By most estimates, global consumption of natural gas—a cleaner-burning alternative to coal and oil for electric power and other applications—will double by 2030. However, in North America, Europe, and South and East Asia, the projected consumption of gas is expected to far outstrip indigenous supplies. Delivering gas from the world’s major reserves to the future demand centers will require a major expansion of inter-regional, cross-border gas transport infrastructures.

This book investigates the implications of this shift, utilizing historical case studies as well as advanced economic modeling to examine the interplay between economic and political factors in the development of natural gas resources. The contributors aim to shed light on the political challenges which may accompany a shift to a gas-fed world.

DAVID G. VICTOR is Director of the Program on Energy and Sustainable Development at the Freeman Spogli Institute for International Studies, Stanford University.

AMY M. JAFFE is Wallace S. Wilson Fellow for Energy Studies at the James A. Baker III Institute for Public Policy, Rice University.

MARK H. HAYES is a Research Fellow at the Program on Energy and Sustainable Development, Freeman Spogli Institute for International Studies, Stanford University.
Natural Gas and Geopolitics

From 1970 to 2040

Edited by

David G. Victor, Amy M. Jaffe, and Mark H. Hayes
Contents

List of figures  page vii
List of tables  x
List of boxes  xii
List of contributors  xiii
Foreword by James A. Baker, III  xv
Acknowledgments  xvii
List of acronyms and abbreviations  xx

Part I  Introduction and context

1  Introduction to the study
JOE BARNES, MARK H. HAYES, AMY M. JAFFE, AND DAVID G. VICTOR  3

Part II  Historical case studies

2  Introduction to the historical case studies: research questions, methods and case selection
MARK H. HAYES AND DAVID G. VICTOR  27

3  The Transmed and Maghreb projects: gas to Europe from North Africa
MARK H. HAYES  49

4  Liquefied natural gas from Indonesia: the Arun project
FRED VON DER MEHDEN AND STEVEN W. LEWIS  91

5  Bypassing Ukraine: exporting Russian gas to Poland and Germany
NADEJDA M. VICTOR AND DAVID G. VICTOR  122

6  Natural gas pipelines in the Southern Cone
DAVID R. MARES  169
Figures

1.1 Global primary energy consumption, by fuel page 8
1.4 The international gas trade projects examined in this book 19
2.1 Case selection: ensuring variation in outcomes 40
3.1 Gas pipelines and LNG facilities: Algeria, Italy, and Spain 50
3.2 Algeria: primary energy supply, by fuel, 1965–2004 52
3.3 Algeria: natural gas production, consumption, and exports, 1970–2004 53
3.4 Italy: primary energy supply, by fuel, 1965–2004 55
3.5 Italy: gas consumption, by sector, 1960–1995 55
3.6 Italy: sources of natural gas, 1965–2002 57
3.7 International oil prices, 1965–2004 62
3.8 Algeria: export revenues, by source, 1965–2000 72
3.9 Spain: primary energy supply, by fuel, 1965–2004 76
4.1 Natural gas infrastructure: Indonesia, Malaysia, and Brunei 93
4.2 Japanese imports of LNG, by country, 1969–2001 96
4.3 Japan: primary energy supply, by fuel, 1965–2003 97
4.4 Indonesia: primary energy supply, by fuel, 1965–2003 115
4.5 Singapore: primary energy supply, by fuel, 1965–2003 117
5.1 Primary energy production on Soviet territory, 1913–2002 127
5.2 The shifting geography of Soviet and Russian gas production, 1960–1998 128
5.3 Production, consumption, and international trade of gas on Soviet territory, 1965–2001 129
5.4 Composition of Soviet gas exports to Europe, 1970–2001 130
5.5 Soviet and Russian earnings from gas export, 1975–2003 133
5.6 Major Soviet and Russian gas export routes, 2003 136
5.7 Germany: primary energy consumption, by fuel, 1965–2003 150
5.8 Poland: primary energy consumption, by fuel, 1965–2003 153
6.1 South America: international gas pipelines 170
6.3 Chile: primary energy mix, 1975–2000 177
6.4 Brazil: primary energy supply, 1975–2000 185
7.1 Existing and proposed Turkmen gas export pipeline routes 204
7.2 Turkmenistan: natural gas balance, 1990–2003 206
7.3 Turkmenistan: key economic indicators, 1992–2003 206
8.1 Greater Persian Gulf region 235
8.2 Qatar: gas infrastructure 236
8.3 Qatar: oil production and revenues, 1971–2002 239
8.4 Qatar: natural gas output, 1980–2001 245
9.1 Trinidad & Tobago: gas infrastructure 271
9.2 US gas supply and demand, 1980–2004 273
9.3 Henry Hub historic prices, 1990–2005 274
9.6 New England: natural gas infrastructure 278
9.7 Unit cost for a 3mtpa LNG plant, 1965–1990 284
9.8 Integrated project with f.o.b. sales 291
9.9 Transfer pricing arrangement 292
9.10 Tolling arrangement 292
9.11 Atlantic LNG Train 1 structure 298
9.12 Atlantic LNG Trains 2 and 3 structures 307
11.1 Historical demand for natural gas, selected countries, 1980–2004 362
11.2 Long-run gas demand curve for different per capita GDP levels 365
11.3 The hypothetical supply of a gas substitute, 2020–2100 369
11.4 Proved natural gas reserves, by region, 2003 371
11.5 Undiscovered natural gas, by region, 2000 estimates 371
11.6 Estimated long-run cost of supply curves, selected regions 372
11.7 LNG transportation network 375