that rely on traditional, polluting fuels. The introduction of solar rooftop systems for free electricity also aligns with this goal, offering a sustainable solution to energy needs.

iii. The government seeks to increase the share of natural gas in India's energy basket to 15% by 2030, up from the current 6.8%. This shift towards natural gas is intended to provide a cleaner, more efficient energy option,

reduce greenhouse gas emissions, and align with global efforts to combat climate change.

iv. By proposing free electricity through solar rooftop systems, the BJP aims to boost the adoption of renewable energy. This initiative is designed to reduce reliance on conventional energy sources, lower carbon emissions, and promote sustainable energy practices.

v. The expansion of the city gas distribution network and the push for more households to convert to piped natural gas are aimed at supporting the growth of the natural gas sector. This includes creating opportunities for companies involved in gas distribution and infrastructure, fostering economic growth, and generating employment in the sector.

vi. By promoting cleaner energy sources such as LPG, piped natural gas, and solar power, the BJP aims to reduce environmental pollution and improve air quality, particularly in urban areas. This objective aligns with broader environmental goals and public health priorities.

5. Infrastructure and Distribution

a. Current status of natural gas infrastructure

In 2024, India's natural gas sector is experiencing substantial growth and transformation, driven by the government's ambition to elevate the natural gas share in the energy mix to 15% by 2030 from the current 6.5%. This strategic shift aligns with India's broader energy diversification goals, aiming to reduce dependence on coal and oil in alignment with global sustainability targets. The strategy focuses on expanding the natural gas infrastructure through:

i. Establishing an extensive pipeline network

ii. Augmenting LNG import terminal capacities

iii. Introducing regulatory reforms to stimulate investment and operational efficiency.

The Indian government has earmarked approximately 4.95 billion dollars to enhance the natural gas pipeline infrastructure, with a particular emphasis on integrating northeastern states, Kashmir, and Ladakh into the National Gas Grid. The Northeast Gas Grid Project, currently 81% complete, is a pivotal component of this expansion. The projected pipeline network expansion of 15,500 km will enhance connectivity across regions. India's operational natural gas pipeline network spans over 33,753 km, with 24,623 km actively utilized. **Key projects like the Jagdishpur-Haldia /Bokaro-Dhamra Pipeline Project (JHBDPL), (PradhanMantri Urja Ganga), Indradhanush Gas Grid Limited (IGGL), Petronet LNG Limited (JVC) and Mehsana-Bhatinda pipelines are**

underway to fortify supply resilience and extend coverage to underserved regions.

India's LNG import infrastructure plays a critical role in meeting escalating energy demands due to limited domestic natural gas production. The existing LNG import capacity stands at 52.7 million tonnes per annum (MTPA), with plans to expand by an additional 25 million tonnes to reinforce energy security. Continuous efforts are being made to elevate operational transparency and terminal utilization through regulatory measures introduced by entities like the Petroleum and Natural Gas Regulatory Board (PNGRB).

Demand for natural gas in India has reached unprecedented levels, with consumption forecasted to reach 68.76 billion cubic meters by March 2024. Major consumers include the fertilizer industry (28%), City Gas Distribution (CGD) networks (20%), and the power sector (16%). Despite a slight decline in domestic production, an 18.6% surge in LNG imports underscores India's growing reliance on external sources. This underscores the necessity for further infrastructure development and policy support to facilitate a stable and sustainable energy transition.

b. Challenges in infrastructure development

The expansion of natural gas pipelines in India encounters various infrastructure challenges that hinder its advancement. These obstacles encompass **bureaucratic hurdles** necessitating multiple approvals from diverse government entities, leading to construction delays and increased costs. Additionally, fluctuations in natural gas demand pose challenges of overcapacity or underutilization, impacting the financial viability of projects.

Geographical impediments, such as varied terrain, severe weather conditions, and disruptions within local communities, further complicate construction efforts, necessitating innovative solutions.

Technical complexities, including securing right-of-way and coordinating with existing infrastructure, present additional hurdles to overcome.

Moreover, the underutilization of the current pipeline network affects economic feasibility, discouraging new investments. Regulatory intricacies and policy constraints contribute to funding limitations and prolonged approval processes,

hindering pipeline development and broader advancements in energy infrastructure.

Addressing these multifaceted challenges is imperative for the progression of India's natural gas pipeline infrastructure, fostering sustainable growth within the sector.

c. **Role of PNG networks**

The evaluation focuses on the competitiveness of gas-based electricity prices, examining capital and variable costs. Variable costs for fossil fuel electricity are fuel-driven, while PNG relies on capital investment. Gas prices and power plant efficiency impact operational costs, influenced by technological advancements. Modern gas power plants are **more efficient** than coal plants. The expansion of PNG networks in India offers a cleaner energy alternative, primarily methane, delivered through MS and PE pipelines. The growth of the CGD network and domestic PNG connections align with the government's focus on alternative fuels for sustainability and economic growth. PNG networks **contribute to reducing greenhouse gas emissions, enhancing energy security, and promoting economic progress in India.**

6. Challenges in Transition to PNG

a. Supply and Demand Imbalance

The challenge of Piped Natural Gas (PNG) supply and demand imbalance in India presents a significant hurdle for transitioning to PNG as a primary energy source. India heavily relies on imports due to limited domestic gas production, resulting in price fluctuations and an unstable supply, deterring infrastructure investments and expansion. Conversely, limited consumer awareness, resistance to switching from established alternatives like Liquefied Petroleum Gas (LPG), and the high costs of PNG infrastructure adoption impede consumption growth. This imbalance creates a cycle where **insufficient supply and infrastructure hinder demand growth**, and **weak demand diminishes the incentive for suppliers to invest**, posing challenges for India in effectively reforming and transitioning the PNG sector.

b. Pricing Mechanisms and Subsidies

The pricing system and subsidy structure for Piped Natural Gas (PNG) in India introduce complexities to the country's transition toward PNG as a primary energy source. The pricing of PNG is heavily influenced by global market fluctuations, given that India relies on imported natural gas for over 50% of its consumption. This reliance on imports results in significant price variations, making PNG less attractive compared to subsidized alternatives like Liquefied Petroleum Gas (LPG).

While LPG subsidies aim to improve affordability for consumers, they create an uneven competitive environment and deter the shift to PNG, which is perceived as more expensive due to its exposure to international market prices. Additionally, the lack of uniform pricing strategies among states, coupled with differing taxes and tariffs, further complicates the adoption of PNG. These pricing and subsidy challenges act as economic disincentives for both consumers and suppliers, hindering the growth of the PNG market and delaying efforts to promote PNG as a cleaner and more sustainable energy option. Consequently, these hurdles exacerbate India's broader struggles in establishing a reliable, scalable, and financially viable PNG infrastructure.

c. **Regulatory and Policy Hurdles**

Regulatory reform and policy hurdles in India hinder the transition to Piped Natural Gas (PNG) as a primary energy source. The complex and fragmented regulatory framework, inconsistent regulations among states, and disparities in safety standards and local policies complicate PNG adoption. Challenges include scarcity of skilled labor, technical expertise, pricing fluctuations, and infrastructure constraints, discouraging investors and operators and impeding PNG infrastructure growth. Despite increased domestic gas production, regulatory obstacles persist, hindering widespread PNG adoption in India.

7. Consumer Perspective

a. Public Perception and Acceptance

The Indian government has introduced reforms to make Piped Natural Gas (PNG) more accessible and affordable, but challenges remain. **About 45% of consumers may not benefit due to regional pricing differences, infrastructure issues, and lack of awareness.** Consumer attitudes vary, with concerns about transition costs and communication gaps. Campaigns promote PNG's advantages over traditional fuels, emphasizing environmental benefits. However, public acceptance is hindered by reliance on Liquefied Petroleum Gas (LPG). To boost adoption, effective communication highlighting economic and health benefits is essential, along with addressing consumer concerns and building trust.

b. Impact on Urban and Rural Households

The adoption of PNG (Piped Natural Gas) has had divergent impacts on urban and rural households, owing to differences in infrastructure, energy demands, and accessibility.

Urban Households:

Urban regions have witnessed a higher rate of PNG adoption, resulting in significant enhancements in air quality.

- Metropolises like Delhi and Mumbai, renowned for their severe air pollution, have experienced marked reductions in harmful emissions following widespread PNG adoption.
- The transition to this cleaner energy source has led to improved public health by mitigating respiratory and cardiovascular ailments due to decreased exposure to air pollutants.
- Urban consumers are generally well-informed about the benefits of PNG and possess the necessary infrastructure for seamless integration.
- Despite progress, challenges remain in ensuring uniform access across urban areas, particularly in densely populated zones where pipeline installation can be intricate and costly.

Rural Households:

- The adoption of PNG in rural settings faces distinct challenges, such as the absence of gas infrastructure and distribution networks.
- Many rural households still rely on traditional fuels like firewood, coal, and kerosene due to their availability and lower initial costs.
- Overcoming these barriers necessitates targeted initiatives to improve rural infrastructure and conduct tailored awareness campaigns regarding the advantages of PNG.
- Implementing subsidies tailored to rural households, akin to LPG subsidies under the Pradhan Mantri Ujjwala Yojana, could render PNG a more attractive and viable option.

8. Recommendations

a. India should not treat natural gas policy in isolation but rather integrate it within a comprehensive energy framework that aligns with climate commitments and economic objectives. This integration entails incorporating natural gas into the Goods and Services Tax (GST) regime to establish a uniform tax structure, enhancing its competitiveness compared to other fuel sources. Moreover, policies should focus on transparent energy pricing and accounting for externalities such as pollution costs to encourage the adoption of cleaner energy sources where applicable. Addressing structural disparities, like the varying treatment of state, central, and private power facilities, is essential to ensure equitable competition and improve market efficiency. This integrated strategy aims to foster a diverse energy mix where natural gas serves as a

transitional fuel, particularly in sectors facing challenges in swift transitions to electricity or greener alternatives.

b. To maintain competitiveness and adaptability, India should establish more research centers focused on energy technologies, providing **increased funding for innovation** in areas such as smart grids, energy storage, and decentralized systems. **Raising public awareness** and **enhancing education** on the benefits of natural gas and clean energy can accelerate adoption across industries. The government should **offer incentives for tri-generation systems**[1] in industrial zones and urban areas, boosting the role of natural gas in energy solutions. Additionally, **removing regulatory barriers for third-party electricity sales** and decentralized energy systems will attract private investment, fostering a resilient, sustainable energy sector capable of meeting future demands.

c. India stands at a crucial joint in its energy strategy, where it can significantly benefit from the experiences of the Gulf Cooperation Council (GCC), Europe, and the Association of Southeast Asian Nations (ASEAN) in developing its pipeline infrastructure and regulating gas pricing. Like the GCC, **India faces challenges surrounding gas pricing and cross-border infrastructure.** To address these issues, India should implement **transparent, market-based gas pricing reforms** to foster investment in domestic production and pipeline development. **Aligning gas prices with international standards and removing price controls** can stimulate private sector involvement and promote regional cooperation with neighboring countries for cross-border pipeline projects. Furthermore, **imitating Europe's integrated gas grid model**[2] can help India optimize resource utilization, reduce its dependency on LNG imports, and ensure a stable, affordable gas supply for its industrial and energy sectors. Additionally, lessons from the ASEAN region underscore the **necessity of political will to achieve successful regional energy trade and infrastructure development**. Political will is crucial for the success of energy trade initiatives in the ASEAN region. It serves as the driving force that enables cross-border collaboration and integration among member states. Without the commitment and support of political leaders, efforts to establish multilateral power trading are unlikely to succeed. By drawing on these international examples, India can enhance its energy security and support robust economic growth.

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[1] A trigeneration system, also known as Combined Cooling, Heat and Power (CCHP), is a technology that uses a single fuel source to produce electricity, heat, and cooling.

[2] The integrated electricity and gas grid is modeled using a single non-linear mathematical model that also accounts for various operational factors to improve system coherence and reliability. This approach allows for better alignment of electricity and gas supply dynamics, paving the way for optimized energy distribution across the European Union.

d. India's implementation of a regulatory framework for **hydraulic fracturing**, similar to the U.S. model, offers a chance to improve transparency and safety by rectifying existing issues. A critical measure is to require full disclosure of all chemicals used in fracking, without allowing exemptions for proprietary "trade secret" formulas. Creating a **transparent, centralized** database for chemical reporting that is accessible to both the public and relevant authorities will ensure that information is readily available for examination and action. **Increasing penalties for incomplete disclosures** can serve as a strong barrier against regulatory breaches, while enforcing real-time reporting will enable swift actions to address any environmental or health concerns. Moreover, promoting **collaboration between central and state agencies** can guarantee uniform enforcement and accountability across various regions, ultimately enhancing public safety and environmental protection. This strategy not only strengthens regulatory oversight but also cultivates **public trust through increased transparency and proactive risk management.**

e. In India, **promoting gas-based industries** can be achieved by implementing several key measures. First, the government can introduce tax benefits, such as **reduced corporate tax rates or investment tax credits**, for industries that transition to natural gas from coal and oil. This financial relief would encourage businesses to adopt cleaner energy. Second, **lowering tariffs** on natural gas imports and related infrastructure, like pipelines and LNG terminals, would reduce the cost of gas, making it more competitive. Additionally, the government can ensure e**asy access to gas supplies** by expanding the national gas grid, creating reliable distribution networks, and supporting investments in pipeline infrastructure. Finally, **policies should focus on easing regulatory approvals and offering long-term contracts** for industries switching to natural gas, ensuring stable pricing and supply security. These steps can help India achieve its clean energy goals and reduce dependence on more polluting fuels.

Conclusion

In conclusion, this study underscores the critical role of natural gas within India's evolving energy landscape, particularly emphasizing the opportunities afforded by low gas prices (LGP) to enhance gas penetration across various sectors. Nonetheless, substantial challenges, including insufficient infrastructure—especially in pipeline networks and LNG capacity—impede the full realization of these advantages. Despite the growth potential associated with LGP, India remains predominantly reliant on coal, particularly in the power generation sector, which continues to prioritize coal and renewables over natural gas.

The findings highlight the necessity for regulatory reforms and infrastructure investments to fully leverage the potential of the LGP scenario. Expanding gas distribution networks, increasing investments, and resolving regulatory bottlenecks are essential steps toward strengthening India's gas infrastructure. The ongoing discourse regarding gas allocation policy also presents a pivotal decision point. While withdrawing the policy could diminish gas utilization in critical sectors such as power and fertilizers, implementing market-driven reforms is imperative to promote long-term efficiency and growth within the gas sector.

Furthermore, the study emphasizes the integration of natural gas policy within a comprehensive energy framework that aligns with India's economic objectives. This integration may involve addressing discrepancies between state and central energy frameworks, and advancing research in energy technologies. Increased investment in smart grids, decentralised energy systems, and infrastructure is essential to position natural gas as a transitional fuel while bolstering overall energy security.

Lastly, the study acknowledges certain limitations, including the need for further analysis of downstream impacts, tax reforms, and the prospective role of natural gas within the broader energy mix. Transitioning toward a market-based and resilient gas sector will be crucial for achieving sustainable growth in the coming years.

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