

TABLE OF CONTENTS

Executive Summary	11
1. Demand	15
Highlights.....	15
Global overview.....	15
Sectoral outlook	17
Assumptions	23
Regional outlook.....	23
Asia and Pacific.....	23
North America.....	40
Middle East.....	47
Eurasia.....	50
Europe	51
Latin America.....	56
Africa	59
References.....	62
2. Supply	67
Highlights.....	67
Global overview.....	67
Regional supply outlook.....	70
North America.....	70
Asia and Pacific.....	77
Middle East.....	88
Eurasia	89
Europe	92
Latin America.....	97
Africa	100
References.....	103
3. Trade	107
Highlights.....	107
Global natural gas trade	107
Global LNG market	109
LNG demand: Towards greater diversification, driven by emerging Asian buyers.....	110
LNG supply: The emergence of three global players	112
LNG trade flows: Go East.....	118
Towards a tighter LNG market?	119

Regional trade outlook.....	123
Asia	123
Europe	132
North America	137
References.....	141
4. The essentials.....	143
Glossary.....	148

LIST OF FIGURES

Figure ES.1	Global natural gas consumption growth, 2017-23	12
Figure ES.2	Natural gas production growth in selected countries and regions, 2017-23.....	13
Figure ES.3	LNG liquefaction capacity and utilisation, 2013-23	14
Figure 1.1	Global natural gas demand by sector, 2003-23	17
Figure 1.2	Change in annual world power generation, 2010-15	18
Figure 1.3	FIDs for CCGTs and OCGTs by region, 2009-17	19
Figure 1.4	Natural gas-fired generation share in each region, 2010-15	20
Figure 1.5	MARPOL Annex VI sulphur limits	21
Figure 1.6	Natural gas demand by country and sector, Asia and Pacific, 2003-23.....	23
Figure 1.7	Gas demand by sector, China, 2005-23	24
Figure 1.8	Energy consumption by source, China, 2016-17	25
Figure 1.9	Natural gas demand and supply, Japan, 2003-23	29
Figure 1.10	Power generation by fuel and LNG import volumes, Japan, 2008-17	29
Figure 1.11	Status of safety approval for nuclear power reactors in Japan, 2013-18	30
Figure 1.12	Number of natural gas customers and sales volume by sector, Japan, 2006-16.....	31
Figure 1.13	Evolution of gas retail market liberalisation, Japan, 1995-2017.....	31
Figure 1.14	Natural gas demand, Korea, 2003-23	34
Figure 1.15	Natural gas demand, Australia, 2017-23	35
Figure 1.16	Power generation by fuel and state, Australia, 2017	36
Figure 1.17	Gas demand by country and sector, other emerging Asian economies, 2003-23	36
Figure 1.18	Natural gas demand by country and sector, North America, 2003-23	40
Figure 1.19	Natural gas consumption growth, United States, 2011-23.....	41
Figure 1.20	Power generation by source, United States, 2011-17	41
Figure 1.21	Power capacity and generation mix, United States, 2017 and 2023	42
Figure 1.22	Ammonia production capacity and gas consumption, United States, 2012-21.....	43
Figure 1.23	Natural gas consumption in residential and commercial sectors, United States, 2001-23	44
Figure 1.24	Natural gas consumption by sector, Canada, 2011-23	44
Figure 1.25	Implementation of the gas release programme for PEMEX, Mexico, Phase I results	46
Figure 1.26	Gas consumption by sector, Mexico, 2011-23.....	46
Figure 1.27	Natural gas demand by country and sector, Middle East, 2003-23.....	47
Figure 1.28	Natural gas consumption by country and sector, Middle East, 2017	48
Figure 1.29	Natural gas demand by country and sector, Eurasia, 2003-23	50
Figure 1.30	Gas demand by country and sector, Europe, 2003-23	52
Figure 1.31	Changes in power generation by source, Italy, France and Spain	52
Figure 1.32	Annual change in gas demand for power generation in key European countries, 2016-17.....	53
Figure 1.33	Natural gas demand by country and by sector, Latin America, 2003-23.....	57

Figure 1.34	Natural gas consumption by sector, Argentina, 2011-23	57
Figure 1.35	Evolution of natural gas consumption by sector, Brazil, 2003-23	58
Figure 1.36	Natural gas demand by country and sector, Africa, 2003-23	59
Figure 1.37	Sectoral breakdown of natural gas consumption, Egypt, 2016	60
Figure 1.38	Sectoral breakdown of Algeria's natural gas consumption, 2016	61
Figure 2.1	Global natural gas production, 2003-23	68
Figure 2.2	Natural gas production, North America, 2003-23	70
Figure 2.3	Natural gas production, United States, 2007-17	70
Figure 2.4	Natural gas production and WTI crude oil price, United States, 2016-17	71
Figure 2.5	Natural gas production growth by major shale region, United States, 2011-17	71
Figure 2.6	Average monthly gas hub prices, January 2013-April 2018	72
Figure 2.7	Additional takeaway capacity from the Appalachian Basin (selected projects)	73
Figure 2.8	Waha price spread to Henry Hub (monthly averages), January 2013-April 2018	73
Figure 2.9	Natural gas production, United States, 2013-2023	75
Figure 2.10	Tight and shale gas production growth by basin, Canada, 2011-17	76
Figure 2.11	Natural gas production, Mexico, 2005-16	77
Figure 2.12	Natural gas production, Asia and Pacific, 2003-23	77
Figure 2.13	Natural gas production, China, 2011-17	78
Figure 2.14	Marketable domestic gas production of NOCs, China, 2016-17	79
Figure 2.15	Gas- and oil-related NOC investment, China, 2016-18	81
Figure 2.16	Natural gas production and export volumes, Australia, 2003-23	83
Figure 2.17	Natural gas production, other emerging Asian economies, 2003-23	86
Figure 2.18	Change in natural gas production, other emerging Asian economies, 2001-23	86
Figure 2.19	Natural gas production for domestic and export, Indonesia, 2003-23	87
Figure 2.20	Natural gas production, Middle East, 2003-23	88
Figure 2.21	Natural gas production, Eurasia, 2003-23	90
Figure 2.22	Natural gas production, Europe, 2003-23	92
Figure 2.23	Natural gas production in the Netherlands, 2010-23	93
Figure 2.24	Schematic overview of low calorific gas supply and demand 2017-30	95
Figure 2.25	Natural gas production, Latin America, 2003-23	97
Figure 2.26	Natural gas production, Argentina, 2007-17	98
Figure 2.27	LNG imports by origin country, Argentina, 2017	98
Figure 2.28	Natural gas production, Brazil, 2007-17	99
Figure 2.29	Natural gas production, Africa, 2003-23	100
Figure 3.1	Main natural gas trade flows, 2017 and 2023	108
Figure 3.2	LNG trade increment, imports and exports, 2016-17	109
Figure 3.3	Incremental regasification capacity: conventional vs FSRU, 2012-20	111
Figure 3.4	World LNG imports by region, 2013-23	111
Figure 3.5	LNG nameplate liquefaction capacity, 2013-23	113
Figure 3.6	World LNG exports by region, 2013-23	114
Figure 3.7	Qatari and Russian strategies in response to LNG competition, 2017-18	117
Figure 3.8	LNG trade per basin and supplier, 2013-23	118
Figure 3.9	LNG exports per basin for a selection of suppliers, 2013-23	119
Figure 3.10	LNG export capacity additions, 2013-23	120
Figure 3.11	LNG trade and liquefaction utilisation rate, 2013-23	120
Figure 3.12	US liquefaction projects development lead time as of early June 2018	123
Figure 3.13	Natural gas imports, China, 2013-23	124
Figure 3.14	Natural gas imports by source, China, 2016-17	124
Figure 3.15	Top 10 LNG exporters and importers, 2017	126
Figure 3.16	LNG imports, China, 2016-17	126
Figure 3.17	LNG imports by type of contract, China, 2015-17	127

Figure 3.18	Spot LNG import price, China, 2015-17	127
Figure 3.19	LNG imports and contracts, China, 2013-23	130
Figure 3.20	Pipeline imports, China, 2016-17.....	130
Figure 3.21	Pipeline imports, China, 2017-23.....	131
Figure 3.22	LNG imports and contracts, Japan and Korea, 2013-23.....	131
Figure 3.23	LNG imports and contracts, Other emerging Asian economies, 2013-23	132
Figure 3.24	Natural gas supply-demand gap, Europe, 2013-23.....	133
Figure 3.25	Natural gas balance, Europe, 2013-23.....	133
Figure 3.26	Turkey's flow capacity per entry and exit point, 2013-23	135
Figure 3.27	LNG imports and share of consumption, Europe, 2009-23	136
Figure 3.28	Evolution of natural gas trade, United States, 2011-17.....	137
Figure 3.29	LNG exports by destination (region), United States, 2016-17	138
Figure 3.30	LNG exports by destination (country), United States, 2016-17	139
Figure 3.31	LNG imports in 2017 by source, Mexico	140

LIST OF MAPS

Map 1.1	Global natural gas consumption growth by region, 2005-11, 2011-17, 2017-23	16
Map 1.2	LNG terminals and pipeline network, Japan, 2018	33
Map 2.1	Global natural gas production growth by region, 2005-11, 2011-17 and 2017-23	69
Map 2.2	Selected natural gas pipeline projects from the Appalachian Basin.....	72
Map 2.3	Cross-border pipeline projects from United States to Mexico	74
Map 2.4	Major basins and gas infrastructure in China	81
Map 2.5	Natural gas resource basins in Australia.....	85
Map 2.6	Main natural gas fields of Azerbaijan	91
Map 2.7	Natural gas discoveries, offshore Mauritania and Senegal	102
Map 3.1	LNG import countries and LNG import volumes, 2010-23.....	112
Map 3.2	LNG export countries and LNG export volumes, 2010-23	115
Map 3.3	The three major LNG export players and their respective business models	115
Map 3.4	Natural gas supply sources, China, 2017	125
Map 3.5	Russian natural gas export pipelines operating and projects	135
Map 3.6	Cross-border pipeline interconnections between the United States and Mexico.....	140

LIST OF TABLES

Table 1.1	Global natural gas demand by region, 2017-23 (bcm)	16
Table 1.2	Fuel shares in the global power mix	19
Table 1.3	LNG bunkering vessels operational and under construction.....	22
Table 1.4	Reforms to promote gas demand in China, 2017	26
Table 1.5	Natural gas heating development targets, 2017-21	27
Table 1.6	Natural gas vehicles in China	28
Table 1.7	Methanol production capacity additions, United States	43
Table 1.8	CCGTs recently commissioned and under construction in Mexico.....	47
Table 2.1	Global natural gas production by region, 2017-23	68
Table 2.2	Average daily natural gas production by region (mcm/day), China, 2015-17	80
Table 2.3	Australian LNG export projects, existing and under development.....	84
Table 2.4	Selection of Russian natural gas production projects.....	90
Table 3.1	US LNG export projects regulatory status.....	122
Table 3.2	Operating LNG regasification terminals, China.....	128
Table 3.3	LNG regasification terminals under development, China	129
Table 3.4	LNG regasification terminals by operator, China.....	129

LIST OF BOXES

Box 1.1	Gas demand for power generation.....	18
Box 1.2	Prospects for LNG as a bunker fuel.....	21
Box 1.3	Japanese gas market reform.....	30
Box 2.1	Impact of the Groningen natural gas phase out plan on Dutch domestic supply	94
Box 3.1	The strong growth of FSRUs	110
Box 3.2	Tug of war: Exporters brace themselves for more competition.....	117
Box 3.3	US LNG liquefaction projects status and potential development.....	121
Box 3.4	2017 was a record breaking year for natural gas imports in China	124
Box 3.5	Nord Stream 2 project update.....	135