



Petroleum Federation of India

The Green Imperative

Future of Natural Gas in India
August 2006

Draft Rev1-0: 12/20/2006 9:30 PM

Final Draft: For Editorial Review and Laying out only

Privileged and Confidential

Knowledge Partner

PRICEWATERHOUSECOOPERS 

Acknowledgements

Petroleum Federation of India (PetroFed) is presenting this study in Knowledge Partnership with its member company **PricewaterhouseCoopers** Private Limited (PwC).

PetroFed was assisted by the Oil & Gas Industry Practice of PwC, a specialty practice established to serve the industry advisory requirement of the oil & gas industry. This study also includes views of the industry. We are thankful to PwC for their efforts.

We are also appreciative of the participation and responsiveness of **Oil & Gas companies and other experts** without which preparation of this study would not have been possible.

Copyright

The data or other contents in part or full, shown in this Publication cannot be copied, reproduced, republished, uploaded, posted, printed, stored, transmitted or distributed in any other way for non-personal or commercial use without obtaining the prior permission of PetroFed in writing. Any alteration of the material or use of the material contained in this publication in violation of the Copyright laws is strictly prohibited.

Disclaimer

Interpretation and Usage: This publication, “the Publication”, is intended to provide general guidance on matters of interest only. The application of inferences drawn in the Publication can vary widely based on the facts involved.

All the contents of the Publication includes information collated from various official sources specifically mentioned herein and other publicly available information disseminated for research, analysis, review and reference purposes.

While we have made reasonable attempts to ensure that the information contained in this Publication has been obtained from reliable sources, PetroFed and PwC are not responsible for any errors or omissions, or for the results obtained from the use of this information.

The information contained in this Publication is for guidance only and should not be regarded as a substitute for appropriate professional advice. PetroFed accepts no liability with regard to the information herein or any action that may be taken by readers of this Publication. Neither PetroFed nor PwC nor any individuals associated with this Publication shall be required, by reason of this Publication, to provide testimony to appear in Court or at other legal proceedings, unless specific arrangements to do so have been made.

All information in this Publication is provided “as is”, with no guarantee of completeness, accuracy, timeliness or of the results obtained from the use of this information, and without warranty of any kind, express or implied, including, but not limited to warranties of performance, merchantability and fitness for a particular purpose.

In no event will the Petroleum Federation of India and/or PricewaterhouseCoopers Pvt. Ltd or their employees thereof be liable for any decision made or action taken in reliance on the information in this Publication or for any consequential, special or similar damages, even if advised of the possibility of such damages.

PricewaterhouseCoopers Pvt. Ltd. (PwC)

PwC. is one of the largest and most reputed professional services networks in the country. PwC specialists from the tax and advisory teams connect their thinking, experience and solutions to build public trust and enhance value for clients and their stakeholders.

The Oil & Gas Industry Group within PwC works with national and international companies in the public and private sectors to provide industry focussed solutions. PwC is privileged to work with an unrivalled Oil and Gas industry client base, who value the rigorous, practical approach, characterised by a detailed understanding of individual client issues and by deep industry knowledge and experience. Strategies to develop services and delivery methods that fully meet client's needs have enabled networks of highly skilled professionals to be built around clients. The success in meeting clients' business challenges is mirrored in the growth seen by the Oil and Gas companies.

PwC has offices in Bangalore, Kolkata, Chennai, Hyderabad, Mumbai, New Delhi, Bhubaneshwar and Pune.

Contact: Mr. N. N. Gupta, Head - Oil & Gas Practice

Tel.: +91 (11) 2321 6023 Fax: +91 (11) 2321 0594 E-mail: oil.gas@in.pwc.com

Petroleum Federation of India (PetroFed)

PetroFed is a Registered Society of Indian and International Companies / Associations in the hydrocarbon sector to promote the interests of members in line with Public / National Policies through a self regulatory environment with consumer interests in mind.

It acts as an oil industry interface with the Government, regulatory authorities, public and representative bodies of traders. It helps in resolution of issues and facilitates evolution of hydrocarbons related policies and regulations and their implementation. It represents the industry on Government bodies, committees & task forces.

PetroFed promotes energy conservation, health, safety & environment and helps to optimise resource utilisation of members. It organises seminars, conferences, workshops, training programmes, lectures and brings out technical publications. It also produces a quarterly journal.

It functions through committees from member organisations and other experts, covering all aspects of oil and gas industry which submit recommendations on an ongoing basis.

Contact: A. K. Arora, Director General

Tel.: +91 (11) 2653 5697 Fax: +91 (11) 2696 4840 E-mail: petrofed@petrofed.org

Table of Contents

FOREWORD
1 EXECUTIVE SUMMARY	4
1.1 Background.....	4
1.2 Methodology	4
1.3 Natural Gas – The Green Fuel of the Future.....	5
1.4 The 400 BCM Market in 2030 – A Realistic Scenario?.....	5
1.5 Key Issues – Gas Market Development	7
1.6 Make Environmental Protection a Real Driver for Clean Energy Development	8
1.7 Establish a Legal Framework on Natural Gas	9
1.8 Create a Central Administration for Energy.....	9
1.9 Key Issues – Gas for Power Generation	10
1.10 Key Issues – Non-Power Natural Gas Demand	13
1.11 Key Issues – Gas Pricing and Taxation	13
1.12 Key Issues – Gas Infrastructure.....	14
1.13 Global scenario.....	15
1.14 Looking ahead – A Challenge to build the 400 BCM Market.....	16
1.15 In Conclusion.....	17
2 GAS INDUSTRY IN INDIA – NATURAL GAS 2030.....	18
2.1 India Gas Market Growth Projections.....	18
2.2 The 400 BCM Market in 2030 – A Realistic Scenario?.....	19
2.3 Forces Changing the Landscape	21
2.4 The Supply Test.....	24
2.5 The Next Infrastructure Race	25
2.6 Redefining Relationship with Customers.....	25
2.7 Key Drivers: Natural Gas in 2030.....	26
3 ECONOMY AND ENERGY	29
3.1 Economic Overview	29
3.2 India's Energy Mix.....	30
4 INDIA'S NATURAL GAS INDUSTRY	32
4.2 Gas Reserves	32
4.3 Gas Production	33
4.4 Gas Consumption	35
4.5 Gas Infrastructure	36
4.6 Gas Industry Structure	38
4.7 Gas Pricing – A Hybrid Market	42
4.8 Gas Linkage Committee	42
4.9 Regulatory Framework.....	43
4.10 Existing Gas Related Laws and Regulations	47
4.11 Foreign Direct Investment Policy in India.....	48
5 NATURAL GAS DEMAND OUTLOOK	52
5.1 Introduction.....	52
5.2 Energy Information Administration (EIA) (2005).....	52

5.3 International Energy Agency (IEA) (2005).....	53
5.4 Asian Development Bank (ADB) (1999).....	54
5.5 India Hydrocarbon Vision 2025 (IHV 2025) (1999).....	55
5.6 Expert Group for Import of Natural Gas to India from the Middle East (1993).....	56
5.7 Report of the Committee on India Vision 2020 (2002).....	56
5.8 Petroleum Federation of India: Fuelling India's Growth Vision 2030 (2005).....	57
5.9 GAIL's MDRA Study.....	57
5.10 Integrated Energy Policy (2006).....	58
5.11 Gas Demand Projection by Sector.....	58
5.12 Gas for Power Generation.....	61
5.13 Gas for Fertiliser.....	67
5.14 Gas for Petrochemicals.....	69
5.15 Conclusions.....	70
6 NATURAL GAS SUPPLY OUTLOOK.....	73
6.1 Introduction.....	73
6.2 Natural Gas Supply Forecasts.....	73
6.3 New Gas in the Market.....	76
6.4 Gas Import Options.....	77
6.5 Cross-Country Gas Pipelines.....	79
6.6 Long Distance Pipelines involving India.....	80
6.7 Issues on Pipeline Gas Imports and Transit.....	82
6.8 Proposed LNG Terminals.....	83
6.9 Coal Bed Methane (CBM).....	84
6.10 Gas Hydrates.....	84
6.11 Conclusion.....	85
7 NATURAL GAS PRICING.....	87
7.1 Traditional gas pricing system for ONGC/OIL gas production.....	87
7.2 Gas pricing for gas produced under JV, NELP, LNG & Pipeline imports.....	97
7.3 Conclusions & Recommendations.....	97
8 NATURAL GAS – GREEN FUEL.....	99
8.1 Natural Gas – A cleaner source of energy.....	99
8.2 Air Emissions: Fewer Impacts on Local Air Quality than Other Fossil Fuels.....	100
8.3 New Technologies and the Role of Natural Gas.....	101
8.4 Understanding Kyoto Protocol and CDM.....	102
8.5 Internalisation of Externalities.....	103
8.6 Conclusions.....	105
9 GLOBAL GAS MARKET.....	107
9.1 Global LNG Outlook.....	107
9.2 The Challenges Ahead.....	107
9.3 Global Growth Projections.....	108
9.4 Regional LNG Market Trends.....	111
10 ANNEXURE.....	113
10.1 Annexure I - Abbreviations.....	113

Foreword

To be inserted.....draft submitted separately for PetroFed approval