Report
on
Assessment Of Maturity In Natural Gas Market

Prepared For Petroleum And Natural Gas Regulatory Board (PNGRB)
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Study Context

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The Petroleum and Natural Gas Regulatory Board (PNGRB) has undertaken a study to define and assess the key parameters of maturity in the natural gas sector during the unbundling of transportation and marketing of natural gas. The study has identified the gas market situation in terms of infrastructure, gas share in the primary energy mix of the country, supply diversification, liquidity in the market, robustness of the regulatory framework, and the transparency in pricing that exists in countries where unbundling took place in the natural gas sector.

Scope of Work for each of the Modules

1. **Objective of the Study**
2. **Introduction**
3. **Section I – Parameters of Mature/Developed Natural Gas Markets**
4. **Section II – Analysis of development in natural gas sector of India (2015-24)**
5. **Section III – Status of various parameters during and after unbundling in selected countries**
6. **Section IV – Analysis of Power sector in India where unbundling occurred and benefits**
7. **Section V – Realized Benefits of Separating Marketing and Transportation Activities Globally**
8. **Conclusion**

Objective of the Study

The objective was to define and assess the key parameters of maturity and development in the natural gas sector in India

The **Petroleum and Natural Gas Regulatory Board (PNGRB)** has undertaken a study to define and assess the key parameters of maturity in the natural gas sector during the unbundling of transportation and marketing of natural gas. The study has identified the gas market situation in terms of infrastructure, gas share in the primary energy mix of the country, supply diversification, liquidity in the market, robustness of the regulatory framework, and the transparency in pricing that exists in countries where unbundling took place in the natural gas sector.

The Government of India's target to raise the share of natural gas in the energy mix to 15% by 2030[1] underscores the critical role of unbundling in facilitating this transition. Unbundling is expected to enhance market efficiency, attract investment, and support the expansion of infrastructure necessary to meet these ambitious goals.

Additionally, India has committed under international climate agreements, such as the Paris Agreement (COP 21) to reduce emissions intensity per unit of GDP by 33-35% from 2005 levels and to achieve 40% of installed capacity from non-fossil energy resources by 2030. India has already achieved the same and now under the Glasgow Convention (COP 26), India has committed to cutting total projected carbon emissions by 1 billion tonnes by 2030, reducing the carbon intensity of its economy by less than 45% by the end of the decade, achieve 50% of installed capacity from non-fossil energy resources and achieving net-zero carbon emissions by 2070[2].The unbundling of the natural gas sector plays a crucial role in meeting these climate targets by fostering a more competitive, transparent, and efficient gas market that supports the transition to cleaner energy sources.

Sources: 1. PIB India- Natural Gas Target for India by 2030 2. India’s Updated Nationally Determined Contribution to be communicated to the UNFCC

Introduction (1/9)

Unbundling

Unbundling refers to the separation of activities of an industry involved in multiple parts of value chain-trading, producing, transporting, distributing, that was previously integrated.

Unbundling in Natural Gas Sector

In the context of the natural gas sector, unbundling typically involves separating the ownership and operation of gas transportation (pipeline infrastructure) from the marketing and sale of gas. This separation ensures that pipeline operators (who manage the physical infrastructure) and gas marketers (who sell the gas to consumers) operate independently, promoting competition, transparency, and fairness in the market. The primary goal of unbundling is to prevent conflicts of interest, enhance market efficiency, and create a level playing field for all market participants.

Unbundling may or may not be the first step in liberalizing a market. In some cases, it happens when the market has reached a certain maturity level in terms of development of Natural gas ecosystem (all aspects of supply, trading or marketing, transmission, distribution) in a country or when competition is hindered by presence of monopolies or infrastructure bottlenecks.

In cases where infrastructure monopolies hinder competition (in terms of access or transparency in accounting, pricing, competition) or innovation, unbundling becomes a corrective mechanism, which restores the market to healthy competition levels.

In the USA, unbundling in the natural gas sector came after regulatory reforms aimed at increasing competition in the interstate pipeline business (FERC's Orders 436 and 636). This unbundling was a response to the complexities and inefficiencies within the market, ensuring open access to pipelines and allowing for more dynamic price formation. It wasn’t necessarily a starting point of liberalization but rather a step required to keep pace with market growth, technological advancements and when the ecosystem has evolved.

Sources: 1. FERC

Introduction (2/9)

Unbundling in Natural Gas Sector: Global Perspective

Unbundling has been a significant part of regulatory reforms aimed at liberalizing the market, improving access to infrastructure, and fostering competition. As countries-initiated unbundling at different stages of gas market development, the factors determining market maturity varied accordingly basis their as-is status. Consequently, the specific circumstances at the time of unbundling depended on whether a country was already operating in a mature market or was still developing towards that goal. The intent of unbundling was to promote fair access to infrastructure, increased competition through a larger number of market participants, and greater number of consumer choices.

From the global perspective, there are different stages of unbundling in the gas sector with lower degree of unbundling to higher degree of unbundling.

1) **Account Unbundling**: It is the lowest form of unbundling, which requires an entity involved in various parts of the value chain to keeping separate accounts of various activities.
2) **Legal Unbundling:** It is lower form of unbundling, which requires an entity involved in more than one part of the value chain (production, marketing, transmission & distribution) to reorganize its activities into separate legal entities. Legally unbundled entity is owned by the previously vertically integrated firm through a holding company.
3) **Ownership Unbundling**: It is the highest form of unbundling. It requires an entity involved in more than one part of value chain to ownership unbundle all its activities. A firm owning and operating a activity cannot be active in any other competitive segment of the supply chain nor have an interest in any company involved in those activities.

Status of Unbundling in Natural gas sector: Global

Globally, countries have undertaken initiated unbundling implementing lowest form of unbundling, and then moving to higher forms of unbundling in a phased manner i.e. account separation, followed by legal unbundling and then finally to ownership.

Below is the list of few countries, which have implemented unbundling in their natural gas sector and have foreseen benefits:

Sources: 1. EU

Introduction (3/9)

Country Name	Developed/ Developing	Year of Unbundling
USA	Developed	1992: Ownership Unbundling
France	Developed	2005: Legal Unbundling
Brazil	Developing	1997: Legal Unbundling
United Kingdom	Developed	1997: Ownership Unbundling
Spain	Developed	2014: Ownership Unbundling
Mexico	Developing	2014: Ownership Unbundling
Netherlands	Developed	2005: Legal Unbundling 2006: Ownership Unbundling

Sources: 1. EU

Introduction (4/9)

How Unbundling was enforced globally?

The European Union's (EU) energy sector unbundling process is a powerful example of how regulation, legislation, and legal enforcement can drive market liberalization. The process unfolded over several decades through three key energy market directives, each addressing specific challenges in the sector's liberalization.

The unbundling of energy companies (specifically separating generation and supply from transmission) was a critical component of this transformation.

Here's an analysis of how each directive was enforced, why it was important, and the role of courts in resolving legal challenges.

1. **First EU Gas Directive[1] (1998)** – Initial Steps Toward Market Liberalization

Context and Motivation:

The First EU Gas Directive (1998) aimed to break down national energy monopolies in gas, initiating the move towards a competitive EU energy market. Before this, vertically integrated companies-controlled generation, transmission, and distribution in many EU member states, resulting in inefficiencies, high prices, and limited competition.

Key Provisions:

- **Third-Party Access (TPA):** The directive introduced negotiated access for third parties (new entrants) to the gas transmission networks. However, access to these networks was subject to negotiation with incumbent network operators, and there were no strong legal guarantees of non-discriminatory access.
- **Market Opening:** The directive mandated the partial opening of the energy markets i.e. certain % of consumers can choose their energy suppliers.

Sources: 1. Based on Analysis of EUR-Lex : European Union Website- Directive 98/30/EC

Introduction (5/9)

Why It Was Important:

This directive was the EU's first step toward liberalizing its energy markets, allowing for some level of competition. However, it lacked robust mechanisms for unbundling and regulatory oversight, leading to limited market impact.

Limitations:

- **No Full Unbundling:** There was no clear requirement for separating network activities (transmission and distribution) from generation and supply, so vertically integrated companies continued to dominate.
- **Negotiated TPA:** Since access to networks was subject to negotiation, incumbents could still limit access to new competitors, maintaining their dominance.

2. Second EU Gas Directive[1] (2003) – Introducing to Legal Unbundling

Context and Motivation:

By the early 2000s, it was clear that the First Directive had not gone far enough to ensure market competition. Vertically integrated companies were still dominating the market, and new entrants struggled to gain non-discriminatory access to essential network infrastructure.

Key Provisions:

- **Legal Unbundling:** The Second Gas Directive (2003) introduced the concept of legal unbundling, requiring the separation of transmission and distribution activities from generation and supply within vertically integrated energy companies. This meant that companies had to create legally distinct subsidiaries for network operations.
- **Regulated TPA:** The directive introduced regulated third-party access, ensuring that tariffs for network access were regulated by independent national authorities, reducing the ability of incumbents to unfairly block competitors.
- **Market Opening:** The directive required a higher percentage of the market to be open to competition, with full market opening in gas by 2007.

Sources: 1. EUR-Lex : European Union Website- Directive 2003/55/EC

Introduction (6/9)

Why It Was Important:

The Second Directive marked a significant step forward in the liberalization process. By mandating legal unbundling, it ensured that network operators were legally separate entities, reducing the conflict of interest between network operation and energy production. This helped improve transparency and competition.

Limitations:

- **No Ownership Unbundling**: Despite legal separation, many vertically integrated companies still owned both generation/supply and transmission/distribution assets, leading to potential conflicts of interest.
- **Varying Implementation:** Some member states were slow to implement the directive, and the quality of unbundling varied across countries, leading to uneven market liberalization.

3. Third EU Gas directive Package[1] (2009) – Full Ownership Unbundling

Context and Motivation:

The shortcomings of the Second Directive, particularly the continued influence of vertically integrated companies, prompted the EU to take further steps with the Third Energy Package (2009). The goal was to complete the liberalization process and create a fully competitive energy market across the EU.

Key Provisions:

- **Ownership Unbundling:** The Third Energy Package introduced the requirement for full ownership unbundling. This meant that energy companies could no longer control both production/supply and transmission networks. Transmission System Operators (TSOs) had to be completely independent of companies involved in generation and supply.

Sources: 1. EUR-Lex : European Union Website- Directive 2009/73/EC

Introduction (7/9)

- **Three models for unbundling were introduced:**
    - **Full Ownership Unbundling:** Complete separation of ownership of generation/supply and transmission.
    - **Independent System Operator (ISO):** A third-party operator could manage the transmission system, but ownership of the assets could remain with the energy company.
    - **Independent Transmission Operator (ITO):** Vertically integrated companies could still own transmission systems, but strict rules were imposed to ensure independence in decision-making.
- **National Regulatory Authorities:** Independent national regulators were empowered to oversee market activities, ensuring transparency and fairness in access to networks.
- **Agency for the Cooperation of Energy Regulators (ACER):** A new EU-wide regulator, ACER, was established to oversee cross-border energy market activities and harmonize rules between member states.

Why It Was Important:

The Third Energy Package was crucial because it finally tackled the root of the problem—ownership of transmission assets by vertically integrated companies. This was the most significant step towards ensuring a level playing field in the EU energy market. By separating ownership, it was possible to foster true competition, reduce conflicts of interest, and promote transparency.

Benefits of unbundling have been in-terms of increase in competition levels, increase in number of gas suppliers, increase in third party access to infrastructure, and also in terms of decrease in transportation tariffs for pipeline networks due to efficient operations. Refer Section V of detailed benefits experienced in different countries and refer section IV for assessment of different parameters at the time of unbundling in different countries from global cases.

Introduction (8/9)

Status of Unbundling in Natural gas sector: India

- Currently, in India as per the PNGRB affiliate code of conduct[1], 2008, Entities have implemented account separation but the compliance towards legal separation as per clause 5A of the PNGRB affiliate code of conduct, 2008 is pending. Under PNGRB's affiliate code of conduct 2008, entities engaged in transportation and marketing are required to legally separate the two functions into two separate legal entities. There is also a provision to require an entity to unbundle the ownership.

- Largely, in India, the status of entities complying with affiliate code of conduct is as follows:

Entity Name	Status of Unbundling
GAIL	Not legally unbundled
GSPL	Legally Unbundled but control of vertically integrated entity
PIL	Ownership Unbundled
GTIL	Legally Unbundled
GIGL	Legally Unbundled
IGGL	Legally Unbundled
IOCL	Not Legally Unbundled

Note:

1. GSPL is legally unbundled but its shareholder is GSPC, which has 37% stake in GSPL. Hence, in this arrangement, promotor can influence decision of the transportation entity

2. PIL was earlier owned by RIL and now its being owned by Brookfield Asset Management. PIL does not carry out any gas marketing

Sources: 1. PNGRB Affiliate code of conduct 2008- Amendment 2015

Introduction (9/9)

Approach

The note is divided into five sections:

- Parameters constituting market maturity for a Natural gas sector
- Analysis of development in natural gas sector of India from 2015 to 2024 in terms of different parameters required for a mature natural gas market
- Status of various parameters at the time of unbundling in natural gas sector of the selected countries
- Benefits of unbundling in natural gas sector from global case study scenario
- Analysis of power sector in India where unbundling has occurred two decades ago

Methodology

Assessment methodology is based on the analysis of the data and information collected through primary and secondary research by PNGRB.

- Secondary research is based on the data & information retrieved from publicly available reports and information available on websites of governments, regulators, and transmission system operators. Supporting sources of the data have been enclosed in the endnote
- During the primary research phase, PNGRB has interacted with energy regulators from France, Belgium, Netherlands, Spain, and United Kingdom

Sources: 1. PNGRB Affiliate code of conduct 2008- Amendment 2015

Section I: Parameters of Mature Natural Gas Markets (1/4)

Section I: Parameters of Mature Natural Gas Markets

A mature natural gas market, in the context of unbundling transportation and marketing activities in both developed and developing markets, may be characterized by the following parameters. These parameters, derived from an assessment of global case study of natural gas markets, present the situation or circumstance at the time of unbundling in various countries around the world. These parameters are as follows:

1. Demand
2. Supply
3. Infrastructure
4. Market Structure or Ecosystem
5. Regulations
6. Commercial mechanism
7. Net Zero Emission
8. Energy Security

Details of the respective parameter are mentioned below:

1. Demand

Firm demand in a natural gas market is evaluated by:

- Evolving consumption and requirement of natural gas across various sectors such as City Gas Distribution (CGD), power, refinery, fertilizers, steel, transportation, bunkering etc.
- Presence and creation of new demand centers and also new areas of application such as Compressed Natural Gas (CNG) stations, industrial and commercial connections in CGD in Geographical areas, domestic connections via Piped Natural Gas (PNG), in new initiatives-bunkering, fishing, LNG transportation

Section I: Parameters of Mature Natural Gas Markets (2/4)

- Analyzing dependency on natural gas, which is demonstrated through share of natural gas in primary energy mix of a country and also established by existing & upcoming infrastructure that enable consumption of gas (equipment, machines, plants) in sectors mentioned above

2. Supply

Robust gas supply in a natural gas market is evaluated by analyzing:

- Production of natural gas from domestic fields
- Supply of natural gas volume from firm LNG contracts and spot markets
- LNG storage and regasification capacity

3. Infrastructure

Robust Infrastructure in a natural gas market is evaluated by presence of:

- **Transmission Pipelines:** Extensive, well-maintained & interconnected transmission pipeline forming a gas grid i.e., interconnected pipeline network with sufficient capacity to transport gas across different regions of the country
- **LNG terminals:** Terminals with adequate capacity, strategically located across the country, connected by pipelines to efficiently transport natural gas
- **CGD infrastructure:** It is covered by presence of number of CNG stations, and PNG connections in domestic, industrial and commercial segment in different geographical areas
- **CGD Connectivity:** Number of Geographical Areas connected by natural gas transmission pipeline and other modes of supply
- **Gas Grid connectivity to supply sources:** Interconnected pipelines to supply sources i.e., domestic fields and LNG terminals

Section I: Parameters of Mature Natural Gas Markets (3/4)

4. Market Structure or Ecosystem

In a gas market structure, an ecosystem is created by **presence of multiple market participants**. A competitive landscape with a variety of market participants in different parts of Natural gas value chain include:

- Gas Producers
- Gas Marketers & Traders
- Gas Transporters
- Gas Distributors
- Gas Consumers
- LNG Terminal Operators
- Gas Exchange Platform

5. Regulations

This is demonstrated by the presence of control through coded standards and guidelines, which establish, operationalize, and regulate the petroleum and natural gas market ecosystem—covering participants and infrastructure. These controls promote infrastructure expansion, ensure safe operations, protect consumer and company interests, and foster competition. It is enabled through:

- Presence of standards & regulations governing market operations and safety
- Presence of regulations and guidelines to enable third party access to infrastructure
- Presence of independent regulatory bodies to oversee and enforce market rules
- Policies supporting competition and preventing monopolistic practices
- Authorization of pipelines through competitive bidding mechanism to promote market-driven tariff discovery.
- Presence of tariff Regulation, establishing fair mechanisms for tariff determination, attracting investments in infrastructure and optimizing logistics.
- Presence of regulations around account unbundling and legal unbundling of transportation and marketing functions in natural gas sector

Section I: Parameters of Mature Natural Gas Markets (4/4)

6. Commercial Mechanism

Resilience of the commercial mechanism is evaluated by presence of:

- Standardized contracts and trading practices
- Active markets for capacity booking and balancing services
- Revenue settlement mechanism among the gas transporters

7. Net Zero Emission

A mature natural gas market would facilitate the integration of natural gas into country’s broader decarbonization strategy, supporting industrial sectors, transport, and households in reducing emissions. The market should enable easier access to clean fuels like natural gas, while regulatory and policy frameworks would ensure compatibility with country's emission reduction goals.

8. Energy Security

The ability to balance domestic production with imports via a well-developed pipeline infrastructure and LNG import terminals ensures supply stability. Market maturity also implies strategic reserves, transparent market signals, and pricing mechanisms that reflect global conditions.

Section II: Analysis of development in natural gas sector of India (2015-24) (1/9)

2015	2024
Demand	
Consumption: 131 mmsmcd[1]	**Consumption**: 188 mmcmd[2]

Key Highlights

- **Growth:** Gas demand has increased by 43% in 9 years, with ~12% y-o-y increase[3] in FY24
- **Drivers of demand:**
  - Gas demand rose in CGD sector from 15 to 38 mmscmd[4] by 150% within 9 years through increase in CNG stations , PNG - domestic, industrial and commercial connections in various Geographical Areas (GAs) after twelve rounds of bidding and authorization covering entire India.
  - **Demand in Fertilizer sector** has risen by 33% in 9 years from 44 to 58.8 mmscmd[5] (FY16 -FY24)
  - Although demand in the Power and Refinery sectors in 2024 did not reach 2015 levels, it has picked up in FY2024, increasing by 11% compared to FY2023, driven by the availability of affordable RLNG.

FICCI projects annual gas demand of 300 MMSCMD by 2030 and 450 MMSCMD by 2040 in its report-Transition Journey to Clean Energy[6]. EIA has projected annual gas demand increase to 300-310 MMSCMD by 2030[7] So we, see the expected demand is in the range of 300 MMSCMD.BP energy outlook projects an increase of natural gas consumption to 485 MMSCMD (net zero case) and 643 MMSCMD (accelerated) respectively by 2050[8]

With the successful completion of Minimum Work Program (MWP) targets and the establishment of pipeline connectivity in City Gas Distribution (CGD), gas demand is expected to be primarily driven by CNG, domestic, and industrial & commercial (I&C) connections. Additionally, demand is likely to increase in other sectors such as Power, Refinery, and Petrochemicals, alongside new initiatives like LNG transportation and bunkering. This growth is being supported by the economic availability of RLNG and the expansion of refining and petrochemical capacities.

Sources: **:** 1. MOPNG IPNG statistics 2014-2015; 2. PPAC May 2024; 3. MOPNG IPNG Statistics 2022-2023 & PPAC Ready Reckoner May 2024; 4. PPAC Natural gas consumption Sector-wise India 2023-2024; 5. PPAC Natural gas consumption Sector-wise India 2009-2024; 6. FICCI- Transition Journey to clean energy; 7. EIA ; 8. BP energy outlook

Section II: Analysis of development in natural gas sector of India (2015-24) (2/9)

Supply	
Domestic: 70 MMSCMD[1] **LNG import:** 61 MMSCMD	**Domestic:** 99 MMSCMD[2] **LNG import:** 89 MMSCMD

Key Highlights

- LNG supply from long-term contracts and the spot market has increased by 47% over the past nine years, highlighting the strength of global LNG supply contracting. In contrast, supply from domestic gas fields has grown at a slower rate of 15% during the same period

Hence, India's Gas supply is being strengthened basis renewal and addition of new long-term LNG supply contracts by entities such as PLL, GAIL, IOCL in gas portfolio. Delivery of LNG is being strengthened by capacity addition at LNG import terminals and commissioning of new LNG terminals in western and eastern part of India.

The domestic supply is projected to increase[3] to a peak of 113 MMSCMD in 2026 and is expected to be around 90-100 MMSCMD by 2030

Sources: 1. PPAC Natural gas consumption Sector-wise India 2009-2024; 2.PPAC Natural gas consumption Sector-wise India 2009-2024; 3. Institute for Energy Economics and Financial Analysis

Section II: Analysis of development in natural gas sector of India (2015-24) (3/9)

Infrastructure (Transmission Pipeline, LNG Terminal, City Gas distribution)	

• **Transmission Pipeline[1]**: 16,231 Km with total capacity of 345 mmscmd
• **LNG Terminals[2]**: 4 LNG terminals (Dahej, Hazira, Dabhol, Kochi) with 21.7 MMTPA
• **CGD[3]:** Domestic connections-31,63,588, Industrial (23,304) & Commercial (6225)
  ○ 1081 CNG stations across GAs 84 authorized till FY 2016
	• **Transmission Pipeline[4]**: 24,881 Km with operational capacity of 379 mmscmd and 10,494 km with capacity of 118 mmscmd under construction
	• **LNG Terminals[5]**: 7 LNG terminals (Dahej, Hazira, Dabhol, Kochi, Mundra, Dhamra, and Ennore) with 52.7 MMTPA & 3 upcoming (Chahra,Jafrabad, Gopalpur) with total capacity expected to increase to 73.7 MMTPA by 2030
	• **CGD[6]:** Domestic connections-1,31,18,891, Industrial (44,471) & Commercial (19,211)
	  ○ 6959 CNG stations across 307 GAs authorized till June 2024
	  ○ 100% Geographical area coverage achieved in terms of CGD authorization
	  ○ 287[7] out of 307 GAs have been made operational either via pipeline or via other modes
	  ○ 195 GAs[8] have achieved connectivity via gas transmission pipeline

Sources: 1.MOPNG IPNG statistics 2015-2016; 2.MOPNG IPNG statistics 2015-2016; 3. MOPNG IPNG statistics 2015-2016; 4. PNGRB NGPL Status March 2024; 5,6. PPAC Ready Reckoner May 2024; 7. PNGRB; 8. PNGRB

Section II: Analysis of development in natural gas sector of India (2015-24) (4/9)

Infrastructure (Transmission Pipeline, LNG Terminal, City Gas distribution)

Key Highlights

- **Network Expansion with Gas Grid connectivity:** Gas transmission network increased by 53% in 9 years with gas grid connectivity across several demand centers in India
- **LNG Import Capacity Boost:** Total LNG import capacity surged by 119% from 21.69 MMTPA in 2015 to 47.7 MMTPA in 2024, creating robust infrastructure for importing and processing LNG. Further, capacity expansion has been proposed at existing LNG terminals (Dahej (+5), Dabhol (+7) and Dhamra (+5)).
- **CGD Proliferation:** Domestic and Industrial & Commercial connections have increased by 314% and 115% respectively with number of CNG stations witnessing an increase by 543% in 9 years (2015-2024)

Hence, India's gas delivery has been adequately strengthened by addition of transmission & distribution pipeline network and development of GAs and LNG terminals in the country.

Section II: Analysis of development in natural gas sector of India (2015-24) (5/9)

Market Structure or Ecosystem through Presence of Market Participants	
• **Gas Transporters[1]**: 7 Nos • **Gas Distributors[2]**: 21 Nos • **LNG Terminal Operators:** 4 LNG terminals by 3 Entities (PLL, Shell, and JV of GAIL & Ratnagiri) • **Gas Exchange** did not exist in 2015 • **Major Gas Marketer:** GAIL, IOCL, BPCL, and GSPC	• **Gas Transporters[3]:** 8 Nos • **Gas Distributors[4]:** 43 Nos • **LNG Terminal Operators:** 7 LNG terminals with 3 upcoming facilities by 7 entities (PLL, Shell, JV of GAIL & Ratnagiri, GSPC LNG, IOCL, Adani, HPCL, and Swan LNG) • **Gas Exchange[5]** was established in 2020 with annual volume of gas traded accounting to 1030 MMSCM with 998 trades in 2024 • **Major Gas Marketer:** GAIL, IOCL, BPCL, and GSPC

Key Highlights

- Currently in 2024, there are 8 gas transporting, 4 gas supplier or marketing, and 43 gas distribution entities present in the ecosystem
- Gas Exchange has been operationalized by PNGRB in 2020 to provide market-based price discovery of gas, access to domestic and global LNG suppliers across 9 delivery points & 6 regional gas hubs in domestic market

India's gas market encompasses all the essential elements of a robust ecosystem. To fully enable this ecosystem, it is crucial to enhance transparency, improve operational efficiency, and foster competition to provide end consumers with greater choice. This could be done by bringing efficiency in different business activities of the gas sector i.e. by separation of marketing and transportation functions.

Sources: 1.PNGRB Authorized Natural Gas Pipeline; 2. PNGRB Authorized GAS; 3. PNGRB Authorized Natural Gas Pipeline ; 4. PNGRB Authorized GAs; 5. Indian Gas Exchange Annual Presentation 2023-2024

Section II: Analysis of development in natural gas sector of India (2015-24) (6/9)

Regulations	
• There was no mechanism to set zonal unified tariff for customers • Regulations around LNG terminals, imbalance management services and gas exchange were non-existent in 2015	• Unified Tariff[1] was established by PNGRB in 2023 with moto of one-Nation, One-Grid and One- Tariff • PNGRB has expanded its regulatory oversight to include the regulation of LNG terminals[2] (2018 & 2024), the provision of imbalance management services (2016) in gas transportation, and the operationalization of a gas exchange (2020) in 2024

Key Highlights

- Unified tariff mechanism has been established by PNGRB to provide benefit to end consumer with motto-one nation, one grid & one tariff.

Comprehensive regulations in gas sector has truly made the market to move towards maturity

Sources: 1. PNGRB Tariff Regulations for Natural Gas Pipeline ; 2. PNGRB Regulations for T4S-LNG terminals, Imbalance management etc.

Section II: Analysis of development in natural gas sector of India (2015-24) (7/9)

Commercial mechanism	
• In 2015, there was no unified revenue settlement mechanism in place, as each pipeline operated under its own individual tariff structure • In 2015, there was no commercial settlement mechanism in place for the imbalance management in gas transport operations	• A revenue settlement mechanism[1] was introduced in 2023 with the implementation of the unified tariff system • Mechanism for providing Imbalance management services in gas transportation was established in 2016

Key Highlights

- Commercial terms & conditions and mechanisms for revenue entitlement & tariffs have been defined by PNGRB and have been operationalized by Industry settlement committee

This demonstrates the stability in the trade practices through established regulatory mechanisms evolved in the gas sector of India.

Sources: 1. PNGRB Tariff Regulations for Natural Gas Pipeline

Section II: Analysis of development in natural gas sector of India (2015-24) (8/9)

Net Zero Emission: India has been pursuing aggressive pollution reduction agendas

- In 2015, India submitted its Intended Nationally Determined Contribution (NDC) to UNFCCC on October 2, 2015
- The 2015 NDC comprised eight goals; three of these had quantitative targets up-to 2030:
- cumulative electric power installed capacity from non-fossil sources to reach 40%
- reduce the emissions intensity of GDP by 33 to 35 percent compared to 2005 levels
- creation of additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover.

- In **2022**, India now stands committed to reduce Emissions Intensity of its GDP by 45 percent by 2030, from 2005 level.
- India to achieve about 50 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030.

Key Highlights

- India's commitment to climate goals (under the Paris Agreement) is also becoming a central part of policy, and natural gas can serve as a transition fuel from coal and oil to renewable energy.

This demonstrates the focus and commitment of India, enabled by the intervention of PNGRB and ecosystem enablers, in fostering growth within the gas sector ecosystem through technological advancements in India.

Section II: Analysis of development in natural gas sector of India (2015-24) (9/9)

Energy Security	
• In 2015, RLNG import was 61 mmscmd where as the domestic production was 70 mmscmd in India	• In 2024, the RLNG import has grown to 90 mmscmd, where as the domestic production has grown to 99 mmscmd

Key highlights

- Energy security is crucial as India remains dependent on imports for its energy needs, especially oil and gas. A mature natural gas market should promote diverse supply sources (domestic and international) and infrastructure resilience.
- As RLNG import going to increase in the future with marginal increase in domestic production to cater to the growing demand, Unbundling would enable various players to participate in the supply chain, increasing the diversity of suppliers and competition, which would enhance energy security. It would also attract private investment into infrastructure development, contributing to a more resilient supply network.

LNG import infrastructure has evolved to cater to the import needs of India. Further, fostering competition and making efficient market is the way forward.

Section III: Status of various parameters during & after unbundling in selected countries (1/8)

Section III: Status of various parameters during and after unbundling in selected countries where unbundling occurred

The key conclusions out of the global study are as follows:

1. **Markets which got unbundled, did not necessarily exhibit a specific threshold share of natural gas in their primary energy mix; rather, unbundling occurred in countries with varying levels of gas share in their energy mix. Further, in some countries, the gas transportation infrastructure was already well-established at the time of unbundling, while in others, it expanded significantly after the unbundling process.**

   a. **Global Context**

      i. Natural Gas share in the primary mix has ranged from 2.9% to 37% for the global gas markets where unbundling took place.
      ii. Brazil's (with an area[1] of 85,15,770 sq km) share of gas[2] was only 2.9% (~17 MMSCMD of NG) in PE mix at time of legal unbundling in 1997 whereas other countries - UK, Spain, France, and Mexico had gas[3] share ranging from 14% to 38%.
      iii. Brazil had[4] approximately 1,400 kilometers of natural gas pipeline infrastructure in 1997, which expanded to around 9,409 kilometers[5] by 2023. In contrast, other countries had already developed more extensive gas transmission infrastructure at the time of unbundling, compared to current levels of 2024.Countries such as UK had 65% (~5000Kms) in 1997 of today's(2024) gas transmission infrastructure[6] (7666 Kms)

   b. **Indian Context:** Currently, India's share of Natural gas consumption has touched 5.8[7]% with absolute consumption rising to 188 MMSCMD. With authorization of 307 GAs, there is a demand growth expected in the CGD sector as only 191[8] GAs are connected via pipeline. Further, completion of MWP targets would add to the demand of natural gas. Demand in power sector and refinery & petrochemical is picking up with availability of affordable RLNG. Brazil, having an area 2.6 times that of India, unbundled at only 2.9% share of gas in the PE mix.

Sources: 1. CIA; 2. Statistical Review of World Energy Data; 3. Statistical Review of World Energy Data; 4.GASBOL Pipeline in 1999; 5. 2031 Ten year Expansion Plan; 6.National Gas UK Transmission Length, 7. Statistical Review of World Energy Data; 8. PNGRB

Section III: Status of various parameters during & after unbundling in selected countries (2/8)

2. Countries with 100% import dependency, 100% domestic supply, and a mix of domestic and import dependency have undergone unbundling of transportation and marketing function in natural gas sector. This demonstrates that domestic supply sufficiency is not the only factor to consider for gas market maturity prior to unbundling; rather, the robustness of firm contracts and stable availability through various mechanisms are also crucial.

a. Global Context

i. For example, Spain and France, which had 100% import dependency[1], got unbundled in 2013 and 2006 respectively.
ii. UK, Brazil, Netherlands had ~100% domestic supply of gas at the time of unbundling[2]. (UK (1997) & Netherlands (2006)- ownership & Brazil (1997)- legal). Gradually, these countries developed dependency on LNG impots, with share of LNG imports increasing in its gas supply portfolio.
iii. Mexico, which went ahead with ownership unbundling in 2014, had 35% import and 65% domestic supply dependency.

b. Indian Context

i. Currently, India has a diversified supply of gas from domestic fields and LNG imports[3], accounting for 52% and 48%, respectively, in FY24. This diversified supply, supported by the robustness of firm contracts and stable availability, enhances the overall gas consumption portfolio.

Sources: 1. Statistical Review of World Energy Data; 2. Statistical Review of World Energy Data; 3. PPAC Natural gas consumption Sector-wise India 2023-2024

Section III: Status of various parameters during & after unbundling in selected countries (3/8)

3. Unbundling led to multiple benefits and provided more choices to consumers, but it took over 6-10 years for evolution of gas market in terms of increase in number of shippers, customer switching rates, decrease in market concentration (increase in competition)

a. Global Context

i. For example, in UK, Netherlands, Hungary, Austria, Spain, France and Belgium, there was an increase in number of gas shippers[1] (from 2004 to 2014: UK-8 to 23, Hungary- 6 to 20, Germany- 6 to 20, France-8 to 20, Belgium- 8 to 18); decrease in market concentrations (Hungary- 3200 to 1494, Germany- 1900 to 1886, France-6200 to 4700, Belgium- 5600 to 4000); and increase in choice for customers (switching rates: UK-upto-47%, Hungary- 4 to 20%, Germany- 0 to 10.6%, France-0 to 4.5%, Belgium- 9 to 11%) after unbundling which led to increased choices for consumers. Post unbundling, the evolution of market was being monitored by European commission, which generated report on progress in creating the internal gas and electricity market for entire European countries. The results of this study in detail is highlighted in section IV of this paper

b. Indian Context

i. In India, the natural gas market is predominantly served by four major entities: GAIL, IOCL, GSPC, and BPCL, with each handling significant volumes and major volume share[2] (54%) handled by GAIL. However, there is a need to increase the number of gas suppliers to enhance competition and provide more choices for end consumers. This would facilitate better price discovery both domestically and globally, particularly through LNG supply contracts and competition.

Sources: 1. Report on progress in creating the internal gas and electricity market (2004-2014); 2. GAIL

Section III: Status of various parameters during & after unbundling in selected countries (4/8)

4. Markets, which got unbundled, undertook changes in policies & regulations for third party access, pricing, tariff mechanisms and for acceptability of natural gas as a cleaner source of fuel to drive consumption and growth gas infrastructure in the market post unbundling.

a. Global Context

i. China's government incentivized the transition from coal to natural gas to reduce air pollution and meet emissions targets with focus on expanding gas pipeline infrastructure with gas share[1] rising from 3% to 8% from 2007 to 2022. This period was associated with introduction of pricing reforms aimed at relaxing govt. controls on gas prices.
ii. Post unbundling in 1997, Brazil allowed third party access on pipelines and upstream pricing freedom with certain Gas Laws which led to increase in share of NG in mix[2] to 12% in 2015.
iii. In Mexico, growth in gas consumption (11.8% in Primary Energy mix[2]) in 1990s, prior to unbundling in gas sector, was driven by gas-based power generation. Further, Power Alliance Coal[3] in 2017 decided not to open any coal-based power plants, accepting gas a cleaner source of fuel.

b. Indian Context

i. In India, the PNGRB (Petroleum and Natural Gas Regulatory Board) has enabled third-party access to pipelines through the common carrier concept. To incentivize customers and transporters, PNGRB has also been deliberating on efficient tariff mechanisms through tariff reforms. Additionally, there is a need to enhance operational efficiency in the movement of gas molecules and to increase the diversity of LNG and gas suppliers, providing more options for end consumers.
ii. As globally, countries have achieved efficiency in moving a gas molecule and created a more competitive and transparent gas market through its policies and reforms. Clear separation between the supply and transport of gas has led to improved efficiency, greater supplier diversity, and better price discovery, ultimately benefiting the end consumers.

Sources: 1. Statistical Review of World Energy Data; 2.Statistical Review of World Energy Data; 3.Climate Transparency 2021

Section III: Status of various parameters during & after unbundling in selected countries (5/8)

5. Markets, which got unbundled, had interconnected transmission pipeline network of gas from source of supply-domestic or LNG import facilities

a. Global Context

i. Countries such as UK, France, Netherlands, Brazil had developed sufficient network of pipelines (UK-~5,000 Km, France ~36,000 Kms, Netherlands~11,000 Km, Brazil~1,411 Km, Mexico~10,800 Km) which were interconnected to gas supply sources- either LNG terminal or domestic gas fields to enable the seamless movement of gas molecule.

a. Indian Context

i. Currently, India has gas transmission pipeline of length[1] 24,881 Km and with length of 10,494 Km under construction. The pipelines are interconnected to form a gas grid for transmission of gas from one part of country to another from source of supply to demand centers. Total operational capacity (cumulative) of the natural gas pipeline is 379 mmscmd with 118 mmscmd under construction as per FY 24

6. Markets, which got unbundled, demonstrated regulatory readiness in terms of operational services, tariff reforms and safety standards

a. Global Context

i. **Regulatory readiness for operational services:** Global countries have demonstrated regulatory readiness in terms of governance of gas market operations-capacity booking mechanism, imbalance management and tariff regulation. Countries such as UK, Spain, France, Netherlands, Belgium had regulatory readiness and framework defined by European Union Commission.

Sources: 1.PNGRB

Section III: Status of various parameters during & after unbundling in selected countries (6/8)

ii. Independent Regulatory Bodies: Markets of countries had independent energy regulator prior to unbundling to frame regulatory policies and develop market operation framework to promote fair access to infrastructure, competition and prevent monopolistic practices. List of countries with energy regulators at time of unbundling:

1. UK- DGGS and Ofgas[1] (established in 1986)
2. Spain-CNMC[2] (established in 2007)
3. France-CRE[3] France (established in 2000)
4. Netherlands- Dte[4] Netherlands (established in 1998)
5. Brazil-ANP[5] (established in 1997)

iii. Tariff Determination: In Europe, European commission[1] set out a EU regulation[6] 2017/460 as per the defined methodology (capacity based tariff, price reference methodology, commodity based etc.) to promote fair pricing.

b. Indian Context

i. Regulatory readiness for operational services[7]: PNGRB (Petroleum & Natural Gas Regulatory Board) has demonstrated regulatory readiness in terms of governance of gas market operations services across petroleum product pipeline and natural gas sector through its various regulations & codes. PNGRB has notified regulations around Authorization, Tariff, third party access, Technical Standards and Specifications including Safety Standards:

1. **Petroleum and Natural Gas Regulatory Board (Authorizing Entities to Lay, Build, Operate or Expand Natural Gas Pipelines) Regulations, 2008 (as amended):** Mechanisms for establishment of natural gas pipeline under different regulation mechanisms (Regulation 5, 17, 18,19,21, Section 42 of PNGRB Act 2006)
2. **Petroleum and Natural Gas Regulatory Board (Access Code for Common Carrier or Contract Carrier Natural Gas Pipelines) Regulations, 2008 (as amended):** Mechanism for access to gas infrastructure (Clause 12), declaration of common carrier capacity on pipeline (Clause 5), system imbalance management (Clause 13), interconnection of two or more pipelines (Clause 11) etc.

Sources: 1. National Gas UK; 2. CNMC –Spain; 3. CRE France-Who are we?; 4. ACM Netherlands; 5. World Bank - Brazil; 6. Commission Regulation (EU) 2017/460 of 16 March 2017 ; 7. PNGRB

Section III: Status of various parameters during & after unbundling in selected countries (7/8)

ii. **Independent Regulatory Bodies:** India has PNGRB (Petroleum & Natural Gas Regulatory Board), which was formed under PNGRB ACT 2006. It was established by an Act of Parliament in 2006 by **Government of India** with an objective to regulate the refining, processing, storage, transportation, distribution, marketing and sale of petroleum, petroleum products and natural gas so as to protect the interests of consumers and entities engaged in specified related activities and to ensure uninterrupted and adequate supply of petroleum, petroleum products and natural gas in all parts of the country and to promote competitive markets.

iii. **Tariff Determination:** In India, PNGRB has established tariff reforms to benefit end consumers (through unified tariff) and entities (through Cost plus DCF tariff for reasonable returns on investments). This has benefited consumers in terms of single zone based tariff and entities in terms of creating opportunities for reasonable returns on investments.

7. Globally Gas Markets, which witnessed unbundling, established platforms for the purpose of trading gas, capacity booking & imbalance management in transmission pipeline to create a liquid gas market.

a. **Global Context:** Globally, countries established Gas exchange platform arrangement to facilitate trading of gas and achieve price discovery mechanism. For Example:

i. **UK:** On-the-day Commodity Market (OCM) was introduced[1] in 1999, as part of new gas trading arrangements, two years post unbundling.
ii. **France:** Gas Exchange Point (PEG) exists with name TRF[2] (Traded Region France)
iii. **Spain:** MIBGAS - Gas exchange platform was established in year 2015 after adoption of unbundling[3] in year 2013 and 2014
iv. **Netherlands:** TTF (Title transfer Facility) was established in 2003, prior to legal unbundling[4]. It has become one of the largest international gas trading platforms in Europe with trade have risen from 153 MMSCMD in 2008 to 12873 MMSCMD in 2020.
v. Centralized Capacity Booking platforms are being used in European countries for booking capacities on natural gas pipeline. Platform such as Prisma is used to transparently declare the capacity to all the buyers and shippers. These centralized platforms have been established gradually with unbundling of transportation functions in these countries in Europe.

Sources: 1. Ofgem; 2. European Traded Gas Hubs: German hubs about to merge: Oxford Studies; 3. MIBGAS Platform ; 4. Gasuin- TTF ; 5. European Traded Gas Hubs: German hubs about to merge: Oxford Studies

Section III: Status of various parameters during & after unbundling in selected countries (8/8)

b. Indian Context: India currently has a fully operational gas exchange platform, IGX, which was established in 2020. IGX offers a range of contracts, from short-term to long-term. In 2024, the annual trading volume on IGX reached 1,030 MMSCM (2.8 MMSCMD) across 998 trades. However, there is still a need to develop greater liquidity in trading. Additionally, in India, capacity booking platforms have been facilitated through capacity declarations made by transporters on their respective websites. Hence, PNGRB has taken aggressive measures to evolve gas trading and access to infrastructure through capacity booking on natural gas pipeline.

Sources: 1. IGX

Section IV: Analysis of the Power Sector in India: Unbundling and Demonstrated Benefits (1/3)

Section IV: Analysis of the Power Sector in India: Unbundling and Demonstrated Benefits

Historical Developments in Power sector developments in Power sector is mentioned below:

- **1970: Challenges in Power sector-** In 1970s, SEBs started incurring losses due to reasons such as operations inefficiency, mismanagement, pilferage, leakage etc.
- **1975: Central Government created centralized generation entities-** Due to poor performance of State Electricity Boards during 1970s, Central Government set up two central public sector utilities for Power Generation: NTPC and NHPC in **1975.**
- **1989: PGCIL as Transmission System Operator with fully ownership unbundled-** In **1989,** NPTC-National Power Transmission Corporation (PGCIL) was created to take over operations of transmission and later took over assets from NTPC and NHPC. Hence, it was established as a fully ownership unbundled entity.
- **2003: Unbundling in State electricity Boards**- In 2003, under Section 131 of Electricity Act 2003, it was mandated to reorganize the State Electricity Boards in India to separate entities of Generation, Transmission and Distribution segments.
- **2003:** After unbundling, open access to transmission and distribution system was enabled.
- **2008: Independent System operator for PGCIL-** POSOCO was formed as 100% subsidiary of PGCIL, with objective to take over operations, managing load despatch centers across the region in India.
- **2008:** Indian Electricity Exchange (IEX) was formed in 2008
- **2017:** POSOCO got fully separated in 2017 from PGCIL with objective to separate the operations from transmission assets. The decision was to separate POSOCO from Power Grid Corp, as PGCIL want to focus on competing with private companies for setting up transmission network but not at the same time operating the grid.
- **2022:** Name of POSOCO changed to Grid Controller of India Limited (Grid-India)

Sources: 1. Turning around the power distribution sector

Section IV: Analysis of the Power Sector in India: Unbundling and Demonstrated Benefits (2/3)

Reasons for unbundling in Power sector

- To enable open access for buyers of capacity
- To bring efficiency in operations-generation, transmission, and distribution
- To restrict losses and prevent cross subsidization of businesses
- To focus on transmission and distribution infrastructure development
- To fully institutionalize the focus of entities in their own business function- generation, transmission, distribution
- To attract investments by private companies
- To create a competitive market-place and increase choices for procurers of electricity by third party access, capacity booking and power purchase contracts

Benefits of Unbundling in Power sector

- **Increase in Private Investment**: Private participation has increased in the power sector in all parts of value chain.
- **Reduction in Transmission and Distribution Losses:** Transmission and distribution losses have significantly reduced, bringing efficiency in operations and saving costs.
- **Efficiency improvements** have been observed in power generation, transmission and infrastructure creation.
- **Enhanced Consumer Choice**: Unbundling has allowed consumers to choose their electricity suppliers, leading to competitive pricing and better service quality. This has resulted in cost savings for consumers.
- **Enhanced Competition:** With participation of private entities, a competitive marketplace has developed leading to increased choices for end consumers
- **Price Discovery on IEX:** The unbundling of the electricity sector, particularly the separation of generation, transmission, and distribution, has significantly transformed the market dynamics, creating an open and competitive environment.

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Sources: 1. Turning around the power distribution sector

Section IV: Analysis of the Power Sector in India: Unbundling and Demonstrated Benefits (3/3)

- **By allowing multiple players to enter the market**, unbundling has dismantled monopolistic control, fostering a more competitive landscape. This has enabled competition on electricity exchanges leading to more efficient price discovery, as prices are now determined by market forces rather than being set by a single entity. The increased competition has also encouraged innovation, improved service quality, and provided consumers with more choices, ultimately driving the sector towards greater efficiency and sustainability.
- Further, tariff determination through bidding on electricity exchanges has led to effective price discovery.

Sources: 1. Turning around the power distribution sector

Section V: Realized Benefits of Separating Marketing and Transportation Activities Globally (1/2)

Section V: Realized Benefits of Separating Marketing and Transportation Activities Globally

Benefits of unbundling has been assessed globally across several parameters. For example, European Commission published reports on "**progress in creating the internal gas and electricity market for entire European countries[1]**".

a. Competition levels: Competition level in the gas market is accessed by several factors. Such as change in market concentration, increase in customer switching rates, increase in number of gas suppliers etc.

I. Countries like Belgium, France, Germany, Hungary, Netherlands witnessed a decrease in HHI i.e. increase in number of market players, increasing market competitiveness. (HHI: The Herfindahl-Hirschman Index (HHI) is a common measure of market concentration that is used to determine market competitiveness. Higher is HHI, lesser is the market concentration)

II. Countries, which got unbundled, witnessed an increase in number of gas suppliers

III. Globally, Gas Markets witnessed an increase in Customer switching rates as more number of choices were available to customers in the market after unbundling.

Progress in creating the internal gas and electricity market for entire European countries 2004-2014

S.N	Subject	Belgium	France	Germany	Hungary	UK	Netherland
1	**Market Concentration**	**5600** (2008) to **4000** (2014)	**6200** (2008) to 4700 (2014)	**1900** (2008) to **1886** (2014)	**3200** (2008) to **1494** (2014)	Not available	**7200** (2008) to **6455** (2014)
2	**Number of Gas Suppliers**	**8** (2004) to **18** (2014)	**8** (2004) to **20**(2014)	**9** (2004) to **38** (2014)	**6** (2004) to **20** (2014)	**8** (2004) to **23**(2014)	**5** (2004) to **14** (2008)
3	**Switching Rate of customers**	**9%** to **11%**	**0%** to **4.5%**	**0** to **10.6%**	**4** to **20%**	Up-to **47%**	**5%** to **12.3%**

Sources: 1. Report on Progress in creating the internal gas and electricity market for entire European countries 2004-2014

Section V: Realized Benefits of Separating Marketing and Transportation Activities Globally (2/2)

b. Market Opening[1]: Countries like Belgium, France, Hungary witnessed an improvement in level of access to infrastructure Post unbundling with market opening.

S.N.	**Subject**	**Belgium**	**France**	**Germany**	**Hungary**	**Netherland**
1	**Market Opening**	90% (2005) to 100% (2011)	70% (2005) to 100% (2011)	100% (2005) to 100% (2011)	69% (2005) to 100% (2011)	100% (2005) to 100% (2011)

c. Optimization of transportation Tariffs: Unbundling of gas transportation from gas marketing has resulted in optimization of transportation tariffs. During an interaction with CREG, the Belgian energy regulator, it was revealed that Belgium[2] has not experienced a single increase in gas transmission tariffs over the past 10 years (2014-2024). This stability is attributed to increased efficiency and network optimization following the unbundling process.

d. Gas Market Opening & liberalization: Unbundling of transportation from marketing function has resulted in creation of liberalized ecosystem through open-access.in different countries with countries moving to more liberalized gas market, creating opportunities for customers by introducing competition in gas supply and increased choices Refer Point V (a) and V (b).

Sources: 1. Report on Progress in creating the internal gas and electricity market for entire European countries 2004-2014; 2. Primary Research with International Regulators.

Section VI: Conclusion (1/3)

Conclusion

Natural gas can play a pivotal role in India's decarbonization strategy by acting as a transitional fuel. It emits significantly lower carbon dioxide compared to coal and oil, making it a cleaner alternative for power generation and industrial use. By integrating natural gas into the energy mix, particularly in sectors like transportation and manufacturing, India can reduce its carbon footprint while gradually shifting towards renewable energy sources considering the carbon emission targets.

The government has announced plans in 2023 to develop the Indian Carbon Market[1] (ICM) where a national framework will be established with an objective to decarbonize the Indian economy by pricing the Green House Gas (GHG) emission through trading of the Carbon Credit Certificates. Natural gas can enhance India's participation in the carbon credit trading market by lowering overall greenhouse gas emissions, thus generating carbon credits. By substituting higher-emission fuels like coal with natural gas, industries can earn carbon credits, which can be traded to offset emissions or support further investments in cleaner technologies.

Assessment on India’s Market Development

India’s gas sector has adequately evolved and has seen expansion in terms of demand, infrastructure, supply, regulatory intervention, commercial practices, adding to maturity in this sector.

Learnings from Global case study

India demonstrates market & ecosystem readiness with respect to parameters that existed in different countries at the time of unbundling. Further, global countries mentioned above have demonstrated development of competition in the gas market post bundling.

Sources: 1. ICM Market

Section VI: Conclusion (2/3)

Learnings from Power Sector

Similar to power sector, the gas sector aims to achieve several key benefits, including attracting private investments through open access, fostering competition, expanding consumer choices for gas, and enhancing business efficiency by unbundling functions.

The unbundling of the electricity sector, particularly the separation of generation, transmission, and distribution, has significantly transformed the market dynamics, creating an open and competitive environment.

- **By allowing multiple players to enter the market**, unbundling has dismantled monopolistic control, fostering a more competitive landscape. This has enabled competition on electricity exchanges leading to more efficient price discovery, as prices are now determined by market forces rather than being set by a single entity. The increased competition has also encouraged innovation, improved service quality, and provided consumers with more choices, ultimately driving the sector towards greater efficiency and sustainability.

- Further, tariff determination through bidding as per Electricity Act 2003 on electricity exchanges has led to effective price discovery.

For India, Unbundling in the gas sector, similar to the electricity sector, can significantly enhance the functioning of the Indian Gas Exchange (IGX) by creating an open and competitive market environment. By separating the infrastructure (transmission and distribution) from gas marketing and supply, unbundling removes the monopolistic control of vertically integrated companies, allowing multiple players to enter the market. This promotes competition among suppliers, leading to more dynamic price discovery on the IGX as prices are determined by market forces rather than by a few dominant players.

Hence, basis above detailed assessment from global and sectoral outlook, India's gas market is mature in comparison to levels in 2015. It has achieved high level of maturity in all the parameters mentioned -demand, supply, infrastructure, regulatory intervention, commercial mechanism.

Section VI: Conclusion (3/3)

Supply side: Substantial increases from domestic production sources have not been projected in the future hence, the future gas supply is expected from LNG long term contracts.

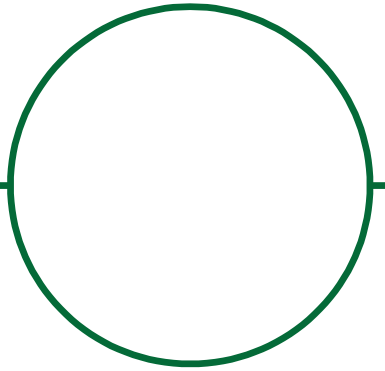
As India uses LNG for its 48% of its gas, which is priced based on market conditions, the increasing consumption means that most of the gas will be LNG based, with prices determined by the market. This requires elimination of risk at LNG entry points with LNG volumes marketed by only few suppliers and hence, there is need to increase more open access in terms on the supply front to tackle such risks. Hence, unbundling would create opportunities for open access to infrastructure.

Demand Side: Key demand centers (majority of fertilizers and power plants) are connected to the national gas grid and more consumption centers are expected to come online once the CGD GAs, which were recently authorized, commence operations. As the demand for natural gas increases and it begins to replace LPG, it will provide significant benefits to the exchequer by potentially lowering subsidies.

Regulatory: Regulatory mechanisms are well in place to tackle all functions of gas market, hence it is required to fully liberalize the gas market through unbundling to take benefits of the regulatory interventions and reforms envisaged by the regulator.

These are visible signs of fully functional natural gas market, showing deep level of maturity in the country.

End of the Report



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