

Preface

Overview

Environment and climate change continue to attract attention of developed, developing, and least developed countries. Today, global leaders, policymakers, think tank, and consuming class are more concerned about climate change and global warming. Considerable efforts are being made to build a consensus on controlling rising temperature and retaining mother earth's natural beauty. Energy remains the biggest factor behind any climate change discussions or negotiations because growth, development, and industrialization are largely dependent on energy. Even today, the global community heavily relies on fossil fuels, notably more polluting fuels such as coal and oil. As far as India is concerned, its primary energy consumption basket is too skewed towards fossil fuels. In 2014, coal contributed 56.47% followed by oil (28.33%), natural gas (7.14%), hydro (4.64%), renewables (2.18%), and the rest contributed by nuclear energy. India's share of natural gas in the primary energy basket is much lower than global average of 23.71%.

There are plenty of reasons for low-consumption share of natural gas in the country. India being an energy-deficit country, it faces serious challenges related to natural gas demand–supply gap. Continuous efforts are being made to reduce the gap between the demand and supply of natural gas in the country through domestic production and import of gas in the form of liquefied natural gas (LNG). Further, efforts are being made to import natural gas through transnational natural gas pipelines. The government has been implementing many policy measures to increase the use of natural gas in various segments such as domestic and transport.

This book shares the latest market developments and advances in natural gas demand, supply, transmission, distribution, and consumption. Chapters are written by researchers and industry professionals working in the field of natural gas and energy. The book covers entire natural gas value chain, and the contributing authors provide insightful analyses in the areas of natural gas demand–supply, exploration and production policy, downstream regulatory developments, city gas distribution,

pipeline, pricing, and taxation policy natural gas market development in India. We hope the readers of this book would enjoy thoughts, ideas, practices, and policy analyses shared by the authors.

Part I: Natural Gas Market Scenario in India

India's Active Engagement with Natural Gas: Imperatives and Challenges

In this chapter, Manish Vaid and Sanjay Kumar Kar discussed about post-COP 21 scenario and India's reconfigured energy goals—which are linked with climate policy goals. Their submission is that India's Intended Nationally Determined Commitments (INDC) submitted to the UNFCCC signals that India wishes to strive for green growth. By 2030, India's INDC commits for 40% share of electricity that would come from non-fossil fuel sources. This calls for a paradigm shift in India's energy strategy by reshuffling its energy basket in a way that it not only continues and expedites with its renewable capacity expansion programmes, which is largest in the world, but also sticks to its active engagement with natural gas as a base fuel for electricity generation and city gas distribution. The chapter discusses the imperatives for India's continued engagement with natural gas and the challenges it would face in increasing its share in its natural gas basket amidst stiff emission targets set by India in the Paris Summit.

Impact of Slashing Oil Prices on the Natural Gas Market

Husain Ahmad discusses the challenges faced by natural gas due to proverbial free fall in the prices of crude oil during the year 2014–15. The chapter also includes a recapitulation of the key drivers that have slumped the global crude oil prices. Further, it discusses about the macroeconomic and financial propositions and impact on Indian economy due to plummeting oil prices thereof.

Part II: Gas Sourcing, Contract, and Pricing

Sourcing of Natural Gas Through Cross Border Pipelines

Coauthors Ayush Gupta and Bhavesh Gupta present how in the era of economic modernization and globalization, India has unfolded itself as central economic and trading zone in emerging Asian market and has focused a lot towards its foreign policies impacting its accelerating economic performance. Private sector involvement in power sector and rationalization of prices has forced India to look for efficient energy management system. Natural gas, a highly promising commodity in India, is presently supplied from only two sources, i.e. domestic production and liquefied natural gas (LNG). But now instead of importing costly LNG, India has to examine and start importing through low-cost cross-border pipelines. Technological

development in the field of deep-sea pipelines has made it possible for India to consider importing natural gas from Iran and other Middle East countries, bypassing countries such as Pakistan and Afghanistan having serious security issues. Construction of Turkmenistan–Afghanistan–Pakistan–Indian (TAPI) pipeline has already started, and Indian government has also initiated discussions with Oman, Myanmar, Kazakhstan, and Russia for new pipeline projects. Indian Prime Minister Narendra Modi can imagine energy has beating heart of accelerating India and pipelines as its veins; hence, to deal with energy diplomacy and to have sufficient amount of fuel, he is focusing on developing strong and long-term strategic relationships with resource rich countries. This will give a big boost to the natural gas industry in India.

Issues and Challenges of Gas Contracts

Manas Das discusses important issues and challenges involved in natural gas contracting. Contracts are agreements entered into by two parties with the intention of creating a legal obligation. As the gas sector in India has evolved from pre-NELP regime to a market open to international LNG contracts, the domestic gas contracts also evolved with newer dimensions, newer clauses, newer obligations, or bindings. Gas contracts are entered into various forms with different objectives across the gas value chain. In the upstream sector, production sharing contract (PSC) is signed between Government of India and the producer consortium. Joint Operating Agreement (JOA) is signed among the consortium members. Gas producer also signs gas supply contract (GSC)/Gas Supply Agreement (GSA) with the transporter/trader in the midstream segment. In the downstream, the transporter/trader signs agreements with the customers/consumers of gas. The supply gets governed by the GSC, and the transmission is governed by Gas Transmission Agreement (GTA). In some cases, the transmission and the supply get clubbed in a single contract termed as GSTA or Gas Supply and Transmission Contracts. The downstream contracts may be named differently, but structurally, they still remain same with minor modifications. This first section of this chapter covers basic features of production sharing contracts, how profit/cost petroleum is arrived at, contractual obligations under PSCs, issues and concerns in PSCs, and changes proposed by Rangarajan Committee and Kelkar Committee. The second section brings in illustration on different types of midstream and downstream contracts, the process description of execution of contracts, how the contracts have evolved, and futuristic changes expected in these contracts.

Natural Gas Pricing

In this chapter, the author Pramod Paliwal simplified the concept of pricing of natural gas. Consumption of natural gas has grown rapidly over the last few decades and currently accounts for nearly a quarter of the world's primary energy basket. Natural gas prices are mainly a function of market supply and demand. Natural Gas pricing—like any other commodity—is not immune to the forces of demand–supply. However, it would be interesting to understand the uniqueness of natural gas and

the subsequent context with its pricing. The physical properties of crude oil and the fact that it is relatively uncomplicated to transport and to store facilitated the emergence of commodity pricing mechanisms in the oil sector. However, these considerations do not apply in the same way to natural gas. Globally, one of the biggest challenges in the market is the pricing techniques. As known, natural gas does not have a globalized market; rather, there are regional markets with substantial differences. The overriding mechanism for the international gas trade nevertheless remains oil indexation. The phenomenon of international natural gas trade and pricing is under evolution also because once-isolated regional gas markets are now practically interconnected through the increasing trade in liquefied natural gas (LNG). Starting with Natural Gas International Demand Supply Matrix, the chapter discusses distinctiveness of natural gas pricing followed by international context of natural gas pricing including the conventional oil indexation-based pricing. Natural gas pricing in India has later been discussed in detail with a brief mention of the concept of natural gas price pooling in India. The chapter concludes with a reality check on the prospects of evolution of global natural gas trading hub.

Feasibility of Price Pooling for Gas-Based Power Generation in India: A Reality Check!

In this chapter, the author RK Tripathy throws lights on gas price pooling and its feasibility. Gas-based power projects are on the verge of becoming bad assets for the country. While nearly 14 GW of gas-based projects are non-functional, 9 GW of projects operates at a suboptimal level of 25% or less. Domestic gas supply to power sector seems a distant dream with no major gas discovery in sight. In a bid to kick start the plants and to enable the project developers to service their debts and cover up the operational expense, the government has started a scheme of reverse e-auctioning for supplying spot RLNG to power plants. This plan will help revive some of stressed gas projects in the country with the help of government subsidy out of power system development fund. While this is a welcome step from the government and would function well in constantly depreciating spot RLNG price, the scheme provides only short-term visibility for operations and servicing of debt. The long-term operations and viability of these plants would remain dependent upon ramping up production of gas from domestic sources. The current situation where long-term RLNG price hovers around USD 7 to 8 per MMBTU, the government has to rethink its strategy and should move away from indirectly bailing out of gas-based power projects and open the sector for competition with necessary policy support. Gas price pooling is long debated in India, and finally, it was made effective for fertilizer sector from 1 July 2015. While the decision to introduce pooling price concept would go a long way for fertilizer unit revival, the debate is still on its implementation for the power sector. The feasibility of such an option for the power sector would be accessed in this chapter along with government's preparedness in addressing the concerns of various stakeholders.

Part III: City Gas Distribution in India

A Comprehensive Review of City Gas Distribution in India

Authors S.K. Kudaisya and Sanjay Kumar Kar provide a comprehensive review and analysis of city gas distribution in India. City gas distribution is going through transformation in India. A sincere attempt is made to offer a comprehensive review of city gas distribution in the country. The chapter provides critical insights into developmental gas market and evolution of city gas distribution business in India. The authors discuss about causes of city gas distribution evolution. Important linkage between regulatory developments and city gas distribution has been discussed. The authors highlight the progress of city gas distribution system after constitution of Petroleum and Natural Gas Regulatory Board. The readers can find a comprehensive review of various bidding rounds as per the regulations developed by the Petroleum and Natural Gas Regulatory Board. The chapter provides meaningful insights on opportunities and challenges available in the city gas distribution business. It points out the critical factors responsible for achievement or failure of commitments made by the entities to the regulator. The authors suggest with the support of the government, constant vigil and involvement of the regulator, and professional management of entities; the city gas distribution business would gain greater penetration in India.

Building and Sustaining Natural Gas Business in India

Authors Sanjay Kumar Kar, Piyush Kumar Sinha, and Bhashit Dholakia offer insights on building and sustaining natural business in India. Natural gas is a green fuel, and the Government of India is highly committed to promote green fuel like natural gas to replace more polluting fuels. The chapter provides critical insights on demand–supply scenarios, enabling factors, challenges, and opportunities to build sustainable gas business in the country. It highlights role of global factors such as demand, supply, pricing, and geopolitics in natural gas market in India. Author presents insightful analysis on natural gas business environment, industry growth, role of competition, new entrants, opportunities available, challenges experienced, and suggestions for sustainable natural gas market growth in the country.

Issues and Challenges in the Development of Efficient Gas Market

In this chapter, author Akhil Mehrotra discusses critical issues and challenges in the development of efficient natural gas market developments in India. India needs energy, whereby its population can access and afford. Government of India intends to increase energy availability by increasing the share of gas, in the energy mix from 7.1 to 20% by the year 2030. However, this is not possible unless there is a thriving gas market in the country. The current Indian gas market has distortions such as monopoly power, inadequate infrastructure, and lack of transparency. Gas market evolution curve helps segment various phases of gas market, starting from government controlling the gas chain, negotiated market, early wholesale, and fully

developed gas market. Study of major countries reveal India at negotiated market phase, with aspirations similar to other countries, to move to a fully developed market phase such as the USA and UK. The learning from the USA and UK can help to understand factors for such a transition; however, this can only be achieved if challenges such as issue relating to large population below poverty line, lack of integrated planning, continued distortion in all energy markets, unstable fiscal regime, and misalignment between federal and state governments are addressed. Government needs to calibrate its approach to develop gas market in order to increase the share of gas in the energy mix.

Demand Assessment and Design Aspect of City Gas Distribution Network

Author Husain Ahmad discusses about design aspects of city gas distribution network in India. Natural gas is a promising policy element in achieving equitable, balanced, and sustainable economic growth by widening its user base beyond conventional industries. The city gas distribution is what we call the “last mile” in entire gas value chain. Gas supplies usually are at low/medium pressure to the residential/domestic, commercial, and industrial consumers; this is called as pipe natural gas and is compressed to very high pressure to increase the volumetric efficiency in order to make it compatible for the usage in automobile sectors as compressed natural gas.

Part IV: Legal, Regulatory Developments: Impact on Natural Gas Market in India

Petroleum Exploration and Licensing Policy in India

T.P. Rao and Sanjay Kumar Kar discuss progress of Petroleum Exploration and Licensing Policy in India. This chapter lucidly brings out policy developments in the area of petroleum exploration in India. Authors discuss historical perspectives, existing policy frameworks, recent developments, and set futuristic directions. Findings suggest that the current policy fails to attract desired level of investment and retaining confidence of investors. Therefore, to bring back petroleum exploration and production on track, the government should implement investor-friendly E&P policies at the earliest.

Downstream Petroleum and Natural Gas Regulatory Developments in India

The downstream regulatory environment is passing through developmental stages in India. Sanjay Kumar Kar covers historical and recent downstream regulatory developments in India in this chapter. A sincere attempt is made to discuss about vision, functions, and operations of the Petroleum and Natural Gas Regulatory Board (PNGRB). The chapter highlights all important regulations developed since

the inception of the PNGRB and authorizations granted to entities as per the regulations. The chapter discusses challenges faced by the regulator to develop efficient natural gas market in India. It is suggested that the regulator should be empowered to regulate the entire petroleum sector.

Taxation Issues in Natural Gas Industry in India

Author Pankaj Gupta discusses important taxation issues relevant for natural gas business in India. The author points out that the entire natural gas supply chain is plagued by plethora of taxes in India. These taxes are levied through separate statutes administered by different authorities from central and state government. Each statute levies tax at different stages in the value chain and therefore provides separate valuation methodology. Most of these taxes are non-vatable having huge cascading effect. The customers mainly from power and fertilizer sectors are also not able to take credit of most part of taxes paid on purchase of natural gas. This inefficiency is further compounded by administrative cost resulting from compliance of taxation statutes which are administered by different government authorities. More often than not, divergent position taken on same issue by various wings of the taxation administrative authorities results in further complication. Consequent litigation takes anywhere between 5 to 10 years for final position to emerge. Any adverse tax ruling results in huge unrecoverable tax burden as indirect taxes are largely passed through, and it becomes difficult to recover past tax dues from the customers after such a long lag. Therefore, a reform in the current tax regime is required for increasing the share of natural gas in the energy basket of India, being a cleaner fuel compared to other fossil fuels. But the expectation is being belied, as natural gas is being kept out of the proposed goods and services Tax.

Part V: Other Important Areas

Human Resource Challenges for Gas Sector in India

Authors Ayush Gupta, Sanjay Kumar Kar, Amit Ray, and DV Shastri highlight how natural gas industry across the world is facing a severe crunch of talented, skilled, and experienced manpower. The industry is losing experience by way of superannuation of experienced employees and losing talent to other industries as oil and gas sector is no longer a preferred sector among younger generation. The chapter discusses critical issues and emerging challenges related to human resource requirements for natural gas sector in India. Further, the authors throw some lights on human resource demand, skilled manpower availability, academic and professional institutions offering specialized courses/training programmes, and skill sets required to succeed in the sector. The authors discuss about ways to address prominent HR challenges and meet existing gap in the natural gas value chain in India.

Health, Safety, Environment: Issues and Challenges for Gas Value Chain in India

In this chapter, author Jitin Saxena highlights health, safety, and environment issues and challenges across natural gas value chain. With growing demand of energy in country, activities in sector are increasing due to which managing health, safety, and environment are becoming major and critical concern for gas companies. Any laxity in upkeep/handling of highly inflammable gas products can be a reason of accident taking place which possess high risk to life, property, and environment. Over the period, accident rates in sector have gradually reduced which shows that companies are becoming more vigilant and proactive on safety issues. Still, there are number of safety-related issues and challenges across gas value chain in India which needs to be addressed by the companies with the support of government. This chapter describes the various safety issues and challenges emerging these days in sector and highlights the needs for developing safety culture and well-established HSE management system to address those issues.

Reviewing Europe's Transition from a Gas Market to Renewables

In this chapter, Gerard Kreeft presents an interesting review of Europe's transition from a gas market to renewables. While this chapter is focused on the European gas market, it is also an overview/summary of trends and innovations that have started in Europe and helped shape renewable energy. Trends can indeed influence various parts of the global energy market. Much of this has been done within the confines of the global energy village, an annual storage event conducted by EnergyWise, an event which brings together the best minds so that new trends and innovations can be explained, compared, and scenarios developed. Key issues include Europe's diminished gas production and its increased dependency on gas imports, in particular from Russia. While gas imports will probably stay at their current level, in long term, this can change. There is the question whether Gazprom can finance its Yamal's assets to ensure a continued supply of gas to Europe. And Europeans are increasingly turning to renewable fuels. How this will play out remains to be seen. Europe's energy politics is in the short-medium term a muddle. The rise of shale gas in the USA has given a sharp rise to coal imports to Europe. CO₂ emission trading prices are so low that they are irrelevant. Continuous subsidies for green energy continue to distort the marketplace. And in Germany, "brown coal" continues to be popular as an industrial fuel. Also, an analysis is given of the oil and gas industry. The basic tenant of a hydrocarbon base, known in the industry as RRR (Reserve Replacement Ratio), is critically examined. Instead, it is argued that the industry should introduce an "Energy Unit", based on renewables, and be CO₂ neutral. This can be the basis of a new energy road map.

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