Index

adverse selection risk 113
Agency for the Cooperation of Energy Regulators (ACER) 181, 201
aid measures, compatibility of 250–54
Altmark judgment 248
Amsterdam Power Exchange (APX) 186
anti-competitive effects 219–20
antitrust cases 164
intervention 263
laws, US 261, 266
perspective, relevance in electricity 216
regulations 263–4
arbitrage, between gas and electricity markets 43, 46
assets
diversification 79
life span 107
specificity 106, 107
Asteris judgment 251
asymmetric information 104
auction mechanism 190
Australia, national electricity market (NEM) 75
backwards vertical integration 106
bankruptcy risk 66, 71
baseload capacities, ageing of, coal, fuel, oil, nuclear 295
baseload equipments 59, 188
bilateral contracts 30–31, 298
between generators and retail suppliers 61
Netherlands 184, 186
bounded rationality 104, 124
breach penalties 165, 170
British market, new investment in generation 90
British Midland/Aer Lingus 1992
Bundesnetzagentur (BNetzA),
Germany 148
buyer power 121, 220
California Department of Water Resources (DWR) 42
call option contracts 72
capacity development
producer–consumer joint venture 80
capacity expansion models
competitive market in risky environment 16–19
capacity markets 29
capital asset pricing model (CAPM) 36–7
capital-intensive equipment 83, 79, 181
capital-intensive technologies 24, 69
carbon dioxide (CO2) emission permits in Europe 38
Centrica
former gas utility in UK, major electricity retailer 98
strategy of electricity sourcing 76
CESSA 13
Chicago School 210, 211
on exclusion 164–5
climate change 13
climate policy commitments
investment in high-cost technologies 295
coal generation plants 59, 78–9
coal portfolio, fixed prices 50
coal price index Antwerp/Rotterdam/Amsterdam (ARP) 45
coal units, investment 26, 30
collateralized debt obligation (CDO) 28
collective buying schemes 206
collusion 163

301

Jean-Michel Glachant, Dominique Finon and Adrien de Hauteclouque - 9781849804806
Downloaded from Elgar Online at 01/12/2019 08:32:19AM via free access
combined-cycle gas turbine (CCGT) 208, 210, 296
combined heat power (CHP) technology 44–6, 55, 65, 69
coal and nuclear power plant 39
co-generation of heat and electricity 81
co-generation of heat and electricity, least risky option 51–2
plants portfolio, fixed prices 50
self-hedged 68–9
least risky option 51–2
plants portfolio, fixed prices 50
self-hedged 68–9
technology 44–6, 55, 65, 69
combined heat power (CHP) technology 44–6, 55, 65, 69
small electricity producers, Dutch market 185–6
Commercial Solvent decision (1974) and EU Treaty 262
Commodity contracts in gas markets 134, 147
competition enforcement at EU level long-term contracts (LTC) 202
excessive 94
hindrances to 183
in retailing 94
securing investment 31
and security of supply 14
without entry 160–64
competition authorities, national and EU 299
competition cases, evolution of economic analysis 232
competition law 35
cross-border issues 274, 276
European Union 219–20, 234–7
competition policy 7–9
in European energy markets 201–28, 202, 275
Trinko decision 265–9
competitive markets 18, 241, 267
building of, sector-specific regulator 270
coordination and investments 140–42
coordination problem in network upgrading 141
cost equipment, low variable 59
cost minimization 65
cost-plus contract types 104
cost-setting technology reduced market risks 47
cost structure and risks electricity generation technologies 66
cournot competition in spot market Cournot conjecture in forward market 162–3
Court of First Instance (CFI), European Communities 260
cross-border tariffs 272
cross-border trading in Europe 181, 190
cross-subsidies in Dutch electricity sector (NMa) 137
reduction of, effect of unbundling 136–7
cumulative foreclosure, E.ON Ruhrgas 220–21
customers, large
  price and quantity risks for retailers 110
day-ahead market, Belgium (Belpex) 190
debt 28
debt finance 68
decentralized markets 84, 214
definition of ‘aid’ 249–50
de-integration (unbundling) 101
demand risks 24
demand uncertainty 107
derivatives, use of, for electricity price risk 68
‘destination clause’, competition obstacle in Europe 43
Deutsche Telekom (DT) decision European Commission, 2003 263–4
Directorate General of Competition 180
  contract duration restriction 178
discrimination 273–4
  dispatchability period, reduction 69
  ‘dispatchability risk’, gas price increase 66
disruption risk 17, 32–3
distribution network owners (DNO), unbundling 138–9
Distrigaz and EDF
  commitments comparison 226
  settlement, October 2007 222, 235
  treatment of incumbents 225–7
dominance, collective, in energy 273
dominant firms in Europe
  Hoffman-Laroche decision, 1979 268
double marginalization 206
downstream competition 211
downstream integration by generators 118–19
duration clauses 212
duration of contracts 222
Dutch–German border, transport capacity 190
Dutch–German interconnection
difference in prices APX and EEX 192
Dutch–Norwegian NorNed, explicit auctioning 190
Dutch retail market for electricity 192–4
economic dependency of buyer 221
economics of long-term contracts
  liberalized energy markets 202–16
EDF/Direct Energie case, France 281–4
EDF v. Commission, 2009 236
  efficiency gains 212
  and anti-competitive effects, criteria for 223–4
  and losses, long-term contracts (LTC) 213
Electrabel, strategy of 76–7
Electricidad de Portugal (EDP), state-aid case 236–7
Electricidad de Portugal/Pego 217
electric-intensive industries, long-term supply contracts 70
electricity connector BritNed between GB and the Netherlands 279
electricity distribution cooperatives, rural, USA
  upstream vertical integration 106
electricity generation
  capacity investment 204
  technologies, costs and risks 209
electricity markets
  competitive 23–4, 26
  decentralized 94–130
  and forward contracts 168–9
  imperfect competition, long-term contracts 159
  investment and competition in 58–92
  need for risk management 109–11
  electricity price, spot markets 45–7
  electricity price risk 66
  combination with fuel price risk 45
  electricity reforms, market 58
Electricity Supply Board (ESB) 224
Index

electricity systems, decentralized 126
contracts in 108–16
rationales for vertical integration 117
vesting contracts 123
electricity transmission system
operators, Germany 144
electro-intensive industrial consumers
73
energy-intensive industries
baseload electricity need 206
energy-intensive users, risks 297
energy-only market 29
Enron scandal, California 214–15
entry deterrence 166–7, 171
Environmental Aid Guidelines 250
environmental policy of EU
and power-intensive industry 177
environmental protection 242
environmental standards 248
\textit{E.ON Ruhrgas} 222
Essential Facilities Doctrine (EFD)
266, 273, 295–300
antitrust liability 261
competition policy, transatlantic
view 260–69
direct divestitures 277
energy sector case 259–88
in EU energy sector 268–84
gas storage 272
implementation in USA and EU
260–62
interconnectors, regulatory powers
in the EU 281
nuclear facilities extension 281–4
related principles in energy 277
\textit{Trinko} decision 262–3
and unbundling 270–72
US Supreme Court case law 261
European Commission, major
objectives in energy 13
European competition policy
essential facilities doctrine 259–88
European continental market
investors’ relations with supply
business 91
European Court of Justice (ECJ)
‘exceptional circumstances’ 261
European internal energy market
cross-border interconnector capacity
142
European legislation 135
European markets
household and commercial segments
74
European Network of Transmission
System Operators (ENTSO) 278
event tree interpretation 17–18, 36–7
with BaU, 21
with SoS risks 20
exclusionary clauses 167–8, 211
long-term contracts (LTC) 164
exclusive agreements 169–71
exclusive dealings and entry 164–8
exclusive distribution clauses in gas
216
exclusivity clauses 205, 212
\textit{Exeltium} arrangement, bilateral
contract 30
expected net present value (ENPV) 49
external contract monitoring 104

farmer-ownership of dairy processors
downstream vertical integration 106
fidelity rebates 211, 219
financial crisis 35, 295
financial futures markets 164
financial hedging instruments 51
electricity industry 39–40
financial instruments, innovative 203
financial risk management instruments
39
financing generation investment 78–9
financing uncertain revenues 26
Finland, baseload supplies of power 92
Finnish TVO consortium, nuclear
plant 81–2
fixed-cost recovery 64, 65, 69, 166
fixed-fee contract types 104
fixed-price electricity contracts 41–2
protection 70–71
fixed-quantity contract 73
‘flexibility clause’, part of long-term
contracts in Europe 43
foreclosure 101, 222
and European electricity markets
178, 181, 216
foreign investment promotion in
Poland and Hungary 241–2
forward contracting 115–16
short-term 160–64, 168–9
Index

forward markets 27
  Dutch 187
illiquid 113–14
  strategies 207
forward price 75
fossil fuel price, investment 38–9
fuel diversity 208
fuel price risk 66
  CCGT project 72
fuel price, spot markets 45–7
fuel prices, gas, coal and nuclear 38
fuel procurement contracts, risk allocation 51
fuel supply contracts 118, 216
full-risk trading 27
gas disruption risk 22, 31
gas equipment, nuclear and coal 208
gas-fired power stations, Centrica 76
  market price signals 43
gas from Russia, risks 109
gas industries, liberalization, risks for investors 38
gas industry, decentralized investment decisions 144
gas markets
  competitive 23–5
  Europe 32–3
  pipelines and transportation contracts 146–51
  US, variety 150
Gas Natural/Endesa 217, 219
  leading electrical producer, Spain 221
gas plants, correlation between gas and power prices 46
gas price insecurity, North Sea reserves, decline in 109
gas prices during disruption 33
gas retailers 98
gas storage and interconnectors, markets 273
gas supply problem 20
gas turbines 26, 29
Gazprom/Eni (2003) 275
  Trasis Austria Gasleitung (TAG) 276
Gazprom/OMV (2005) 134–5, 276
  Trasis Austria Gasleitung (TAG) 276
GDF Suez, 2007
  nuclear investment in France 283
generation capacity 145–6
generation investment 59, 64, 69, 77, 208
generation portfolio 78–9
generation, renewable
  long-term fixed-price contracts 42
generation technologies 44
electricity and fuel price risks 42–3
  ‘generation three’ nuclear technology 44, 55
generator competition and dominance 127
generators
  hold-up risks for 111–13
  integrated 118
  price and quantity risks 109, 111
generator supply, retailer–customer demand 114
George Verkeorganisation GmbH (GVG)
  and refusal of Ferrovie dello Stato (FS) 262
German gas market
  EU gas directive 1998 146–7
  NetConnect and Gaspool 148
governance, multiple forms 105
governance problems, ‘moral hazard in teams’ 140
‘green technologies’
  capital intensive technologies 39
  grid companies and utilities 99
‘hard-core’ restraints (blacklisted clauses) 218–19
hedge contracts, expiring 112
hedge markets, liquidity 114
hedging electricity price risks, large customers 97
hedging options 40
hedging short-term exposure to price 110
Herfindal–Hirschman Index (HHI) 185
‘hold-up’ risks 65, 94–95
  and generators 112
  for large customers and retailers 112–13
horizontal concentration 60
horizontal de-integration 65, 127
horizontal integration 60
household segment, retail competition 75
human capital requirements
barrier to generation ownership 118
Hungarian PPAs 245–7
Hungarian spot market 245
Hungary, electricity markets
Magyar, Villamos Művek Zrt (MVM) 237–41
hydro generators
environmental regulations, risk 109
storage constraints, risk 109
variable inflows, risk 109
Ijsselcentrale 217
imperfect competition 5–7, 159–74
short-term efficiency 2
independent power producer (IPP) projects 75
independent system operator (ISO) 31, 136
investment issue 143–4
tendered transmission investment 143–4
indexed-price contracting 72
industrial structures, vertically de-integrated 64
industry coordination, Dutch 184
information asymmetries 113
information costs 40
infra-marginal rents, hourly market equilibrium 62
infrastructure-based policies, US preference
Trinko decision 266
infrastructure of electricity industry 189
input cost risk 58
input price risks 110
interconnection with Germany and Belgium
Netherlands electricity industry 189
interconnector capacity 134
competition improver 142–3
Germany, electricity market model 145
supply security improver 142
interconnector expansion
effect on social welfare 144
interconnector investment in electricity markets 144–6
internal transfer pricing 137
investment decisions
coordination pricing 139–40
electricity price signals 61
investment development 2–5
investment hedging 65
investment model, power generation assets 44
investment by producer 170–71
investment projects in Dutch energy-only market 188
investment risk 39
investment and supply security 119
investments 168–72
risk-free market 17
investments, ex ante and ex post 15–16
security of supply 19–23
investments in generation capacity 1997–2007 in different liberalized markets 89–93
investor-owned processors 106
Isab Energy/Enel 217
Jahrhundertvertrag 217
jet fuel storage 276
KalibaXel/EDF 219
large generation companies
diversified portfolio of technologies 48
LARSEN workshop on long-term supply contracts
European decentralized electricity markets 295–300
legal unbundling 136
legislation in US gas market, major occurrences 150
Lerner Index (LI), RSI–LI equation 145
liberalization plans in Poland 246
liquid contracts market
competitive entry of retailers 97
liquid futures markets 40, 179
liquid markets, importance of 147
liquid natural gas (LNG) 26
liquidity in German gas market 148
load servicing entity 77
London Economics parameter values 145
long-term contracts (LTC) 2–9, 38–57, 67–8, 71–2, 80, 82, 116, 160, 183, 206
anti-competitive effects 217, 219, 298
comparison with vertical integration 77–8
in electricity markets 159–74, 177–82
European energy markets 201–28
exclusionary effects 211
Netherlands 186–7
new productions 73
potential anti-competitive effects 216–23
roles of 102–8
security 38
and state aid 233–57
USA 105–6
value, 44–51
long-term contracts under EC state-aid rules 234–7
long-term contracts value capturing probabilistic model 55–7
long-term efficiency 2–5
and market imperfections 82–4
long-term future markets 63–4
long-term power purchase agreements 48, 50
long-term supply contracts 204, 296
Magyar, Villamos Művek Zrt (MVM) 237–41, 243, 247
mandatory ownership unbundling
German political opposition 136
marginal units 208
market-based transacting 104
market capitalization 79
market design and long-term contracts 178–9
market economic investor test (MEIT) 246–7
market failure 34, 61
in decentralized market model 65–73
in fixed-cost recovery 65–7
incompleteness of 68
in investment 24
market foreclosure
long-term vertical contracts 233
market illiquidity 113–14
market imperfections and long-term efficiency 82–4
marketing contracting costs 107
market integration 181
market liberalization 89
market liquidity 178
market monitoring 83
market partitioning 212
market power 115, 159, 207, 220
fluctuations 77
output markets 115
reduction 164
risk 82
and vertical integration 161
market risk 36–7, 78
markets to bureaucracies 103–8
mature markets in Europe 92
mean-variance portfolio (MVP) theory 49
merchant investment in transmission 278–81
merchant lines 279
merchant plant project 58, 69, 78, 79, 89
revenues by spot sales 64
merchant system 24–5
Microsoft decision on interoperability
dominant firms in Europe 268
‘missing money’ problem 119
model information 19
monopolization strategies 266
monopoly commission 136
Monte Carlo simulation 44, 49
moral hazard 71, 140
multiple equilibria, gas markets 135
Nash bargaining process 172
national balancing point (NBP) 45
national electricity market (NEM)
Australia 99, 100
National Electricity Trading Arrangement (NETA) 91, 99, 203
natural gas-fired generation 42
‘natural monopoly’ features 97
‘net competition effect’ 212
of long-term contracts 214
Netherlands case, loss of synergies 138
Netherlands electricity industry, competition 183–97
net present value minimization 65
Index

network unbundling in energy markets 135
new productions and large consumers 80
vertical arrangements 79–82
New Zealand market, restructuring vertical integration 100
New Zealand unbundling 101
non-fossil fuel plants 79
non-recourse debt 64
Nordic market, transnational 181
NordPool, Scandinavia contract markets 99
market price 82
NorNed, Netherlands and Norway 280
NPV distribution model 45–6
nuclear build
France, Finland, UK and USA 43
nuclear extension 20
nuclear fuel cost 47
nuclear generating costs 42
nuclear investment in France, capital-intensive 283
nuclear plant portfolio, fixed prices 50
nuclear technology 24
‘nuclear waste fee’ 55

offshore wind capacity 141
oil products 40
operating flexibility
risk allocation 51
value of 43, 45
opportunism incentives 81, 108, 171
opportunistic behaviour on rents 104–5
optimal generation portfolios 49–50
options markets 27
over the counter (OTC) 68
markets, Dutch 184, 186
ownership and contracting costs 102, 107–8, 116–17
ownership/integration 105–6
ownership unbundling 134, 136
ownership unbundling of distribution networks
arguments for 138

partial monopoly regulation 75
peak-load plants 188
Pennsylvania–New Jersey–Maryland regional market (PJM) 100–101, 203
perfect competition 19–23
perfect information 210
physical assets 76–7
pipelines and transportation contracts in gas markets 146–51
pipelines, unbundling, USA
Federal Energy Regulatory Commission (FERC) 143
Poland, electricity markets
Polskie Sieci Elektroenergetyczne S.A. 237, 241
power purchase agreement 237
Polskie Sieci Elektroenergetyczne S.A. 237–44
power purchase agreements (PPAs) 246
portfolio of assets, utility 48–51
portfolio bidding 78
portfolio strategy 63
portfolio utilities, diversified generation technologies 49, 52
Power Exchange (PX) 24–6
power generation technologies 39
capital intensive technologies 51
exposure to market risk 38, 51
power industries, liberalization
risks for investors 38
power-intensive industries
capital-intensive equipment 180
and electricity market liberalization 177
power plant investors, futures in gas or electricity 40
power plant valuation, contractual hedges impact 44
power purchase agreements (PPAs) 42, 73, 75, 224, 244
core principle 243
energy-intensive users 216
Hungary and Poland 239–42
risk allocation 41, 51
security of supply, Poland and Hungary 249
as state aid 233
stranded 299
power supply in market transition 181–2
price capping 33, 128
price competition 162
price indexation clause 70
price and quantity risks for retailers 109, 110
price risk 58, 109
management 71
in medium to long term 44
price variations, stochasticity 68
price volatility 64, 74
private generators, risk aversion of 114–15
private sector merchant projects, Australia 90
privatization process 237–8
producer–consumer joint venture 81
producer–supplier, alignment of interests 69
production portfolios 79
production risks 24
production technologies 164
‘project finance’ 64, 89
failure of 68–9
project management expertise 118
project profitability 204
project risk 58
‘purchase obligations’, Hungarian PPA’s 253–4
pure merchants projects
European continental markets, 1998–2009 92

random variables 56
real-time demand-side responsiveness 125
real-time demand variability 109
real-time imbalances 129
real-time supply and demand 68
recovery issues, Hungary 253–4
reduction clauses 205, 212
redundant capacities 28
refusal-to-deal cases 273
Regional Aid Guidelines, Poland and Hungary 250
regulation of partial monopoly 75
regulation risks, reduced 121–2
regulation versus antitrust, Trinko decision 263–4
regulatory adjustments 84
regulatory costs, limitation
harmful infringements 218–19
regulatory powers in EU 201
relative risk aversion 114–15
remedies to missing money 29–30
renewable energy sources (RES) wind, hydro, photovoltaic 20
REN/Turbogas 217
Repsol 222
Residual Supply Index (RSI) 145
pivotal and market results, relationship 188–9
retail competition 71
reduced hold-up risk 117–19
reduction of 124–5
retail customer demand 125
retail entry and generation investment 98–9, 118, 205
retail franchise monopolies 127
retail market competition 73–5, 128
retail monopoly, suppression, 1998 90
Rheinish-Westfälische Elektrizitätswerke (RWE) antitrust enforcement 269
right of first refusal 212
risk allocation 65, 70
barrier to investment decentralized market model 61–4
risk diversification 79
risk-free world 24–5
risk hedging 73
long-term, fixed-price contracts 63
risk management 59, 97
basic principles 59
Dutch market 187
of large consumers 177–82
mismatches 126
need 67
risk mitigation advantage
marginal price in electricity market 46
risk protection 243
risk-return combination 49
risk sharing 65
investors and ‘consumers’ 69
via vertical arrangements 73–84
risk-shifting 74
risks minimization 65
Index

risk trading 19–5
and market failure 27, 37
Russia–Ukraine gas dispute 35

sales contracts portfolios 63
Sarlux 217
scarcity rents 62, 207
scenario analysis, impact of risk 16–17
Scottish Nuclear 217
scrubbed coal technology 44, 55
Sea Containers v. Stena Sealink (1994) 274
Sealink/B&I Holyhead (1992) 274
secondary EU law
third-party access (TPA) 270–72
Sector Enquiry Report (EC) 235
long-term energy contracts, guidelines 234–5
security of supply (SoS) 13–16, 23–5, 35, 225, 242
and long-term contracts 300
security trading 37
self-hedging effects 66, 78
selling and purchasing consortia 217
Services of General Economic Interest (SGEIs)
and power purchase agreements (PPAs) 248–9
short-dated hedge contracts 90
short-term cash management 204
short-term contracts 64, 124, 245
short-term purchase 77
simulation techniques 51
’single buyer’ model, electricity 237–8
single-buyer systems 237
social cost–benefit analysis (SCBA) 145
ownership unbundling 144
social welfare 211–12
in European Union price and quantity risk hedging 203
positive effects of long-term contracts 207
SoS risks 21–2
sourcing portfolios 63, 73
’spark-spread contract’ 86
spot contracts, USA 105
spot exchange, day-ahead 178
spot and forward markets, volatility 296
spot markets 47, 77, 82, 119, 203
drying out 211
and longer-term contracts 104
strategies, market power 207
trading through 98
spot prices 75, 160–61, 163
spot trading 61, 129
stand-alone peaking investment 122
State Aid Action Plan (SAAP), 2005 235
state aid
and long term contracts 233–57, 239–40, 242–3
and tender procedures 241–2
state financial support 235
state-owned generators, risk aversion of 114–15
‘stochastic processes’ 17–18
stochastic program, SoS events 21
Stranded Cost Methodology, 2001, aid 251
stranded costs
compensation 237
variety of forms 251
strategic bargaining risks 126
strategic investment withholding 142–3
suboptimal capacity margins 126
sunk cost equipment 73
suppliers and risk management 63
’supply functions’, short-term competition 162
supply security 111, 127
switching costs 73–4
Sydkraft/Graninge (2003), balancing services 273
Synergen 217, 223–4
synergies, vertical economies of scope 137–9
system operation (SO) 140
tacit renewal clause 212
take or pay contracts, compensation 252
tariff regulation 75–6
taxpayer guarantees 97
TCE (transaction cost economics) perspective 84
technological choices
diversified portfolio 48
Index

in electricity markets 38–57
electricity price signals 61
technology mix 208
Telecommunications Act US, 1996 263
Telemarketing decision, 1995, and EU Treaty 262
temporal specificity 106
tendered transmission investment 144
tendering procedure
Poland, objectives of 238
state aid 241–2
thermal generation 119
third energy legislation package 181
third-party access (TPA)
grants 270–72
restrictions cases 275
threshold level of vertical integration 122–3
tolling agreements 216
tolling contracts 72
natural gas to electricity, conversion 42
transaction cost economics (TCE) 65, 77, 85, 102, 205
transaction costs 40, 104
increase of 104–5
of renegotiation 205
transaction frequency 107
TransEuropean Energy Networks-Electricity (TEN-E) 278
transmission capacity auctions 114
transmission constraints 122
barriers to retail entry 124
transmission markets 273
transmission system operator (TSO) 29, 136, 190
abuses of dominance by 272–7
merchant lines building 280
unbundling 271
transportation contracts, entry and exit points 147
transportation capacity 143, 148–9
transport contracts in gas industry 143
Transpower, Eon transmission network 136
Treaty on the Functioning of the European Union (TFEU) 201, 218, 233, 235, 236
Trinko decision 264, 267
TVO consortium, bilateral contract 30–32
TXU-Europe 90
under-investment in essential facilities, case law 276
upstream integration by generators into fuel supplies 119
upstream investment incentives 122
uranium prices 42
US competition policies, major divide with Europe 259
US gas market, comparison with Germany 150–51
US markets, household and commercial segments 74
utilities generation portfolios 49
Verizon 263
vertical arrangements, necessity of vertical integration, long-term contracts 296–8
vertical de-integration 65, 127
vertical economies of scope, loss of 138
vertical integration 2, 39, 60, 65, 77, 82, 95–6, 126, 183
decentralized systems 116–26
increasing levels 101
partial or complete 76
production-supply 76–7
reduction of spot trade 83
and risk management 77
supply-security and load matching 121
of utilities 61
wholesale price risks 119
vertically integrated utility (VIU) 142–3
vertical ownership unbundling 136
vertical reintegration 215, 297
vertical relations 134–53
unbundling and investment 135–44
vertical separation and re-integration 99–101
vertical unbundling of transmission networks 142
virtual power plants (VPPs) 283
volume clauses 205
volume risk 58
and demand variability 66
Index

welfare-enhancing competition 97

wholesale buyers and producers sharing investment risks 68–73

wholesale electricity markets, Dutch 185–9

wholesale price 71, 125, 161

internationalization via vertical integration 120

wind farms, investing in 65

wind power plants 79