Index

accidents 174–5
ACPI AP-X liquefaction process 36
Adriatic terminal 78
AECO Hub 348–9
Africa
   LNG industry
      emerging suppliers 114–15, 119, 129–36
      liquefaction capacity 144
      production capacity predictions 96
      trade flows 167–8
natural gas
   consumption trends 5–7
   gas “puzzle” 129–32
   reserves 93, 129, 297, 302
   unconventional gas 297, 302
see also MENA
AIPN Master Sale and Purchase Agreements 162–4
Alaska
   exports to Japan 59–60
   Kenai terminal 57, 59–60, 423
   LNG industry development 59
Albania 80
Algeria
   accidents, at LNG facilities 175
   electricity generating capacity 130
   gas flaring 245
   on GECF cartel activity 398–9
   liquefaction 144, 412
   LNG exports 93–5, 105
      to Europe 56–7, 73, 75–6, 105
      to US 57
   natural gas
      production trends 327
      reserves 93, 244
Aliaga terminal 80, 444
Altamira terminal 123, 447
ambient air vaporizers 48–9, 203
American Gas Association (AGA) 7
American Public Gas Association (APGA) 341–3
Anadarko Petroleum 114
Angola
   gas flaring 245
   LNG exports 112, 327–8
   natural gas reserves 112
Angola LNG 94, 154
   liquefaction terminals 383, 412
   project costs 383
   US shale gas, knock-on effects of 327–8
annual contract quantity (ACQ) 463
annual delivery program (ADP) 463
Antrim Shale 291, 293
Apache Canada Ltd 352
APCI AP-X liquefaction process 200
APCI MCR liquefaction process 36, 200
Arab Gas Pipeline 109, 134
Argentina
   Gas Plus Program 124
   LNG exports 127
   LNG imports
      regasification 142, 448
      terminals 124–5, 142, 448
      trends 49, 123–4
   natural gas reserves 123
Arish-Ashkelon pipeline 109
Arkutun-Dagi gas field 249
Arrow LNG 237
Arun terminal 98
Arzew LNG 105, 412
Asia-Pacific LNG market
   contracts and pricing 72–3, 147–8, 160
   demand trends and predictions 72, 118
   history 57–8, 138
   inter-regional trade flows 143, 167–8
   LNG exports
Energy for the 21st century

Emerging European importers 121–2
Re-exports 155
LNG imports 72, 119–21
Liquefaction capacity 144
From MENA region 129–36
From North America 137, 350–51, 358–9
Regasification capacity 50
From South and Central America 122–9
Natural gas
Consumption trends 5–7
Reserves 93, 297, 302
Trade flows 167
Unconventional gas 297, 302
And Panama Canal expansion 389–90
Spot and short-term LNG markets 154–5
See also Individual countries
Asia-Pacific Partnership on Clean Development and Climate 197–8
Associated natural gas, meaning 463
Association of International Petroleum Negotiators (AIPN) 162–4
Association of South East Asian Nations 101
Atlantic Basin region See North American/Atlantic Basin
Atlantic Basin terminal 81
Atlantic LNG 104, 187, 231
Atlantic shale spreads 329
Australia
Arrow LNG 237
Australia Pacific LNG 187, 189, 223–4, 235, 237, 420
Bonaparte LNG project 234–5
Browse LNG 187, 189, 194, 234
Carbon Tax proposal 192–5
Coal seam gas to LNG projects 236–7
Environmental concerns 238–41
Landowner rights 239–40
Curtis Island LNG 187, 190, 237, 383
Darwin LNG 187, 223–4, 231, 418
Floating terminals 95, 187, 189, 223–4, 234, 392–5
Gladstone LNG project 66, 95, 187, 190, 223–4, 236–7, 383, 419
Gorgon LNG project 66, 95, 104, 187–8, 223–4, 226–32, 383, 419
Greater Sunrise LNG project 234–5
Greenhouse gas emissions, from LNG 185–90, 277
Compared with coal emissions 190–92
Ichthys LNG 187, 189, 234–5, 419
Industry management structures 222–3
Liquefaction 144, 418–20
LNG exports 95, 223
Competition from North America 382
To Japan 225–6
To Taiwan 67
Trends and predictions 192–3, 220–22
LNG market entry 57
LNG production capacity 96, 98, 220–22, 233
LNG projects, generally 169, 223–6, 236–8
Natural gas reserves 93, 101, 222, 225, 298, 302
North West Shelf LNG 187, 191, 223, 231
Panama Canal expansion, potential impact 389–90
Pluto LNG 95, 187–8, 194, 223, 225–6, 235, 418
Prelude LNG 95, 187, 189, 223–4, 234, 392–5, 419
Queensland Curtis LNG 120, 223–4, 236–7, 419
Shale gas developments 298, 302
Spot and short-term LNG markets 154–5
Unconventional gas 298, 302
Wheatstone LNG project 66, 185–8, 223–4, 232–3, 235, 419
Australia Pacific LNG 187, 189, 223–4, 235, 237, 420
Australian Petroleum Production and Exploration Association (APPEA) 193–4
Austria 299
Azerbaijan 79
Bahia Blanca terminal 123–4, 448
Bahrain 93, 130, 132
Barnett Shale 290–92, 309–10
Barrow Island terminal 227–31
Barzan Gas Project 219–20
baseload, meaning 463
Basrah Gas Company 134
bcm, meaning 54
Bechtel Corp 60
Belarus 246
Belgium
 LNG imports 57, 73, 444
 LNG re-exports 156
 regasification terminals 78–9, 444
 Zeebrugge Hub 78, 79
 Zeebrugge terminal 78–9
BG Group 108, 114, 120, 364–6, 459
BHP Billiton 179, 182–3
Bintulu LNG 99, 101, 421
Blackstone 369
Blue Stream gas pipeline 246–7
Bolivia
 electricity nationalization 125–6
 LNG exports 124, 126, 128
 natural gas reserves 125
boil-off gas, meaning 463
Bonaparte LNG project 234
Bontang-Badak terminal 98, 420
Botas 80
BP 128, 458
Brass LNG 106, 414
Bratrstvo gas pipeline 246
Brazil
 LNG import trends 49, 126–7, 142
 regasification 142, 448–9
British Gas Council 56
Broadwater Energy 85, 179
Browse LNG 187, 189, 194, 234
Brunei 57, 140, 420
Bulgaria 80, 122, 247, 299
Bureau of Resources and Energy Economics 146
burner tip, meaning 463
C3-MR (propane-precooled mixed-refrigerant process) 199–200
Cabot, Godfrey 55
Cabrillo Deepwater Port 182–3
Cal Cartage 408–9
Cambridge Energy 461
Cameron LNG 156, 461
Cameroon 113–14, 413
Camisea gas field 260
Canada
 energy exports, generally pricing trends 348–9
 to US 293–4
LNG exports
 to Asia-Pacific 350–51, 358–9, 381
 competition potential 380–82
 development trends 350–51
 Kitimat LNG project 72, 148, 351–7, 380, 420
 pipeline developments 350
 US shale gas impact on 348–9
LNG imports
 demand trends and predictions 49, 83, 142
 history 81
 regasification 142, 445
 LNG trade flows 167–8
 natural gas
 production trends 327
 reserves 93
 shale gas
 development and expansion 293–6
 estimated recoverable reserves 294–6
 key shale gas plays 294–5
Canaport LNG 351, 445
Cancun Climate Change talks 28
Canvey Island terminal 76
carbon tax, Australian proposal for 192–5
cargo container system, meaning 463
Carib Energy 461
Caribbean
 Panama Canal expansion 390
 see also Trinidad and Tobago
Carnegie Mellon lifecycle emissions study 183–5
Cartagena terminal 156, 443
Centrica 76
charterparty, meaning 463
Chayvo gas field 249
Cheniere Energy 459
Case Study 331–48
Cheniere Marketing 331–48
 see also Sabine Pass LNG terminal
Chesapeake Energy Corp 308–9, 408

Susan L. Sakmar - 9781781005880
Downloaded from Elgar Online at 03/21/2019 02:32:17AM
via free access
Chevron 458
activities in Angola 112, 327–8
activities in Colombia 128
see also Gorgon; Wheatstone
Chile
LNG import trends 49, 127–8
and Panama Canal expansion 390
regasification terminals 449
China
12th Five-Year Plan 24–5
global energy market role 16–18, 23–5
LNG imports
demand trends and predictions 68–70, 142
import terminals 68–9, 449–51
from North America 350–51
regasification 142, 449
natural gas
production trends 327
reserves 93, 101, 298
unconventional gas 298
shale gas 298
China National Offshore Oil Company 70
Chinese Petroleum Corporation 67
Chubu Electric Power Co 209–10
Chugoku Electric Power Co 210
CIF contract (cost, insurance and freight) 51–2, 463
Clean Development Mechanism (CDM) 198–9
Clean Energy Fuels 407–9
cal bed methane (CBM) 283, 289–99
cal seam gas (CSG) to LNG projects in Australia
environmental concerns 238–41
landowner rights 239–40
projects 236–7
hydraulic fracturing 239–40
processes 236
Colombia 128
combined-cycle gas (CCG) turbines 463
Compagnie Industrielle Maritime 77
compressed natural gas (CNG) 121, 463
as vehicle fuel 404–5
condensates, meaning 463–4
ConocoPhillips 59, 459
closure of Kenai terminal 88, 91
liquefaction project costs 383
Optimized Cascade process 36, 60
Continental Oil Company 56
Copenhagen Accord (2009) 13–14, 21–2
Cove Point terminal 81–2, 86, 89, 102, 378–9, 446, 458, 461
Croatia 80
cryogenic storage tanks 48
Curtis Island terminal 187, 190, 237, 383
Cusiana gas field 128
Cyprus 80
Dahej terminal 70, 451
daily average sendout, meaning 464
Damietta LNG 107–8, 112, 413
DAP contract (delivery at place) 52, 158, 464
Darwin LNG 187, 223, 231
DAT contract (delivery at terminal) 158, 464
Dawn Hub 348
debottlenecking, meaning 464
Delaware Coastal Zone Act 88
deliverability, meaning 464
deregulation, meaning 464
DES contract (delivery ex ship) 464
diesel fuels, EPA guidelines on 320–21
Distrlgas 57, 78
Dolphin Gas Project 216–17
Dominion 102
LNG export proposals, opposition to 378–9
see also Cove Point terminal
Dominion Republic 447
Donggi Senoro LNG 95, 98
Douglas Channel LNG 351
downstream, meaning 464
draft, meaning 464
Dragon terminal 76, 445
dry gas, meaning 464
Dual Mixed Refrigerant (DMR) process 36
Dubai see United Arab Emirates
Dunkerque terminal 77, 442
EA Gibson 42–3
Eagle Ford Shale 291, 293
Index

East Ohio Gas Company 56
Ecopetrol 128
EDF 77
EG LNG 413
Egegaz 80
Egypt
  electricity generating capacity 130
  international energy market role 109–10
  liquefaction terminals 413
LNG exports 108, 112
  pipeline exports 109–11
  pricing 152
  supply capacity 106–9
natural gas
  consumption trends 106–7
  reserves 93
  political unrest, impact of 111–12, 136
El Musel terminal 75, 443
Elba Island terminal 81–2, 86, 89, 445, 458–9
electricity generation see power generation
Elengy 77
emerging issues
  floating terminals 360, 390–95
Gas Exporting Countries Forum (GECF) 360–61
  compared with OPEC 400–401
history and development 395–6
international status 396–8
mission and objectives 398
oil-linked prices, policy on 399–400
whether a cartel 398–9
LNG as fuel 140
  for shipping 361, 401–4
  for vehicles 361, 404–9
Panama Canal expansion
  history and progress 387–8
  importance of 360
  potential impact of 389–90
  purpose 388–9
  vessel size 388–9
see also LNG exports under US
Enarsa 124
EnCanA 381, 407–8
Energia Costa Azul terminal 87, 179
energy poverty 20
ENI 77, 114, 128–9, 458
Ennore terminal 71
environmental issues
  coal seam gas to LNG processes 238–41
environmental threats
  to aquatic/shoreline environments 173–4
  from LNG industry 173–6
  from LNG transport 174
  physical safety hazards 174–5
greenhouse gas emissions
  emissions targets 13–14, 21–2, 28
  IEA GAS Scenario 28–9
  IEA New Policies Scenario 21–2
  methane emissions 180–81, 195–9
  methane mitigation 195–9
  new technologies, role of 28–9
  from shipping, regulation of 40, 201, 401–3
whether global or local concern 190–92, 277–8
international environmental guidelines 173–4
lifecycle emissions, of LNG 172, 181–3
carbon capture and sequestration 184
LNG vs. coal-fired power plants 183–5
LNG export projects, opposition to 341–3, 378–9
natural gas
  advantages 7–8
  as “bridge” fuel 7, 11–12
  compared with fossil fuels 8, 11–13, 181–5
noise pollution 174
shale gas 11
  hydraulic fracturing 306–7, 309–11
  water contamination 306–10, 313–15
  water quantity and flowback 308–10, 319–20
waste management 174
wastewater disposal 174, 309, 319–20
Environmental Protection Agency (EPA)
  diesel fuel guidelines 320–21
  hydraulic fracturing study 317–19
Energy for the 21st century

Leaf v. EPA 314–15
shale gas, effluent guidelines 319–20
EPC contract (engineering, procurement and construction) 464
Equatorial Guinea 113, 413
Escobar terminal 124–5, 448
Esso Highlands Limited 269, 279
Estonia 80
Europe
Emissions Trading Scheme 196
LNG market
domestic production market share 73
emerging European importers 80, 121–2
energy supply mix, position in 73–4
history 55–8, 73–4
import terminals 74–5
inter-regional trade flows 143, 167–8
liquefaction capacity 144
overview 75–80
pipeline gas, competition from 73–4
natural gas
consumption trends 5–7
reserves 93, 297–300, 302
unconventional gas 297–300, 302
shale gas
developments 297–300
potential impact 325–6
see also individual countries
European Climate Roadmap 11
European Gas Advocacy Forum 11
Everett terminal 81–2, 445
Excerelate Energy 123–5, 392, 462
exclusion zone, meaning 464
Export-Import Bank of the United States 268–9, 274, 278
Exxon Neftegaz 249–50
ExxonMobil 458
activities in Australia 222–3
Barzan Gas Project 219
liquefaction processes used by 36
natural gas business development 8–9, 299–300
Q-Flex and Q-Marx shipping 201–2, 207
Qatari mega projects 207
shale gas developments 299–300
XTO Energy merger 8–9, 310–11
see also PNG LNG (Papua New Guinea)
Faraday, Michael 55
Fayetteville Shale 291–2
Federal Energy Regulatory Commission (FERC) 177–8, 464
Cheniere re-export proposals 346–8
FEED (front-end engineering and design) 46, 465
feed/feedstock gas 33–4
feed/feedstock gas, meaning 464
flag states 41–2
flameless explosions 175
flammable vapor clouds 175
flaring see gas flaring
FLNG see floating terminals
floating terminals 360, 390–95
advantages 391
operational and under construction 390–91
see also Prelude LNG
Fluxys 78
FOB contract (free on board) 52, 158, 465
force majeure, meaning 464–5
Former Soviet Union see Russia
Fos-Cavou terminal 77, 442
Fos-Sur-Mer terminal 77, 442
Fos-Tonkin terminal 77
Foster Wheeler AG 113–14
FracFocus 322
Fracturing Responsibility and Awareness of Chemicals Act 316
France
CBM and shale gas developments 299–300
LNG imports
demand trends 77
history 57, 73
regasification terminals 77, 442
Freeport terminal 156–7, 446, 461
Fujian terminal 68
Fukushima Daiichi nuclear power plant disaster 24–6, 63, 117
Gas Authority of India Limited (GAIL) 367
exports to Korea 66
greenhouse gas emissions 187, 190
project costs 383
global economic crisis 2008–2009 1–2,
  13–14, 116–17, 149, 410
Global Gas Flaring Reduction
  Partnership 134–5, 197
global LNG markets
demand overview 116–19
Fukushima Daiichi nuclear power
  plant disaster 117
GECF role in 399–401
and global recession 1–2, 13–14,
  116–17, 149, 410
history and development 138–9
  commoditization 166, 169
emerging markets 119
  influences on 169–71
trade flow trends 143–5, 167–8
liquefaction trends 144
LNG exports from North America,
  influence of
  Canadian exports 380–82
  generally 382–7
US exports 386–7
price convergence/divergence trends
  151–3
regasification trends 142, 144
Global Methane Initiative 197
global recession 1–2, 13–14, 116–17,
  149, 410
Global Shale Gas Initiative (GSGI)
  304–5
Golden Age of Gas 1, 15
China’s role in 23–5
demand drivers 24–8
IEA Gas Scenario 22–9, 142
LNG, role in 30–31, 117, 191–2
nuclear power influence on 24–6
price trend predictions 27
sectoral demand trends 22–4
transportation, role in 27
Golden Pass terminal 50
Gorgon gas field 227
Gorgon LNG project 66, 95, 104,
  223–4, 419
  challenges 230–31
  CO₂ injection 228–30
greenhouse gas emissions 187–8,
  228–32

Gas de France 108
Gas Exporting Countries Forum
  (GECF) 360–61
compared with OPEC 400–401
history and development 395–7
international status 396–8
member 396–7
mission and objectives 398
oil-linked prices, policy on 399–400
whether a cartel 398–9
gas flaring 464
  in Iraq 134–5
  in Russia 244–5
volume 245
World Bank Global Gas Flaring
  Reduction Partnership 133–5,
  197
Gas Infrastructure Europe 74
gas on gas competition 38
Gas Shales in Europe 300
Gasbol pipeline 126
Gassi Touil LNG 95
Gate terminal 79, 445
Gaz de Normandie 77
Gazexport 245
Gazprom
  alternate European supply routes
    140
carrier fleet expansion 44
dominance of 243, 245–6
pipeline disputes 246
pricing concessions 150
Sakhalin II and III, role in 250–52
Shtokman project 257–9
Yamal LNG 252, 254
Gazprom Global LNG Limited
  (GGLNG) 44
GDF Suez 65, 77, 234–5, 459
GECF see Gas Exporting Countries
  Forum (GECF)
GeoForschungsZentrum 300
German Border Price (GBP) 146–7,
  150–51
Germany 80
  LNG import transit 246–8
  unconventional gas developments
    299–300
Gladstone LNG project 95, 223–4, 419
  coal seam gas to LNG projects
    236–7

Susan L. Sakmar - 9781781005880
Downloaded from Elgar Online at 03/21/2019 02:32:17AM
via free access
unconventional gas 298  
shale gas developments 298  
Inpex 459  
Institut Français du Pétrole (IFP) 300  
integrated gasification combined cycle (IGCC) power plants 184–5  
Inter American Development Bank 262  
interchangeability, meaning 465  
International Energy Agency (IEA) 450  
Scenario 15–16, 18, 22  
Current Policies Scenario 15, 18  
on energy poverty 20  
Golden Age of Gas (GAS Scenario) 22–31, 142  
LNG measurement units 54  
New Policies Scenario 15–22, 25–7, 141–2  
World Energy Outlook 2009 13–14  
World Energy Outlook 2010 15, 20, 22–4  
International Energy Consumers of America (IECA) 341–2  
International Finance Corporation (IFC) 263  
environmental practices guidelines 173–4, 274–5  
International Gas Codes 40  
International Gas Union (IGU) 7  
International Maritime Organization (IMO)  
on greenhouse gas emissions 40, 201, 401–3  
on LNG carrier design and safety 40  
Iran  
electricity generating capacity 130  
gas flaring 245  
LNG exports 79, 131–3  
natural gas production trends 327  
reserves 92–3, 97, 205, 244  
sanctions, impact of 132–3  
Iraq  
gas flaring 134–5, 245  
legal challenges 134  
LNG exports 133–4  
natural gas reserves 93, 133  
Ireland 80  
Isle of Grain terminal 76, 444  
Israel  
LNG exports 131, 134–5  
LNG imports 134–6, 140  
natural gas reserves 134–6  
Israel Natural Gas Lines 136  
Italy  
LNG imports  
demand trends 77–8  
history 57, 73  
regasification terminals 78, 443–4  
Jansz/Jo gas field 227  
Japan  
export credit agency financing role 219–20  
Fukushima Daiichi nuclear power plant disaster (aka the Great East Japan Earthquake) 24–6, 63, 117  
LNG imports 58–64, 410  
from Australia 225–6  
demand trends and predictions 60–64, 362  
global markets, influence on 63–4  
history 57, 59–60  
import/regasification terminals 50, 61, 452–6  
from Qatar 63–4, 209–10  
from Russia 251  
LNG storage capacity 50  
nuclear power, reliance on 63, 410  
Sale and Purchase Agreements 160  
Japanese Crude Cocktail (JCC) 147–8  
JODI see Joint Organisations Data Initiative  
Joint Organisations Data Initiative 397–8  
Jordan 140  
Jordan Cove Energy Project 461  
Jupiter gas field 127  
K-Power 65  
Kaigansko-Vasyugan gas field 252  
Kansai Electric Power Co Inc 210, 226  
Kashiwazaki-Kariwa power plant 63  
Kazakhstan 245  
Kenai terminal 57, 423  
closure 88, 91  
extports to Japan 59–60  
import proposals 91
Kenya 114
Kirinskoye gas field 251
Kitimat LNG project 72, 148, 420
background and development 351–4, 380
estimated production capacity 354
LNG exports from
Asia-Pacific 358–9
license applications 354–8
market assessment 355–6
KM LNG see Kitimat LNG
Kochi terminal 71, 452
KOGAS
imports 65, 213, 381
SPA with Cheniere 367
terminal upgrade program 64–5
Kuwait
electricity generating capacity 130
LNG imports 49, 132, 142
LNG regasification 142, 449
Kyoto Protocol 13, 277
methane mitigation 195–6
Lake Charles terminal 81–2, 446, 461
Lamut terminal 57
landowner rights
in coal seam gas to LNG projects 239–40
and shale gas development 303
Latin America see South and Central America
Lavaca Bay LNG project 392
Le Havre-Antifer terminal 77
Leaf v. EPA (US) 314–15
Lebanon 140
Leviathan gas field 135
Libya
gas flaring 245
liquefaction terminals 57, 413
LNG supply capacity 106
lifecycle emissions 172, 181–3
carbon capture and sequestration 184
LNG vs. coal-fired power plants 183–5, 190–92
liquefaction
efficiency developments 199–200
gas and steam turbines 35–6
history 55, 57–8
liquefaction terminals
design features 34–6
floating terminals 360, 390–95
growth and capacity trends 37–8, 142, 144
by region and country 412–23
processes 33–4
APCI AP-X process 200
Multi-component Refrigerant (MCR) 36, 200
propane-precooled mixed-refrigerant (C3-MR) 199–200
purification 33–4
technology developments 34–6
train capacities 35
Lithuania 80
LNG chain, meaning 466
LNG contracts
AIPN Master SPA 162–4
bi-directional contracts 164–6, 329, 331
cost, insurance and freight (CIF) 51–2
delivery at place (DAP) 52, 158
delivery at terminal (DAT) 158
delivery ex ship (DES) 464
engineering, procurement and construction (EPC) 464
free on board (FOB) 52, 158, 465
historical basis 138
production sharing contracts 51
Sale and Purchase Agreements (SPA) 157–64
Terminal Use Agreements (TUA) 162
trends 148, 151–3
LNG demand
global LNG demand
emerging markets 119
and global recession 1–2, 13–14, 116–17, 149, 410
influences on 116–18
overview 116–19
see also under individual countries and regions
LNG exports see under individual countries and regions
LNG generally
advantages 1, 30, 139–40
competition with pipeline gas 38, 73–4, 139–41
emerging markets 114–15, 119
as fuel 140
for shipping 361, 401–4
for vehicles 361, 404–9
global natural gas trade, role in 1, 4–7
history 55–8
meaning 1, 466
measurement units 53–4
trade trends and growth predictions 30–31
uncontracted capacity estimates 384
LNG imports, generally
importing countries, developments 166–7
see also individual countries
LNG markets
GECF role in 398–401
see also under Asia-Pacific; Europe;
global LNG market; North
American/Atlantic Basin
LNG projects, generally
challenges 96–7
costs 96
project structures 50
company/merchant model 51–2
contract styles 51–3, 158
integrated model 51
production sharing 51
tolling model 52–3
LNG re-exports 155–7
see also under Sabine Pass LNG
terminal
LNG shipping 466
accidents and safety records 174–5
carrier fleet
design features 37–40
expansion 42–4
flag states 41–2
greenhouse gas emissions,
regulation of 40, 201, 401–3
international design specifications 40
mega ships, development of 44–5
membrane design carriers 39–40
Moss sphere design carriers 39–40, 43, 210
Q-Flex and Q-Max carriers 201–2, 207
ship registration 41–2
shipyard locations 42
tanker capacity 53–4, 225, 423–41
efficiency developments 201–2
environmental threats 174
history 42–3
Panama Canal expansion, potential
impact on 390
as terrorist targets 175–6
through Suez Canal 110–11
LNG storage
terminal storage tank capacity 48, 50, 152
LNG supply, generally
demand trends and predictions 92
“first wave” suppliers 93–4
global natural gas reserves 92–3, 296–302
production capacity trends 94–6
“second wave” suppliers 94–6
LNG trading
commoditization trends 166–8
potential 1, 145
spot and short-term LNG markets 153–5, 399–400, 467
see also LNG contracts
LNG transportation see LNG
shipping
LNG value chain
development, influences on 32–3
liquefaction phase 33–7
LNG shipping 37–45
overview 32–3
regasification 45–50
Londe, Karl von 55
LPG (liquefied petroleum gas) 217–18, 466
Lumskoye gas field 250
Maersk Meridian (ship) 336
Malaysia 100
LNG industry
generally 99, 140
import/regasification terminals 49, 102, 120, 457
liquefaction terminals 421
market entry 57
supply trends 94
natural gas
consumption trends 140
reserves 93, 99, 101, 140
Peninsular Gas Utilization project 99
pipeline networks 99, 101–2
Malaysia International Shipping Corporation 101
manufactured gas, meaning 466
Map Ta Phut terminal 119, 456
Marathon 89, 90, 459
Marcellus Shale 291–2, 298, 308–9, 321–2
Marmara Eregelisi terminal 80, 444
Marsa el Brega terminal 57, 413
Marshall Islands ship registry 41–2
Marubeni Corporation 262
measurement units 53–4
Mejillones terminal 127–8, 449
membrane design carriers 39–40
MENA region (Middle East North Africa)
electricity generating capacity 130
energy policy developments 131
infrastructure investment 131
LNG demand 131
natural gas
gas “puzzle” 129–32
reserves 129–30, 297
unconventional gas 297
pricing 130–31
methane 33
cold bed methane 283, 297
methane emissions 180–81
environmental sustainability, and
LNG 180–81
from LNG industry processes 198–9
methane mitigation
advantages 195–6
barriers to 196–8
opportunities in gas and LNG industry 198–9
Methane Pioneer (ship) 42–3, 56, 336
Methane to Markets Partnership 197
Mexico
LNG imports 81, 262, 447–8
LNG re-exports 156
LNG trade flows 167
natural gas reserves 93
Micoperi 136
Middle East
LNG industry
import trends 49
liquefaction capacity 144
production capacity predictions 96
regasification receiving capacity 50
trade flows 167–8
natural gas
consumption trends 4–7
gas “puzzle” 129–32
reserves 92–3, 129, 297
unconventional gas 297
see also MENA
Milford Haven terminal 76, 445
Mineral Resources Development Company 272
MIT; natural gas vs. coal study 12
Mitsubishi 250, 381
Mixed Fluid Cascade liquefaction process 36
Montney shale gas field 381
Montoir de Bretagne terminal 77, 442
Moss sphere design carriers 39–40, 43, 210
Mozambique 114
Mozdok-Gazi-Magomed gas pipeline 246
Mugardos terminal 156, 443
Multi-Component Refrigerant (MCR) 36, 200
Myanmar 140
Nabucco gas pipeline 134
Nakilat 207
National Balancing Point (NBP) 146–7, 149–51, 329–31
National Clean Fleets Partnership 409
National Copper Corporation 127
National Petroleum Company (Chile) 127
National Petroleum Company (PNG) 269, 272
natural gas
associated/nonassociated natural gas, meaning 463, 466
cold bed methane (CBM) 283, 289–99
cold seam gas to LNG projects in Australia 236–41
hydraulic fracturing 239–40
processes 236
consumption trends 4–7
conversion tables xvii–xviii
Index

demand trends 1, 4–7, 14–15
IEA GAS Scenarios 22–4, 142
IEA Policy Scenarios 14–20
in power generation 18–20, 23
regional demand trends 18–20, 141–2
by sector, generally 18–20
in transportation 19–21, 24
dry gas 464
and environmental sustainability
advantages 7–8, 29
as “bridge” fuel 7, 11–12
compared with fossil fuels 8, 11–13, 181–5
history 55
natural gas liquids (NGL) 33, 466
oil company focus trends 8–11
price trend predictions 27, 348–9
reserves
global reserves 92–3
meaning 465
reservoirs, classification 282–3
tight gas 283, 297
trade flows 1, 167
wet gas 33, 467
see also shale gas
natural gas liquids (NGL) 33, 466
Natural Gas STAR 196–8
natural gas vehicle technology 405–7
Natural Gas Vehicles Drive Project 407–8
NBP (National Balancing Point) 146–7, 149–51
net back price, meaning 466
Netherlands 49, 79, 142, 445
New Albany Shale 291–3
New Policies Scenario see under
International Energy Agency (IEA)
NGL (natural gas liquids) 33, 466
Nigeria
LNG industry 58
exports 152
liquefaction 144, 383, 413–14
supply capacity 96, 106
natural gas
gas flaring 245
reserves 93, 244
Nigeria LNG 187, 231, 413–14
Nigerian National Petroleum Corporation 106
Nihonkai LNG 453
Nippon Oil and Gas Exploration 272
nitrogen injection 34
noise pollution 174
nonassociated gas, meaning 466
Nord Stream pipeline 247–8, 258
Nordic LNG 94
North American/Atlantic Basin LNG market
compressed natural gas, in vehicles 21, 404–5
contract and pricing trends 148, 151–3
history 55–8, 81, 138
influences on 81
inter-regional trade flows 143, 167–8
liquefaction capacity 144
LNG exports
competition potential 380–85
global influence of 386–7
LNG import trends 137
natural gas
consumption trends 4–7
price trends 348–9
reserves 93, 297, 302
unconventional gas 297, 302
shale gas, influence on 76, 88, 105, 137, 153, 328–31
supply and demand trends 137
see also Canada; United States
North Caucasus gas pipeline 246
North Field 205–6, 209, 382
North West Shelf LNG 187, 191, 223, 231
Northern Lights gas pipeline 246
Norway
liquefaction terminals 414
LNG supply trends 94
natural gas production trends 327
northern sea route/northwest passage 103
Snøhvit LNG 36, 102–4
Novatek 252, 254–5, 259
nuclear power
Fukushima Daiichi nuclear power plant disaster 24–6, 63, 117
Kashiwazaki-Kariwa power plant closure 63
and natural gas demand trends 20, 23–4
Energy for the 21st century

Oceania
natural gas consumption trends 5–7
see also individual countries
Odoptu gas field 249
OECD countries
natural gas growth trends 18–20
off-peak, meaning 466
Office of the Federal Coordinator for Alaska Natural Gas Transportation Projects 118–19
offshore terminal, meaning 466
oil companies, generally
natural gas business development trends 8–11
oil-linked pricing 138, 146–8
decoupling 149–50
GECF role in 399–400
Oil Search Limited 269
Olokola LNG 106, 414
Oman
electricity generating capacity 130
LNG industry 58
exports 67
greenhouse gas emissions 187
liquefaction 383, 415
supply capacity 105
ONGC Videsh Ltd 249
open access, meaning 466
open rack vaporizers 48
Ophir Energy 114
Optimized Cascade process 36, 60
organizations, abbreviations for xiii–xvi
Oryx GTL 217
Osaka Gas Co Ltd 210
Pacific shale spreads 329
Pacific Trail gas pipeline 353
Pakistan 457
Panama Canal expansion
history and progress 387–8
importance of 360
potential impact of 389–90
purpose 388–9
vessel size 388–9
Panigaglia terminals 78, 443
Papua New Guinea 268–70
liquefaction terminals 422
political challenges 269–71
see also PNG LNG (Papua New Guinea)
Pascagoula terminal 112, 447
PDVSA 128–9
peakshaving, meaning 466
Pearl GTL 217–18
Pecem terminal 123, 126–7, 448
Pedro Duran Farrell pipeline 75
Peninsular Gas Utilization project 99
Penuelas terminal 123, 448
PERC (power release couplers) 46, 48
Perla gas field 128–9
Peru
LNG exports 128, 262
and Panama Canal expansion 390
trends 94, 129
natural gas reserves 129
Peru LNG
costs 97
development 259–60
marine facilities 261–2
partners and financing 262–3
terminals 123, 260–62, 422
Petro Vietnam Gas 120
Petrobras 126–7
Petroleos del Peru 262
Petronas 99, 101, 120
Petronet 71, 213
Phillips Petroleum 59
see also ConocoPhillips
Piltun-Astokhskoye oil field 250
Pluto gas field 225
Pluto LNG 95, 187–8, 194, 223, 225–6, 235, 418
PNG LNG (Papua New Guinea) 95
benefit sharing agreements 272
challenges 279–81
customers and sponsors 269, 272
development phases 270–71
environmental impact statements 275–7
environmental requirements 272–7
financing 268–9, 272–3
greenhouse gas emissions 276–8
liquefaction terminals 422
production predictions 269, 279–80
project design 276
project progress 269, 279–81
US support proposals 280
Poland
LNG imports 80, 122
regasification terminals 49, 445
unconventional gas developments 299–300
Polskie LNG 80, 122
pool fires 175
Portugal 73, 80, 444
POSCO 65
power generation
influence on natural gas demand trends 18–20, 23
lifecycle emissions analysis 18–20, 23, 183–5, 190–92
LNG vs. coal-fired power plants 18–20, 23, 183–5, 190–92
power release couplers (PERC) 46, 48
Prelude LNG 95, 189, 198, 223, 234, 360, 392–5, 419
prices
alternative pricing mechanisms 169
contract and pricing trends 72–3, 130–31, 147–51
decoupling 149–50, 169
floor and ceiling prices 147
German Border Price (GBP) 146–7, 150–51
and global recession 149
influences on price structures 145
international reference points 146–8
Japanese Crude Cocktail (JCC) 147–8
market convergence 148–51
market divergence 151–3
National Balancing Point (NBP) 146–7, 149–51, 329–31
natural gas
price predictions 27
shale gas influences on 348–9
net back price, meaning 466
oil-linked pricing 138, 146–8, 399–400
price controls 71–2, 160
price review/price re-opener clauses 160–61
pricing certainty, importance of 169
under Sale and Purchase Agreements 160–61
shale spreads 328–31, 362, 383–5
spot and short-term markets 153–5, 399–400, 467
US influence on 151–3, 362, 371–2
production sharing contracts 51
project financing, meaning 466–7
propane-precooled mixed-refrigerant (C3-MR) 199–200
ProPublica 307–8
PTT LNG 119, 140
Puerto del Manzanillo terminal 123, 262, 448
Puerto Rico 448
Pyeongtaek terminal 65, 456
Q-Flex 201–2, 207
Q-Marx 201–2, 207
Qatar
electricity generating capacity 130
Gas-to-Liquids (GTL) projects 217–18
on GEFC cartel activity 398–9
greenhouse gas efficiency 231
helium refining 214
liquefaction capacity 144
liquefaction processes 36
LNG carrier capacity 38, 42
LNG exports 78, 94–5, 131
to Belgium 78
competition from North America 382
to Italy 78
to Japan 63–4, 209–10
pricing links 152
to Taiwan 67
to UK 76, 210–11
to US 152
US shale gas industry, influence on 76
LNG industry, generally
contribution to GDP 97, 205
history, development and prospects 58, 204–8, 216–20
production capacity 96–7, 204, 206–7
LNG projects
Barzan Gas Project 219–20
Dolphin Gas Project 216–17
natural gas
production trends 327
reserves 92–3, 97, 205, 244
see also Qatargas; RasGas
Qatar Petroleum 36, 97, 207, 219
Qatargas
consortium members 207
Energy for the 21st century

greenhouse gas emissions 187
liquefaction 383, 416–17
LNG market role 212
market entry/history 58
production capacity 207–9, 211–12
Q-Flex and Q-Max shipping 201–2, 207
Qatargas I 208–10
Qatargas II 36, 200, 208, 210–11
Qatargas III 94, 208, 211
Qatargas IV 94, 97, 206–7, 208, 212
quantities, abbreviations for xvi
Queensland AgForce 239
Queensland Curtis LNG 120, 223–4, 236–7, 419
Quintero terminal 123, 127, 449
Ras Laffan Emergency and Safety College 215
Ras Laffan Industrial City 209, 215
RasGas LNG (Ras Laffan Co Ltd) 58, 78
Barzan Gas Project 220
greenhouse gas emissions 187, 231
history 213
liquefaction 200, 383, 416–17
production capacity 207–8, 213–15
RasGas Train 1 208, 213
RasGas Train 2 208, 213
RasGas Train 3 208, 213–14
RasGas Train 4 208, 213–14
RasGas Train 5 208, 213–14
RasGas Train 6 208, 214
RasGas Train 7 94, 208, 214–15
REDD mechanism 277
regasification 45–50, 467
efficiency developments 202–3
terminals
capacity trends 49–50, 142, 144
development trends 50, 142
floating terminals 360, 390–95
overview 45–6
processes 46–8
by region and country 442–57
Reliance Industries 298
renewable energy
global recession, influence on 14–15
and natural gas demand trends 20
Repsol 65, 123–5, 128, 262, 459
reservoirs, conventional/
unconventional, meaning 282–3
Revithousasa terminal 444
RN-Astra 249
Romania 80, 299
Rosneft 249–50
Rosneft-Sinopec Consortium 251–2
Royal Dutch Shell 458
activities in Iraq 134
activities in Russia 250
natural gas business development 9
Prelude LNG project 95, 189, 198, 223, 234, 360, 392–5, 419
Shell Gas BV 70
terminal sponsorship 77
Royal Vopack 77, 79
royalties, meaning 467
Ruhl, Christof 191
Rumaila gas field 134
Russia
liquefaction capacity 144
LNG exports 67, 245–6
disputes over 74, 246
European region 73–4
to Japan 251
South Stream project 247
to Turkey 79
US shale gas impact on 326–7
LNG trade flows 167–8
natural gas
consumption 5–7
eexploration and production 244
gas flaring 244–5
production trends 327
reserves 92–3, 205, 243–4, 297
role in economic development 242–3
unconventional gas 297
pipeline gas 67, 246–7
European competition from 73–4
Nord Stream pipeline 247–8, 258
Sakhalin project 248–53, 423
challenges 249
imports from Kenai LNG, Alaska 91
liquefaction processes used by 36
liquefaction project costs 383
Sakhalin I 249–50, 253
Sakhalin II 97, 132, 250–51, 253
<table>
<thead>
<tr>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sakhalin III</td>
</tr>
<tr>
<td>Sakhalin IV</td>
</tr>
<tr>
<td>Shtokman project</td>
</tr>
<tr>
<td>Yamal LNG</td>
</tr>
<tr>
<td>Russian Shipbuilding Corporation</td>
</tr>
<tr>
<td>Sabah Oil and Gas Terminal</td>
</tr>
<tr>
<td>Sabah-Sarawak Gas Pipeline</td>
</tr>
<tr>
<td>Sabine Pass terminal</td>
</tr>
<tr>
<td>bi-directional contracts</td>
</tr>
<tr>
<td>delivered cost comparisons</td>
</tr>
<tr>
<td>early mover advantage</td>
</tr>
<tr>
<td>environmental impact, regulatory controls</td>
</tr>
<tr>
<td>import/regasification facility development</td>
</tr>
<tr>
<td>liquefaction project developments</td>
</tr>
<tr>
<td>LNG re-exports</td>
</tr>
<tr>
<td>applications and approvals</td>
</tr>
<tr>
<td>commercial structure</td>
</tr>
<tr>
<td>DOE role</td>
</tr>
<tr>
<td>environmental impact concerns</td>
</tr>
<tr>
<td>export predictions</td>
</tr>
<tr>
<td>financing arrangements</td>
</tr>
<tr>
<td>opposition to</td>
</tr>
<tr>
<td>public interest duties</td>
</tr>
<tr>
<td>SPA with BG Gulf Coast LNG</td>
</tr>
<tr>
<td>SPA with Blackstone</td>
</tr>
<tr>
<td>to WTO nations</td>
</tr>
<tr>
<td>project costs</td>
</tr>
<tr>
<td>shale spreads</td>
</tr>
<tr>
<td>Safe Drinking Water Act</td>
</tr>
<tr>
<td>safety features</td>
</tr>
<tr>
<td>Sakhalin Environment Watch</td>
</tr>
<tr>
<td>Sakhalin-Khabarivsk-Vladivostok gas system</td>
</tr>
<tr>
<td>Sakhalin project</td>
</tr>
<tr>
<td>challenges</td>
</tr>
<tr>
<td>imports from Kenai LNG, Alaska</td>
</tr>
<tr>
<td>liquefaction processes used by</td>
</tr>
<tr>
<td>liquefaction project costs</td>
</tr>
<tr>
<td>Sakhalin I</td>
</tr>
<tr>
<td>Sakhalin II</td>
</tr>
<tr>
<td>Sakhalin III</td>
</tr>
<tr>
<td>Sakhalin IV</td>
</tr>
<tr>
<td>sale and purchase agreements (SPA)</td>
</tr>
<tr>
<td>AIPN Master SPAs</td>
</tr>
<tr>
<td>duration</td>
</tr>
<tr>
<td>price review/price re-opener clauses</td>
</tr>
<tr>
<td>quantities</td>
</tr>
<tr>
<td>Santos</td>
</tr>
<tr>
<td>Sarawak gas field</td>
</tr>
<tr>
<td>Sasol-Chevron</td>
</tr>
<tr>
<td>Saudi Arabia</td>
</tr>
<tr>
<td>electricity generating capacity</td>
</tr>
<tr>
<td>gas flaring</td>
</tr>
<tr>
<td>natural gas</td>
</tr>
<tr>
<td>demand</td>
</tr>
<tr>
<td>production trends</td>
</tr>
<tr>
<td>reserves</td>
</tr>
<tr>
<td>SB Power Solutions, Inc.</td>
</tr>
<tr>
<td>SCF Group</td>
</tr>
<tr>
<td>SEGAS</td>
</tr>
<tr>
<td>Sempra</td>
</tr>
<tr>
<td>sendout, meaning</td>
</tr>
<tr>
<td>Sevmorneftegaz</td>
</tr>
<tr>
<td>shale gas</td>
</tr>
<tr>
<td>as bridge to renewable energy</td>
</tr>
<tr>
<td>in Canada</td>
</tr>
<tr>
<td>development and expansion</td>
</tr>
<tr>
<td>estimated recoverable reserves</td>
</tr>
<tr>
<td>key shale gas plays</td>
</tr>
<tr>
<td>environmental concerns</td>
</tr>
<tr>
<td>hydraulic fracturing, safety of</td>
</tr>
<tr>
<td>water contamination</td>
</tr>
<tr>
<td>water quantity and flowback</td>
</tr>
<tr>
<td>in Europe</td>
</tr>
<tr>
<td>potential impact</td>
</tr>
<tr>
<td>global industry</td>
</tr>
<tr>
<td>challenges</td>
</tr>
<tr>
<td>developing trends</td>
</tr>
<tr>
<td>estimated recoverable reserves</td>
</tr>
<tr>
<td>hydraulic drilling</td>
</tr>
<tr>
<td>hydraulic fracturing</td>
</tr>
<tr>
<td>EPA study</td>
</tr>
</tbody>
</table>

Susan L. Sakmar - 9781781005880
Downloaded from Elgar Online at 03/21/2019 02:32:17AM via free access
Energy for the 21st century

hydraulic fracturing fluids 286–8, 316–17
importance of 285, 306–7
safety concerns 306–7, 309–11
underground injection 314–16
overview 283–5
technology, role of 284, 289–90
in US challenges 303–4, 323
development and expansion 288–90
DOE role and recommendations 324–3
Environmental issues 305–10, 377–80
EPA diesel fuel guidelines 320–21
EPA effluent guidelines 319–20
EPA hydraulic fracturing study 317–19
estimated recoverable reserves 289, 302
Exxon/XTO merger 8–9, 310–11
Global Shale Gas Initiative 304–5
impact on Russian LNG sector 326–7
Leaf v. EPA (US) 314–15
liquids-rich shale plays 293
LNG exports, influence on 377–80
LNG imports, influence on 76, 88, 105, 137, 153, 327–8, 331–2
production trends 288–90
regulatory developments, Federal 312–17
regulatory developments, State 321–2
shale plays/deposit locations 290–93
“shale spreads” 328–31, 362, 383–5
Shale Gas Subcommittee (US DOE) 322–4
“shale spreads” 328–31, 383–5
Shanghai terminal 68, 449–50
Shell see Royal Dutch Shell
ship registration 41–2
shipping
LNG as fuel for 361, 401–4
engine modifications 403
limitations 404
see also LNG shipping
Shmidtovski gas field 252
short-term LNG markets 153–5
Shtokman Development Corporation 257–8
Shtokman gas field 255–8
Shtokman project 255–9, 423
Sierra Club
“Beyond Gas” campaign 13, 379
opposition to LNG export projects 378–9
Singapore 140
import/regasification terminals 49, 120, 456
Sinopec 298
SK Corporation 262
Skikda LNG 57, 95, 105, 175, 412
Snøhvit LNG 102–4
greenhouse gas emissions 187, 231
liquefaction 36, 383
Snow White gas field see Snøhvit
SODECO 249
Sonangol 112, 328
Sonatrach 57, 105
Sound Energy Solutions terminal 88
South and Central America
LNG imports 50, 122–3
LNG trade flows 167–8
natural gas
consumption trends 5–7
reserves 122, 297, 302
unconventional gas 297, 302
Panama Canal expansion, potential impact of 389–90
US exports to, opportunity cost of 391
see also individual countries
South Hook terminal 76, 78, 210–11, 445
South Korea
LNG imports
demand trends and projections 65–7
history 57–8
import/regasification terminals 50, 64–6, 456
importance of 64–5, 67
sources 65, 213, 381
Sale and Purchase Agreements 160, 367
South Pars gas field 97, 205

Susan L. Sakmar - 9781781005880
Downloaded from Elgar Online at 03/21/2019 02:32:17AM
via free access
Index

South-Tambeyskoye gas field 254
Southern LNG Co 462
Sovcomflot (SCF Group) 44
Soyo LNG 112, 412
Soyuz gas pipeline 246
Spain
  LNG imports 57, 73, 75, 443
  LNG re-exports 156
  LNG storage capacity 50
Spanish Egyptian Gas Company 107–8
Spectra Energy Westcoast gas pipeline 353
spot and short-term LNG markets 153–5, 399–400, 467
StatoilHydro 257, 259, 459
stranded gas, meaning 467
STX Offshore and Shipbuilding 44
submerged combustion vaporizers 48
subsea processes 104
Suez Canal 109–11
Suez-Mediterranean (SUMED) pipeline 110–11, 264
supercritical pulverized coal (SCPC) power plants 184–5
Sweden 49, 80, 299
Swinoujscie terminal 80, 445
Taichung terminal 67
Taiwan 57–8
  import demand trends and predictions 68
  import/regasification terminals 50, 67–8, 456
Taiwan Power Company 67–8
take or pay, meaning 467
Tamar gas field 135
Tangguh terminal 65, 421
tankers see carrier fleet under LNG shipping
Tanzania 114
terminals, generally
  design features 46–7
  receiving terminals, meaning 467
  storage tank capacity 48, 50, 152
see also under liquefaction; regasification
terrorism 175–6
Thailand
gas consumption trends 140
LNG imports
  regasification 49, 142, 456
  terminals 119–20, 456
  trends 119–20, 140
tight gas 283, 297
time charters, meaning 467
Tokyo Electric Power Company (Tepeco) 57, 59, 63, 210
Tokyo Gas 57, 59, 210
tolling rates, meaning 467
Tongyeong terminal 65, 456
Total 458
  activities in Australia 95, 419
  activities in Colombia 128
Total Gaz Electricité Holdings France 70
trans-ASEAN gas pipeline system (TACP) 101
transportation sector
  natural gas role in 19–21, 24
  see also vehicles, fuels for
Trinidad and Tobago
  LNG exports 93–4
  to Brazil 126
  pricing links 152
  supply capacity 104
  to US 81, 104–5
  LNG industry history 58
Turkey
  LNG imports 73, 79–80
  regasification terminals 80, 444
  shale gas developments 299
Turkmenistan 93, 244
Ukraine 74, 246
UN Framework on Climate Change 277
unconventional gas see coal bed methane; shale gas; tight gas
Union Stock Yards of Chicago 56
United Arab Emirates
  electricity generating capacity 130
  LNG industry
    liquefaction terminals 415
    regasification 142, 449
    supply capacity 105
    trends 49, 132
  natural gas
    demand 130
    reserves 244
United Kingdom

LNG imports
from Algeria 56–7, 73, 75, 105
demand trends and predictions 73–4, 76
import/receiving terminals 50, 76, 444–5
from Qatar 76, 210–11
National Balancing Point (NBP) 146–7, 149–51

United States
energy imports, from Canada 293–4
Energy Policy Act 2005 177–8, 315
Kenai terminal 57, 59–60, 88, 91, 423
LNG exports
bi-directional contracts 164–6, 329, 331
commercial structure 137, 362, 364
domestic gas pricing, influence on 371–7
export terminals 88, 90, 460
global impact of 386–7
opportunity cost of 391
political influences on 371–2
shale gas influence on 377–80
success predictions 361–2
LNG facilities
accidents at 174–5
import/regasification terminals 50, 82, 85–9, 176–7, 445–7, 460
liquefaction terminals 57
regulatory developments 177–8, 312–17, 321–2
site location, influences on 176–80
LNG imports
controversy and opposition 85, 87–8
demand trends and predictions 81–3
government policy developments 83–4
import/regasification terminals 50, 82, 85–9, 176–7, 445–7, 460
influences on 81, 176–7
price linking 151–3
shale gas industry influence on 76, 88, 105, 137, 153, 327–8, 331–2

sources 81–2, 108, 152, 280
trade protectionism 177
LNG industry, generally
environmental concerns 176–80
LNG for vehicle fuel, policy development on 406–7
prices, influence on 151–3, 362, 371–7
public opposition to 85, 87–8, 178–9, 341–3, 378–9
site locations, influences on 176–80
LNG re-exports 155–7, 156–7, 329, 331, 335–6, 461
applications and approvals 346–8, 461–2
commercial structure 362–4
DOE role 343–6, 461–2
environmental impact concerns 344–6
export predictions 361, 363–4
financing arrangements 347–8
opposition to 341–3
public interest duties 340–41, 344–6
Sale and Purchase Agreements 364–6, 368–9
to WTO nations 338–41, 370–71
LNG storage capacity 50, 152
LNG trade flows 167–8
natural gas
consumption trends 4–7, 407
production trends 327
reserves 93, 205, 244
Safe Drinking Water Act (US) 313–14
shale gas
challenges 303–4, 323
development and expansion 288–90
DOE role 322–4
environmental issues 305–10, 377–80
EPA guidelines 319–21
EPA hydraulic fracturing study 317–19
estimated recoverable reserves 289, 302
Exxon/XTO merger 8–9, 310–11
Global Shale Gas Initiative 304–5
Index

Leaf v. EPA 314–15
liquids-rich shale plays 293
LNG exports, influence on 377–80
LNG imports, influence on 76, 88, 105, 137, 153, 327–8, 331–2
production trends 288–90
regulatory developments, Federal 312–17
regulatory developments, State 321–2
Russian LNG sector, impact on 326–7
shale plays/deposit locations 290–93
“shale spreads” 328–31, 362, 383–5
terrorist attacks 176
upstream, meaning 467

vaporizers 48–9

vehicles, fuels for
compressed natural gas 21, 404–5, 463
LNG as 361, 404–9
natural gas vehicle technology 405–8
potential cost savings 406
US policy development on 406–9
Venezuela 128, 244
Veninskoye gas field 251–2
venting 181
Vietnam 120

waste management 174

water
disposal concerns 309, 319–20
drinking water 306–10, 313–14
quantity and flowback 308–10, 319–20
in shale gas production 309, 319–20
wastewater 174, 309, 319–20
weathering, meaning 467
Weaver’s Cove terminal 87

West Qurna-1 gas field 134
wet natural gas 33
wet natural gas, meaning 467
Wheatstone LNG project 66, 185–8, 223–4, 232–3, 235, 419
Woodford Shale 292–3
Woodside Energy 10, 186, 194, 222, 226, 459
Browse LNG project 187, 189, 194, 234
Greater Sunrise LNG project 234–5
Pluto LNG project 95, 187–8, 194, 223, 225–6, 235, 418
World Energy Outlook 2009 (IEA) 13–14
World Energy Outlook 2010 (IEA) 15
Worley Parsons study, on LNG greenhouse gas emissions 186, 190–92

Xena gas field 225
XTO Energy 8–9, 310–11

Yamal-Europe I and II gas pipelines 246–7
Yamal LNG 252, 254–5, 259, 423
Yemen 265
challenges
location 263–4, 266
political 264, 268
hydrocarbon dependency 264
LNG exports
to Chile 127–8
trends 94, 267–8
Yemen LNG 97, 264, 266–8
Yergin, Daniel 87, 179
Yung-An terminal 67, 456
Zeebrugge Hub 78, 151
Zeebrugge terminal 78–9, 151, 156, 444
Zubair gas field 134