## **Preface**

Natural Gas 1996: Issues and Trends provides a summary of the latest data and information relating to the U.S. natural gas industry, including prices, production, transmission, consumption, and financial aspects of the industry. The report consists of six chapters and seven appendices.

Chapter 1 presents a summary of various data trends and key issues in today's natural gas industry and examines some of the emerging trends. Chapters 2 through 6 focus on specific areas or segments of the industry, discussing in some detail the many choices and challenges of the current marketplace. Chapter 2 discusses the natural gas transportation market and pipeline capacity release and turnback issues. Chapter 3 examines the development of natural gas market centers during the past 5 years and how these entities have changed the way business is transacted in the natural gas marketplace. Chapter 4 looks at how natural gas producers have responded to the restructuring of the interstate pipeline industry and how they have improved operations to become more efficient in a more competitive market. Chapters 5 and 6 focus upon the distribution end of the natural gas industry, examining first how prices to final consumers have changed since restructuring, and second, how State regulatory agencies are dealing with competitive and operational changes in the intrastate and interstate markets.

Unless otherwise stated, historical data on natural gas production, consumption, and price through 1995 are from the Energy Information Administration (EIA) publication, *Natural Gas Annual 1995*, DOE/EIA-0131(95) (Washington, DC, November 1996). Similar annual data for 1996 and monthly data for 1995 and 1996 are from EIA, *Natural Gas Monthly (NGM)*, DOE/EIA-0130 (96/11) (Washington, DC, November 1996).

Natural Gas 1996: Issues and Trends was prepared by the Energy Information Administration, Office of Oil and Gas, Kenneth A. Vagts, Director (202/586-6401). General information concerning this report may be obtained from Joan E. Heinkel, Director of the Reserves and Natural Gas Division (202/586-4680). Questions on specific sections of the report may be addressed to the following analysts:

- Chapter 1. "Overview," Mary E. Carlson (202/586-4749).
- Chapter 2. "Changes in Firm Transportation Capacity Contracting," Barbara Mariner-Volpe (202/586-5878).
- Chapter 3. "The Emergence of Natural Gas Market Centers," John H. Herbert (202/586-4360) and James Tobin (202/586-4835).
- Chapter 4. "Producers in Today's Competitive Market,"
   William A. Trapmann (202/586-6408).
- Chapter 5. "Consumer Prices Reflect Benefits of Restructuring," Margaret J. Jess (202/586-7499).
- Chapter 6. "State Regulators Promote Consumer Choice in Retail Gas Markets," Margaret J. Jess (202/586-7499).

The overall scope and content of the report was supervised by James Tobin. Overall coordination of the report was provided by James Thompson. Significant analytical contributions were made by the following individuals:

Christopher L. Ellsworth—Chapters 1 and 6

Jason Feld—Chapter 2

Kevin F. Forbes—Chapter 4

James P. O'Sullivan—Chapter 2

Philip Shambaugh—Chapters 1 and 2

Michael J. Tita—Chapters 1 and 2

James Thompson—Chapter 1

James Todaro—Chapter 1

Lillian (Willie) Young—Chapter 1.

Editorial support was provided by Ann C. Whitfield and Willie Young. Desktop publishing support was provided by Margareta Bennett.

## **Contents**

	Page
Executive Summary	ix
1. Overview	1
Data Trends	
Key Issues	
Rey Issues	. 41
2. Changes in Firm Transportation Capacity Contracting	39
Factors leading to Excess Capacity Commitments	
Short-Term Solutions to Excess Capacity Commitments	
Capacity Turnback: Realigning Contracts with Requirements	
Future Challenges	
3. The Emergence of Natural Gas Market Centers	
Value of Market Centers	63
Market Center Locations	66
Trade Between Market Centers	67
Market Center Operations	70
Future Challenges	. 78
4. Producers in Today's Competitive Market	
A More Competitive Supply Industry and Wellhead Market	
Foreign Trade: A Challenge to Domestic Producers	
Future Challenges	. 97
5. Consumer Prices Reflect Benefits of Restructuring	QC
What Determines Gas Prices?	
Prices to Final Consumers	
Citygate Prices	
Price Components	
Future Challenges	111
6. State Regulators Promote Consumer Choice in Retail Gas Markets	113
Extending Choice to Small Customers	
Recent State Actions to Unbundle Retail Gas Markets	
The Canadian Experience with Retail Unbundling	
Future Challenges	123
Appendix	
A. Chapter 1 Supplement	125
B. Analysis of Firm Transportation Contracts: Results and Methodology	
C. Summary of Industry Surveys on Future Capacity Commitments	
D. Comparison of Firm Commitments by Pipeline Company	
E. Analysis of Capacity Release Trading: Results and Methodology	
F. Existing and Proposed Underground Storage Facilities	
G. Pipeline Expansions	. 163

## **Tables**

1.	The Top Natural Gas Marketers Will Change After Mergers	22
2.	Interest Grows in Alternative Transportation Rate Design	24
3.	Regional Characteristics of Released Capacity, November 1993 – March 1996	49
4.	Capacity Turnbacks in the U.S. Western Region	52
5.	Current Capacity Commitments and Cumulative Expirations by Region and Period	54
6.	Transportation Capacity Under Contract in 1990 and 1996 for a Sample of Interstate Pipeline Companies,	
	by Region	56
7.	Summary of U.S. and Canadian Market Center Operations	68
8.	Operational Market Centers in the United States and Canada, September 1996	69
9.	Service Profile of Operational U.S. and Canadian Market Centers	72
10.	Correlations Among Regional Spot Market Natural Gas Prices	83
l1.	Constant Dollar Natural Gas Prices, 1990–1995	100
12.	Natural Gas Consumption and LDC Sales by Region, 1995	100
13.	Unbundling Actions by Selected Public Utility Commissions	118

## **Figures**

Figures 1 through 13 (Chapter 1) are composed of multiple illustrations. Below the figure title for each there is a list of subtitles describing each illustration. The subtitles are listed in the order in which the illustrations appear in the figure, from left to right moving down the page. The remaining figures (14 through 42) are single illustrations with no subtitles.

10111	o right moving down the page. The remaining rightes (1 through 12) are single indistrictions with no subtrices.
1.	Increased Price Volatility Has Become Common in the Gas Industry
	- Monthly Natural Gas Wellhead Prices, 1991 – July 1996
	- Daily Henry Hub Natural Gas Spot Prices, November 1995 – March 1996
2.	A Second Futures Market Began Trading in August 1995
	- Daily Settlement Price Levels for NYMEX and KCBOT Trading, August 1995 – July 1996
	- NYMEX and KCBOT Monthly Futures Contracts Trading Levels, August 1995 – July 1996
	- NYMEX and KCBOT Monthly Options Trading Levels, August 1995 – July 1996
3.	Natural Gas Supply Activities Continue at a Strong Pace
	- Average Daily Domestic Natural Gas Production Levels by Month, 1994 – September 1996
	- Indices of Domestic Natural Gas Well Completions and Average Wellhead Price, January 1994 - September 1996
	- Shares of Rotary Rigs Directed Toward Natural Gas and Crude Oil, 1988–1996
4.	Natural Gas Resources Are Heavily Centered Around the Gulf of Mexico
	- Domestic Natural Gas Reserves, by State, 1995
	- Costs Versus Estimated Economically Recoverable Nonassociated Conventional Gas Resources, 1995
	- Percent of Remaining Undiscovered Natural Gas Fields, by Onshore Region and Size
5.	Canadian Imports Dominate U.S. International Gas Trade
	- U.S. Imports of Canadian Natural Gas, by Region, 1994 and 1995
	- Indices of U.S. Average Wellhead Prices and Imported Canadian Gas Volumes and Prices,
	January 1994 – September 1996
_	- Cumulative Monthly LNG Import and Export Volumes, January 1994 – September 1996
6.	Interregional Pipeline Capacity Increased Only 1 Percent in 1995
	- Capacity Additions and Natural Gas Pipeline Projects Completions, 1995
_	- Summary of Interregional and Interstate Natural Gas Pipeline Capacity, 1995–1999
7.	High-Deliverability Storage Grew in Capacity and Usage in 1995
	- Locations of Natural Gas Underground Storage Sites Completed in 1995 and Planned 1996–1999
0	- Inventory Turnover Rates for High Deliverability Storage, 1991–1996
8.	Service Selection and Costs Have Changed in the Natural Gas Transmission Market
	- Natural Gas Pipeline Throughput by Type of Service, 1987–1995
	- Interstate Pipeline Company Percent of Total Deliveries to Industrial Customers, 1989–1995
	- Natural Gas Pipeline Throughput by Type of Service and Market Participant, 1995
	- Annual Transmission and Distribution Cost by End-Use Sector, 1984–1995

9.	End-Use Consumption of Natural Gas Increases as Prices Fall	18
	- Annual Percent Change in End-Use Consumption by Sector, 1992–1995	
	- End-Use Prices by Sector 1993–1995, Nominal and Real 1995 Dollars	
	- Fuel Prices to Electric Utility Plants, 1985	
	- Fuel Prices to Electric Utility Plants, 1995	
10.	How the Restructured Industry Responded to Recent Periods of Severe Winter Weather	20
	- Average of Actual and Normal Daily Temperatures for Four Cities (Chicago, Kansas City, New York, and	
	Pittsburgh), Heating Seasons 1993–94 and 1995–96	
	- Working Gas in Underground Storage by Month, Heating Seasons 1993–94 and 1995–96	
	- Daily Henry Hub Natural Gas Spot Prices, Heating Seasons 1993–94 and 1995–96	
	- Daily Price Premium, January 12 – February 15, 1994 and 1996	
11.	New Deep Water Fields Are Highly Productive	26
	- Average Proved Reserves per Field for New Fields Discovered Between 1990 and 1994, by Region	
	- Shares of Proved Reserves of Associated-Dissolved Gas, by Region, 1990–1994	
	- Maximum Water Depth Levels Reached for Offshore Oil and Gas Projects, 1978–1997 (Planned)	
12.	Electronic Communication Services Have Increased	28
	- Diagram of Electronic Access and Services Available to Natural Gas User Community	
	- Example of Natural Gas Market Center Electronic Gas Trading Transaction Screen	
13.	Electric Restructuring Begins in Earnest	30
	- Federal Energy Regulatory Commission Open Access Orders for Electric Transmission	
	- Residential Prices of Electricity and Natural Gas, 1990 and 1995	
14.	Seasonal Capacity Held by Replacement Shippers, November 1993 – March 1996	
15.	Index of Capacity Held by Replacement Shippers During Heating Seasons, 1993-1996	
16.	Capacity Held by Replacement Shippers, November 1993 – March 1996	
17.	Heating Season Capacity Release Revenues by Region, 1993-1996	48
18.	Southern California Gas Company Activity on El Paso Natural Gas Company System	50
19.	Capacity Associated with Expiring Firm Transportation Contracts on Transwestern System	53
20.	Pipeline Capacity under Firm Contract in 1990 and 1996 for a Sample of Interstate Pipeline Companies	55
21.	Firm Transportation Capacity as of April 1, 1996, Grouped by Length of Contract	55
22.	Expiration of Firm Transportation Capacity Under Contract as of April 1, 1996	57
23.	Annual and Cumulative Expirations of Firm Transportation Capacity, 1996–2025	57
24.	Regional Exposure to Capacity Expirations, 1996–2025	58
25.	Expirations of Firm Transportation Capacity Under Contract as of April 1, 1996, by Region	59
26.	General Representation of a Hub Configuration	65
27.	Locations of the Major Natural Gas Market Centers in the United States and Canada	67
28.	West Texas Market Centers Interplay with North and East Texas and Louisiana Market Centers	70
29.	Premium Return for Quick and Flexible Delivery Capability, November 1995 – March 1996	76
30.	Difference Between Futures Final Settlement Prices at the Henry Hub and Bid-Week Spot Prices at	
	Selected Locations, June 1990 – March 1996	79
31.	Natural Gas Wellhead Prices, 1980–1995	82
32.	Lower 48 States Map Showing Reference Locations for Price Correlation Analysis	83
33.	Average New Field Discovery Size in the Gulf Coast, 1977–1994	87
34.	Growth in Ultimate Field Recovery: Recovery as Multiple of Initial Proved Reserves for a Stylized Field	88
35.	Growth in Ultimate Recovery for the Top Five Gas Fields in the Lower 48 States, 1977–1992	88
36.	U.S. Imports of Natural Gas: Total and from Canada, 1980–1995	94
37.	Reserves-to-Production Ratios, United States and Canada, 1980–1994	96
38.	Prices to Residential and Commercial Consumers, 1990 and 1995	104
39.	Prices to Residential and Commercial Consumers, 1990 and 1995  Prices to Electric Utilities and Industrial Consumers, 1990 and 1995	104
39. 40.	Natural Gas Citygate Prices, 1990 and 1995	108
	Distribution Margins for Residential and Commercial Customers, 1990 and 1995	
41.		109
42.	LDCs Sell a Smaller Share to Industrial and Commercial Customers, 1989–1995	114