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
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, 320
Bonaparte LNG project 234–5
Browse LNG 187, 189, 194, 234
Carbon Tax proposal 192–5
coil 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 Biliton 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
Bratstvo 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
carrierparty, 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
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
coal bed methane (CBM) 283,
289–99
coal 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
Distrigas 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
downstream, meaning 464
draft, meaning 464
Draper terminal 76, 445
dry gas, meaning 464
Dual Mixed Refrigerant (DMR)
process 36
Dubai see United Arab Emirates
Dunkirk terminal 77, 442
EA Gibson 42–3
Eagle Ford Shale 291, 293
<table>
<thead>
<tr>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Ohio Gas Company 56</td>
</tr>
<tr>
<td>Ecopetrol 128</td>
</tr>
<tr>
<td>EDF 77</td>
</tr>
<tr>
<td>EG LNG 413</td>
</tr>
<tr>
<td>Egegaz 80</td>
</tr>
<tr>
<td>Egypt</td>
</tr>
<tr>
<td>electricity generating capacity 130</td>
</tr>
<tr>
<td>international energy market role 109–10</td>
</tr>
<tr>
<td>liquefaction terminals 413</td>
</tr>
<tr>
<td>LNG exports 108, 112</td>
</tr>
<tr>
<td>pipeline exports 109–11</td>
</tr>
<tr>
<td>pricing 152</td>
</tr>
<tr>
<td>supply capacity 106–9</td>
</tr>
<tr>
<td>natural gas</td>
</tr>
<tr>
<td>consumption trends 106–7</td>
</tr>
<tr>
<td>reserves 93</td>
</tr>
<tr>
<td>political unrest, impact of 111–12, 136</td>
</tr>
<tr>
<td>El Musel terminal 75, 443</td>
</tr>
<tr>
<td>Elba Island terminal 81–2, 86, 89, 445, 458–9</td>
</tr>
<tr>
<td>electricity generation see power generation</td>
</tr>
<tr>
<td>Enelgy 77</td>
</tr>
<tr>
<td>emerging issues</td>
</tr>
<tr>
<td>floating terminals 360, 390–95</td>
</tr>
<tr>
<td>Gas Exporting Countries Forum (GECF) 360–61</td>
</tr>
<tr>
<td>compared with OPEC 400–401</td>
</tr>
<tr>
<td>history and development 395–6</td>
</tr>
<tr>
<td>international status 396–8</td>
</tr>
<tr>
<td>mission and objectives 398</td>
</tr>
<tr>
<td>oil-linked prices, policy on 399–400</td>
</tr>
<tr>
<td>whether a cartel 398–9</td>
</tr>
<tr>
<td>LNG as fuel 140</td>
</tr>
<tr>
<td>for shipping 361, 401–4</td>
</tr>
<tr>
<td>for vehicles 361, 404–9</td>
</tr>
<tr>
<td>Panama Canal expansion</td>
</tr>
<tr>
<td>history and progress 387–8</td>
</tr>
<tr>
<td>importance of 360</td>
</tr>
<tr>
<td>potential impact of 389–90</td>
</tr>
<tr>
<td>purpose 388–9</td>
</tr>
<tr>
<td>vessel size 388–9</td>
</tr>
<tr>
<td>see also LNG exports under US</td>
</tr>
<tr>
<td>Enarsa 124</td>
</tr>
<tr>
<td>EnCana 381, 407–8</td>
</tr>
<tr>
<td>Energia Costa Azul terminal 87, 179</td>
</tr>
<tr>
<td>energy poverty 20</td>
</tr>
<tr>
<td>ENI 77, 114, 128–9, 458</td>
</tr>
<tr>
<td>Ennore terminal 71</td>
</tr>
<tr>
<td>environmental issues</td>
</tr>
<tr>
<td>coal seam gas to LNG processes 238–41</td>
</tr>
<tr>
<td>environmental threats</td>
</tr>
<tr>
<td>to aquatic/shoreline environments 173–4</td>
</tr>
<tr>
<td>from LNG industry 173–6</td>
</tr>
<tr>
<td>from LNG transport 174</td>
</tr>
<tr>
<td>physical safety hazards 174–5</td>
</tr>
<tr>
<td>greenhouse gas emissions</td>
</tr>
<tr>
<td>emissions targets 13–14, 21–2, 28</td>
</tr>
<tr>
<td>IEA GAS Scenario 28–9</td>
</tr>
<tr>
<td>IEA New Policies Scenario 21–2</td>
</tr>
<tr>
<td>methane emissions 180–81, 195–9</td>
</tr>
<tr>
<td>methane mitigation 195–9</td>
</tr>
<tr>
<td>new technologies, role of 28–9</td>
</tr>
<tr>
<td>from shipping, regulation of 40, 201, 401–3</td>
</tr>
<tr>
<td>whether global or local concern 190–92, 277–8</td>
</tr>
<tr>
<td>international environmental guidelines 173–4</td>
</tr>
<tr>
<td>lifecycle emissions, of LNG 172, 181–3</td>
</tr>
<tr>
<td>carbon capture and sequestration 184</td>
</tr>
<tr>
<td>LNG vs. coal-fired power plants 183–5</td>
</tr>
<tr>
<td>LNG export projects, opposition to 341–3, 378–9</td>
</tr>
<tr>
<td>natural gas</td>
</tr>
<tr>
<td>advantages 7–8</td>
</tr>
<tr>
<td>as “bridge” fuel 7, 11–12</td>
</tr>
<tr>
<td>compared with fossil fuels 8, 11–13, 181–5</td>
</tr>
<tr>
<td>noise pollution 174</td>
</tr>
<tr>
<td>shale gas 11</td>
</tr>
<tr>
<td>hydraulic fracturing 306–7, 309–11</td>
</tr>
<tr>
<td>water contamination 306–10, 313–15</td>
</tr>
<tr>
<td>water quantity and flowback 308–10, 319–20</td>
</tr>
<tr>
<td>waste management 174</td>
</tr>
<tr>
<td>wastewater disposal 174, 309, 319–20</td>
</tr>
<tr>
<td>Environmental Protection Agency (EPA)</td>
</tr>
<tr>
<td>diesel fuel guidelines 320–21</td>
</tr>
<tr>
<td>hydraulic fracturing study 317–19</td>
</tr>
</tbody>
</table>
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
Excelsior 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
Index

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
membership 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
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
history and development 226–7
project costs 383
Greater Sunrise LNG project 234–5
Greece 73, 80, 444
greenfield plant, meaning 465
greenhouse gas emissions
Australian LNG experiences 185–92
emissions targets 21–2, 28
IEA GAS Scenario 28–9
IEA New Policies Scenario 21–2
methane emissions 180–81, 195–9
methane mitigation 195–9
from natural gas, compared with fossil fuels 8, 11–13, 181–5
new technologies, role of 28–9
from shipping, regulation of 40, 201, 401–3
study of 190–92
whether global or local concern 190–92, 277–8
Ground Water Protection Council (GWPC) 312
Groupe International des Importateurs de Gaz Naturel Liquéfié (International Group of Liquefied Natural Gas Importers) (GGIGNL) 34
GTL (gas-to-liquids) 217–18, 465
Guajira gas field 128
Guanabara Bay terminal 123, 126–7, 449
Guangdong terminal 68
Gulf Coast LNG Export 461
Gulf Gateway Energy Bridge terminal 88, 446
Gulf Interstate Engineering 260
Gulf LNG Energy 327
Gwangyang terminal 65, 456
Hackberry decision 162, 177
Hackberry terminal 162, 446
Halliburton Loophole 314–15
Hammerfest terminal 102, 414
Haynesville/Bossier Shale 291–2
Hazira terminal 70, 452
heads of agreement, meaning 465
heating value, meaning 465
Heede Cabrillo Study 181–3
Hides Gas Conditioning Plant 276
higher heating value 34
Honda Civic GX vehicles 407
Horn River shale gas field 381
hub, meaning 465
Huelva terminal 156, 443
Hungary 299–300
Hunt Oil Company 262
hydraulic drilling 285–6
hydraulic fracturing 286–7
in coal seam gas to LNG projects 239–40
EPA study 317–19
hydraulic fracturing fluids 286–8, 316–17
Leaf v. EPA (US) 314–15
safety concerns 306–7, 309–11
in shale gas industry, importance 285, 306–7
underground injection 314–16
US regulation 312, 316
hydrocarbon, meaning 465
Ichthys LNG 187, 189, 234–5, 419
Idku terminal 107–8, 413
Incheon terminal 65
India
LNG imports
demand trends and predictions 70–71
import/regasification terminals 71, 451–2
price controls 71–2
natural gas
demand trends 18
reserves 101
unconventional gas 298
shale gas developments 298
Indian Oil 71
Indonesia
LNG industry
generally 98–9
liquefaction 144, 420–21
LNG exports 67, 93–5, 98
regasification 49, 457
natural gas
consumption trends 140
production trends 327
reserves 93, 101, 140, 298
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/Io gas field 227
Japan
export credit agency financing role 219–20
Fukushima Daiiichi 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
exports 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
  to 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 developments 201–2
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 59, 88, 91, 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
c coal 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
Mozdock-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
c coal bed methane (CBM) 283,
289–99
c coal seam gas to LNG projects
in Australia 236–41
hydraulic fracturing 239–40
processes 236
consumption trends 4–7
conversion tables xvii–xviii
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
自然 gas consumption trends 5–7
see also individual countries
Odoptu gas field 249
OECD countries
自然 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
自然 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, liquefaction
- LNG market role
- market entry/history
- production capacity
- Q-Flex and Q-Max shipping
- Qatargas I
- Qatargas II
- Qatargas III
- Qatargas IV
- quantities, abbreviations
- Queensland AgForce
- Queensland Curtis LNG
- Quintero terminal
- Ras Laffan Emergency and Safety College
- Ras Laffan Industrial City
- RasGas LNG (Ras Laffan Co Ltd)
- Barzan Gas Project
- history
- liquefaction
- production capacity
- RasGas Train 1
- RasGas Train 2
- RasGas Train 3
- RasGas Train 4
- RasGas Train 5
- RasGas Train 6
- RasGas Train 7
- REDD mechanism
- regasification
- efficiency developments
- terminals
- capacity trends
- development trends
- floating terminals
- overview
- processes
- by region and country
- Reliance Industries
- renewable energy
- global recession, influence
- and natural gas demand trends
- Repsol
- Rosneft
- Rosneft-Sinopec Consortium
- Royal Dutch Shell
- Shell Gas BV
- Royal Vopack
- Ruhl, Christof
- Rumaila gas field
- Russia
- liquefaction capacity
- LNG exports
- disputes
- European region
- to Japan
- South Stream project
- to Turkey
- US shale gas impact
- LNG trade flows
- natural gas
- consumption
- exploration and production
- gas flaring
- production trends
- reserves
- role in economic development
- unconventional gas
- pipeline gas
- European competition
- Nord Stream pipeline
- Sakhalin project
- challenges
- imports from Kenai LNG, Alaska
- liquefaction processes used by
- liquefaction project costs
- Sakhalin I
- Sakhalin II
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 323–4
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
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
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 (Tepco) 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

- domestic LNG supplies 76
- 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