

Table of Contents

Foreword	i
Table of Contents	iii
List of Tables	xix
List of Figures	xxiv
List of Abbreviations	xxviii
Introduction	1
Indicies.....	1
Opportunities Indices.....	1
Risk Indices.....	3
Chapter 1: EU Renewable Energy Development Policy	7
1.1 EU Targets.....	7
1.2 Incentives in the EU.....	10
1.2.1 Feed-in Tariffs.....	10
1.2.2 Fixed and Variable Premiums.....	11
1.2.3 Tradable Green Certificates.....	11
1.2.4 Tender Schemes.....	12
1.3 Renewable Electricity Incentive System Comparative Analysis.....	13
1.4 Renewable Electricity Incentives Systems in the EU.....	13
1.5 EU Public Acceptance.....	15
Chapter 2: EU Power Market	17
2.1 EU Energy Supply and Consumption.....	17
2.2 EU Electricity Generation.....	18
2.2.1 Future EU Electricity Generation Projections.....	19
2.3 Renewable Electricity Generation.....	20
2.3.1 Overview.....	20
2.3.2 Country Overview.....	21
2.4 Levelised Generation Costs.....	23
2.5 Renewable Energy Technology Overview.....	24
2.5.1 Wind Power.....	24
2.5.1.1 Onshore Wind.....	26
2.5.1.2 Offshore Wind.....	28
2.5.2 Biomass.....	29
2.5.2.1 Solid Biomass.....	30
2.5.2.2 Biogas.....	31
2.5.3 Solar Power.....	32
2.5.3.1 Solar PV.....	32
2.5.3.2 Concentrated Solar-thermal Power (CSP).....	34
2.5.4 Small Hydro.....	36
2.5.5 Geothermal.....	36
2.5.6 Marine (Wave/Tidal).....	37
2.6 EU Grid-Connection Overview.....	39
2.6.1 Overview of the EU's Power Grid.....	39
2.6.2 Unbundling.....	40
2.7 The Electricity Wholesale Market in the EU.....	42
2.8 EU Emissions Trading Scheme Overview.....	43
Chapter 3: Renewable Energy Investment	47
3.1 Total Investment.....	47
3.2 Investor Analysis.....	48

3.2.1 Venture Capital and Private Equity	49
3.2.2 Asset Financing	50
3.2.3 Public Equity Markets	50
3.2.4 Mergers and Acquisitions	51
3.2.5 Investment by Renewable Energy Technology	51
3.3 Overview of the Rates of Return on Investment	52
Chapter 4: Austria	55
Executive Summary	55
Opportunities Indices	55
Risk Indices	55
4.1 Incentive Opportunities Index	56
4.1.1 Feed-in Tariff	56
4.1.2 Investment Subsidies	56
4.2 Power Market Opportunities Index	58
4.2.1 Energy Consumption	58
4.2.2 Electricity Sector	58
4.3 Technology Opportunities Index	60
4.3.1 Renewable Electricity Generation	60
4.3.2 Resource Potential	61
4.3.3 Levelised Generation Costs	62
4.3.4 Wind Power	63
4.3.4.1 Onshore Wind Power	63
4.3.4.2 Offshore Wind Power	63
4.3.5 Biomass	63
4.3.5.1 Solid Biomass	63
4.3.5.2 Biogas	63
4.3.6 Solar Energy	63
4.3.6.1 Solar PV	63
4.3.6.2 Concentrated Solar-thermal Power	64
4.3.7 Small Hydro	64
4.3.8 Geothermal	64
4.3.9 Marine (Wave/Tidal)	64
4.4 Political Will Risk Index	64
4.4.1 Government Structure	65
4.4.2 Targets and Commitments	65
4.4.3 Public Sentiment	65
4.5 Grid Connection Risk Index	66
4.5.1 Functional Separation	66
4.5.2 Grid Capacity	66
4.5.3 Access and Connection Cost	67
4.6 Planning Permission Risk Index	67
4.6.1 Complexity and Expected Timescales	67
4.6.2 Local Opposition and Procedural Improvements	67
4.7 Conclusion	68
Chapter 5: Belgium	69
Executive Summary	69
Opportunities Indices	69
Risk Indices	69
5.1 Incentive Opportunities Index	70
5.1.1 Tradable Green Certificate	70
5.1.1.1 Federal Incentives	71
5.1.1.2 Flanders	71

5.1.1.3 Wallonia	72
5.1.2 Investment Support	73
5.2 Power Market Opportunities Index.....	74
5.2.1 Energy Consumption	74
5.2.2 Electricity Sector.....	74
5.2.3 Nuclear Power.....	76
5.3 Technology Opportunities Index.....	77
5.3.1 Renewable Electricity Generation	77
5.3.2 Resource Potential	78
5.3.3 Levelised Generation Costs	79
5.3.4 Wind Power.....	80
5.3.4.1 Onshore Wind Power.....	80
5.3.4.2 Offshore Wind Power.....	80
5.3.5 Biomass.....	80
5.3.5.1 Solid Biomass	80
5.3.5.2 Biogas	80
5.3.6 Solar Energy.....	81
5.3.6.1 Solar PV	81
5.3.6.2 Concentrated Solar-thermal Power.....	81
5.3.7 Small Hydro.....	81
5.3.8 Geothermal	81
5.3.9 Marine (Wave/Tidal).....	81
5.4 Political Will Risk Index	82
5.4.1 Government Structure.....	82
5.4.2 Targets and Commitments.....	82
5.4.3 Public Sentiment	83
5.5 Grid Connection Risk Index.....	83
5.5.1 Functional Separation	83
5.5.2 Grid Capacity	83
5.5.3 Access and Connection Cost	84
5.6 Planning Permission Risk Index	84
5.6.1 Complexity and Expected Timescales	84
5.7 Conclusion.....	85
Chapter 6: Bulgaria	87
Executive Summary	87
Opportunities Indices.....	87
Risk Indices	87
6.1 Incentive Opportunities Index.....	88
6.1.1 Feed-in Tariff	88
6.1.2 Investment Support	89
6.2 Power Market Opportunities Index.....	89
6.2.1 Energy Consumption	89
6.2.2 Electricity Sector.....	90
6.2.3 Nuclear Power.....	91
6.3 Technology Opportunities Index.....	92
6.3.1 Renewable Electricity Generation	92
6.3.2 Resource Potential	93
6.3.3 Levelised Generation Costs	94
6.3.4 Wind Power.....	94
6.3.4.1 Onshore Wind Power.....	94
6.3.4.2 Offshore Wind Power.....	95
6.3.5 Biomass.....	95
6.3.5.1 Solid Biomass	95
6.3.5.2 Biogas	95

6.3.6 Solar Energy.....	96
6.3.6.1 Solar PV	96
6.3.6.2 Concentrated Solar-thermal Power	96
6.3.7 Small Hydro.....	96
6.3.8 Geothermal	96
6.3.9 Marine (Wave/Tidal).....	96
6.4 Political Will Risk Index	97
6.4.1 Government Structure.....	97
6.4.2 Targets and Commitments	97
6.4.3 Public Sentiment	98
6.5 Grid Connection Risk Index.....	98
6.5.1 Functional Separation	98
6.5.2 Grid Capacity	99
6.5.3 Access and Connection Cost	99
6.6 Planning Permission Risk Index	100
6.6.1 Complexity and Expected Timescales	100
6.6.2 Local Opposition and Procedural Improvements	100
6.7 Conclusion.....	100
Chapter 7: Czech Republic	103
Executive Summary	103
Opportunities Indices.....	103
Risk Indices	103
7.1 Incentive Opportunities Index.....	104
7.1.1 Premium Incentive Scheme	104
7.1.2 Investment Support	105
7.2 Power Market Opportunities Index.....	105
7.2.1 Energy Consumption	105
7.2.2 Electricity Sector.....	105
7.2.3 Nuclear Power.....	106
7.3 Technology Opportunities Index	108
7.3.1 Renewable Electricity Generation	108
7.3.2 Resource Potential	108
7.3.3 Levelised Generation Costs	109
7.3.4 Wind Power	110
7.3.4.1 Onshore Wind Power	110
7.3.4.2 Offshore Wind Power	110
7.3.5 Biomass.....	110
7.3.5.1 Solid Biomass	110
7.3.5.2 Biogas	111
7.3.6 Solar Energy.....	111
7.3.6.1 Solar PV	111
7.3.6.2 Concentrated Solar-thermal Power Projects	112
7.3.7 Small Hydro.....	112
7.3.8 Geothermal	112
7.3.9 Marine (Wave/Tidal).....	112
7.4 Political Will Risk Index	112
7.4.1 Government Structure.....	113
7.4.2 Targets and Commitments	113
7.4.3 Public Sentiment	114
7.5 Grid Connection Risk Index.....	114
7.5.1 Functional Separation	114
7.5.2 Grid Capacity	114
7.5.3 Access and Connection Cost	115
7.6 Planning Permission Risk Index	115

7.6.1 Complexity and Expected Timescales	115
7.6.2 Local Opposition and Procedural Improvements.....	116
7.7 Conclusion.....	116
Chapter 8: Denmark.....	117
Executive Summary	117
Opportunities Indices.....	117
Risk Indices	117
8.1 Incentive Opportunities Index.....	118
8.1.1 Feed-in Tariffs	118
8.1.2 Offshore Wind Power	119
8.1.3 Investment Subsidies.....	119
8.2 Power Market Opportunities Index.....	120
8.2.1 Energy Consumption	120
8.2.2 Electricity Sector.....	120
8.3 Technology Opportunities Index	122
8.3.1 Renewable Electricity Generation	123
8.3.2 Resource Potential	123
8.3.3 Levelised Generation Costs	124
8.3.4 Wind Power.....	125
8.3.4.1 Onshore Wind Power.....	125
8.3.4.2 Offshore Wind Power.....	125
8.3.5 Biomass.....	125
8.3.5.1 Solid Biomass	125
8.3.5.2 Biogas	126
8.3.6 Solar Energy.....	126
8.3.6.1 Solar PV	126
8.3.6.2 Concentrated Solar-thermal Power.....	126
8.3.7 Small Hydro.....	126
8.3.8 Geothermal	126
8.3.9 Marine (Wave/Tidal).....	127
8.4 Political Will Risk Index	128
8.4.1 Government Structure.....	128
8.4.2 Targets and Commitments.....	128
8.4.3 Public Sentiment	129
8.5 Grid Connection Risk Index.....	129
8.5.1 Functional Separation	129
8.5.2 Grid Capacity	130
8.5.3 Access and Connection Cost	130
8.6 Planning Permission Risk Index	131
8.6.1 Complexity and Expected Timescales	131
8.6.2 Local Opposition and Procedural Improvements.....	131
8.7 Conclusion.....	132
Chapter 9: Finland.....	133
Executive Summary	133
Opportunities Indices.....	133
Risk Indices	133
9.1 Incentive Opportunities Index.....	134
9.1.1 Primary Support Mechanism.....	134
9.1.2 Investment Subsidies.....	135
9.2 Power Market Opportunities Index.....	135
9.2.1 Energy Consumption	135
9.2.2 Electricity Sector.....	136

9.2.3 Nuclear Power.....	137
9.3 Technology Opportunities Index.....	139
9.3.1 Renewable Electricity Generation.....	139
9.3.2 Resource Potential.....	139
9.3.3 Levelised Generation Costs.....	140
9.3.4 Wind Power.....	141
9.3.4.1 Onshore Wind Power.....	141
9.3.4.2 Offshore Wind Power.....	142
9.3.5 Biomass.....	143
9.3.5.1 Solid Biomass.....	143
9.3.5.2 Biogas.....	143
9.3.6 Solar Energy.....	143
9.3.6.1 Solar PV.....	143
9.3.6.2 Concentrated Solar-thermal Power.....	143
9.3.7 Small Hydro.....	143
9.3.8 Geothermal.....	144
9.3.9 Marine (Wave/Tidal).....	144
9.4 Political Will Risk Index.....	144
9.4.1 Government Structure.....	144
9.4.2 Targets and Commitments.....	145
9.4.3 Public Sentiment.....	145
9.5 Grid Connection Risk Index.....	146
9.5.1 Functional Separation.....	146
9.5.2 Grid Capacity.....	146
9.5.3 Access and Connection Cost.....	147
9.6 Planning Permission Risk Index.....	147
9.6.1 Complexity and Expected Timescales.....	147
9.6.2 Local Opposition and Procedural Improvements.....	147
9.7 Conclusion.....	148
Chapter 10: France.....	149
Executive Summary.....	149
Opportunities Indices.....	149
Risk Indices.....	149
10.1 Incentive Opportunities Index.....	150
10.1.1 Feed-in Tariff.....	150
10.1.2 Feed-in Tariff for Solar PV.....	151
10.1.3 Investment Subsidies.....	151
10.1.4 Research and Development.....	152
10.2 Power Market Opportunities Index.....	152
10.2.1 Energy Consumption.....	152
10.2.2 Electricity Sector.....	153
10.2.3 Nuclear Power.....	155
10.3 Technology Opportunities Index.....	155
10.3.1 Renewable Electricity Generation.....	155
10.3.2 Resource Potential.....	155
10.3.3 Levelised Generation Costs.....	156
10.3.4 Wind Power.....	157
10.3.4.1 Onshore Wind Power.....	157
10.3.4.2 Offshore Wind Power.....	158
10.3.5 Biomass.....	158
10.3.5.1 Solid Biomass.....	158
10.3.5.2 Biogas.....	159
10.3.6 Solar Energy.....	159
10.3.6.1 Solar PV.....	159

10.3.6.2 Concentrated Solar-thermal Power	161
10.3.7 Small Hydro.....	161
10.3.8 Geothermal	162
10.3.9 Marine (Wave/Tidal)	162
10.4 Political Will Risk Index	162
10.4.1 Government Structure.....	163
10.4.2 Targets and Commitments	163
10.4.3 Public Sentiment	163
10.5 Grid Connection Risk Index.....	164
10.5.1 Functional Separation	164
10.5.2 Grid Capacity	164
10.5.3 Access and Connection Cost	165
10.6 Planning Permission Risk Index	165
10.6.1 Complexity and Expected Timescales	165
10.6.2 Local Opposition and Procedural Improvements.....	166
10.7 Conclusion.....	166
Chapter 11: Germany.....	167
Executive Summary	167
Opportunities Indices.....	167
Risk Indices	167
11.1 Incentive Opportunities Index.....	168
11.1.1 Feed-in Tariffs	168
11.1.2 Degression.....	168
11.1.3 Investment Subsidies.....	169
11.2 Power Market Opportunities Index.....	171
11.2.1 Energy Consumption	171
11.2.2 Electricity Sector.....	172
11.2.3 Nuclear Power.....	173
11.3 Technology Opportunities Index	174
11.3.1 Renewable Electricity Generation	175
11.3.2 Resource Potential	176
11.3.3 Levelised Generation Costs.....	176
11.3.4 Wind Power	177
11.3.4.1 Onshore Wind Power	177
11.3.4.2 Offshore Wind Power	178
11.3.5 Biomass.....	179
11.3.5.1 Solid Biomass	179
11.3.5.2 Biogas	180
11.3.6 Solar Energy.....	180
11.3.6.1 Solar PV	180
11.3.6.2 Concentrated Solar-thermal Power	181
11.3.7 Small Hydro.....	181
11.3.8 Geothermal	182
11.3.9 Marine (Wave/Tidal)	182
11.4 Political Will Risk Index	182
11.4.1 Government Structure.....	182
11.4.2 Targets and Commitments	183
11.4.3 Public Sentiment	183
11.5 Grid Connection Risk Index.....	184
11.5.1 Functional Separation	184
11.5.2 Grid Capacity	184
11.5.3 Access and Connection Cost	185
11.6 Planning Permission Risk Index	185
11.6.1 Complexity and Expected Timescales	185

11.6.2 Local Opposition and Procedural Improvements.....	185
11.7 Conclusion.....	186
Chapter 12: Greece	187
Executive Summary.....	187
Opportunities Indices.....	187
Risk Indices.....	187
12.1 Incentive Opportunities Index.....	188
12.1.1 Feed-in Tariffs	188
12.1.2 Investment Subsidies.....	189
12.2 Power Market Opportunities Index.....	189
12.2.1 Energy Consumption	189
12.2.2 Electricity Sector.....	190
12.3 Technology Opportunities Index	192
12.3.1 Renewable Electricity Generation	192
12.3.2 Resource Potential	192
12.3.3 Levelised Generation Costs	193
12.3.4 Wind Power	194
12.3.4.1 Onshore Wind Power	194
12.3.4.2 Offshore Wind Power	194
12.3.5 Biomass.....	194
12.3.5.1 Solid Biomass	194
12.3.5.2 Biogas	194
12.3.6 Solar Energy.....	195
12.3.6.1 Solar PV	195
12.3.6.2 Concentrated Solar-thermal Power.....	196
12.3.7 Small Hydro.....	196
12.3.8 Geothermal	197
12.3.9 Marine (Wave/Tidal).....	197
12.4 Political Will Risk Index	197
12.4.1 Government Structure.....	197
12.4.2 Targets and Commitments	197
12.4.3 Public Sentiment	198
12.5 Grid Connection Risk Index.....	198
12.5.1 Functional Separation	198
12.5.2 Grid Capacity	199
12.5.3 Access and Connection Cost	200
12.6 Planning Permission Risk Index	200
12.6.1 Complexity and Expected Timescales	200
12.6.2 Local Opposition and Procedural Improvements.....	201
12.7 Conclusion.....	201
Chapter 13: Hungary.....	203
Executive Summary.....	203
Opportunities Indices.....	203
Risk Indices.....	203
13.1 Incentive Opportunities Index.....	204
13.1.1 Premium Incentive Scheme.....	204
13.1.2 Investment Support	205
13.2 Power Market Opportunities Index.....	205
13.2.1 Energy Consumption	205
13.2.2 Electricity Sector.....	206
13.2.3 Nuclear Power.....	207
13.3 Technology Opportunities Index	208
13.3.1 Renewable Electricity Generation	208

13.3.2 Resource Potential	208
13.3.3 Levelised Generation Costs	209
13.3.4 Wind Power	210
13.3.4.1 Onshore Wind Power	210
13.3.4.2 Offshore Wind Power	210
13.3.5 Biomass	210
13.3.5.1 Solid Biomass	210
13.3.5.2 Biogas	211
13.3.6 Solar Energy	211
13.3.6.1 Solar PV	211
13.3.6.2 Concentrated Solar-thermal Power	211
13.3.7 Small Hydro	211
13.3.8 Geothermal	212
13.3.9 Marine (Wave/Tidal)	212
13.4 Political Will Risk Index	212
13.4.1 Government Structure	212
13.4.2 Targets and Commitments	213
13.4.3 Public Sentiment	213
13.5 Grid Connection Risk Index	214
13.5.1 Functional Separation	214
13.5.2 Grid Capacity	214
13.5.3 Access and Connection Cost	214
13.6 Planning Permission Risk Index	215
13.6.1 Complexity and Expected Timescales	215
13.6.2 Local Opposition and Procedural Improvements	215
13.7 Conclusion	215
Chapter 14: Ireland	217
Executive Summary	217
Opportunities Indices	217
Risk Indices	217
14.1 Incentive Opportunities Index	218
14.1.1 Feed-in Tariff	218
14.1.2 Investment Support	219
14.2 Power Market Opportunities Index	220
14.2.1 Energy Consumption	220
14.2.2 Electricity Sector	221
14.2.3 Nuclear Power	222
14.3 Technology Opportunities Index	223
14.3.1 Renewable Electricity Generation	223
14.3.2 Resource Potential	224
14.3.3 Levelised Generation Costs	225
14.3.4 Wind Power	225
14.3.4.1 Onshore Wind Power	226
14.3.4.2 Offshore Wind Power	226
14.3.5 Biomass	227
14.3.5.1 Solid Biomass	227
14.3.5.2 Biogas	227
14.3.6 Solar Energy	227
14.3.6.1 Solar PV	227
14.3.6.2 Concentrated Solar-thermal Power	227
14.3.7 Small Hydro	227
14.3.8 Geothermal	227
14.3.9 Marine (Wave/Tidal)	228
14.4 Political Will Risk Index	228

14.4.1 Government Structure.....	228
14.4.2 Targets and Commitments.....	228
14.4.3 Public Sentiment.....	229
14.5 Grid Connection Risk Index.....	229
14.5.1 Functional Separation.....	229
14.5.2 Grid Capacity.....	230
14.5.3 Access and Connection Cost.....	230
14.6 Planning Permission Risk Index.....	231
14.6.1 Complexity and Expected Timescales.....	231
14.6.2 Local Opposition and Procedural Improvements.....	231
14.7 Conclusion.....	232
Chapter 15: Italy.....	233
Executive Summary.....	233
Opportunities Indices.....	233
Risk Indices.....	233
15.1 Incentive Opportunities Index.....	234
15.1.1 Tradable Green Certificates.....	234
15.1.2 Solar Power Feed-in Tariff and Premium.....	235
15.1.3 Microgeneration Feed-in Tariff.....	236
15.1.4 Investment Subsidies and Tax Rebates.....	236
15.2 Power Market Opportunities Index.....	237
15.2.1 Energy Consumption.....	237
15.2.2 Electricity Sector.....	238
15.2.3 Nuclear Power.....	240
15.3 Technology Opportunities Index.....	240
15.3.1 Renewable Electricity Generation.....	240
15.3.2 Resource Potential.....	241
15.3.3 Levelised Generation Costs.....	242
15.3.4 Wind Power.....	243
15.3.4.1 Onshore Wind Power.....	243
15.3.4.2 Offshore Wind Power.....	243
15.3.5 Biomass.....	243
15.3.5.1 Solid Biomass.....	243
15.3.5.2 Biogas.....	244
15.3.6 Solar Energy.....	244
15.3.6.1 Solar PV.....	244
15.3.6.2 Concentrated Solar-thermal Power.....	245
15.3.7 Small Hydro.....	245
15.3.8 Geothermal.....	246
15.3.9 Marine (Wave/Tidal).....	246
15.4 Political Will Risk Index.....	246
15.4.1 Government Structure.....	246
15.4.2 Targets and Commitments.....	246
15.4.3 Public Sentiment.....	247
15.5 Grid Connection Risk Index.....	248
15.5.1 Functional Separation.....	248
15.5.2 Grid Capacity.....	248
15.5.3 Access and Connection Cost.....	249
15.6 Planning Permission Risk Index.....	249
15.6.1 Complexity and Expected Timescales.....	249
15.6.2 Local Opposition and Procedural Improvements.....	250
15.7 Conclusion.....	250
Chapter 16: Netherlands.....	253

Executive Summary	253
Opportunities Indices	253
Risk Indices	253
16.1 Incentive Opportunities Index	254
16.1.1 Premium Incentive Scheme	254
16.1.2 Investment Support	255
16.2 Power Market Opportunities Index	255
16.2.1 Energy Consumption	256
16.2.2 Electricity Sector	256
16.2.3 Nuclear Power	258
16.3 Technology Opportunities Index	258
16.3.1 Renewable Electricity Generation	258
16.3.2 Resource Potential	259
16.3.3 Levelised Generation Costs	260
16.3.4 Wind Power	260
16.3.4.1 Onshore Wind Power	260
16.3.4.2 Offshore Wind Power	261
16.3.5 Biomass	261
16.3.5.1 Solid Biomass	261
16.3.5.2 Biogas	261
16.3.6 Solar Energy	262
16.3.6.1 Solar PV	262
16.3.6.2 Concentrated Solar-thermal Power	262
16.3.7 Small Hydro	262
16.3.8 Geothermal	262
16.3.9 Marine (Wave/Tidal)	262
16.4 Political Will Risk Index	263
16.4.1 Government Structure	263
16.4.2 Targets and Commitments	263
16.4.3 Public Sentiment	264
16.5 Grid Connection Risk Index	265
16.5.1 Functional Separation	265
16.5.2 Grid Capacity	265
16.5.3 Access and Connection Cost	266
16.6 Planning Permission Risk Index	266
16.6.1 Complexity and Expected Timescales	266
16.6.2 Local Opposition and Procedural Improvements	266
16.7 Conclusion	267
Chapter 17: Poland	269
Executive Summary	269
Opportunities Indices	269
Risk Indices	269
17.1 Incentive Opportunities Index	270
17.1.1 Tradable Green Certificates	270
17.1.2 Investment Support	271
17.2 Power Market Opportunities Index	271
17.2.1 Energy Consumption	271
17.2.2 Electricity Sector	272
17.2.3 Nuclear Power	274
17.3 Technology Opportunities Index	274
17.3.1 Renewable Electricity Generation	274
17.3.2 Resource Potential	275
17.3.3 Levelised Generation Costs	276

17.3.4	Wind Power	277
17.3.4.1	Onshore Wind Power	277
17.3.4.2	Offshore Wind Power	278
17.3.5	Biomass	278
17.3.5.1	Solid Biomass	278
17.3.5.2	Biogas	278
17.3.6	Solar Energy	278
17.3.6.1	Solar PV	278
17.3.6.2	Concentrated Solar-thermal Power	279
17.3.7	Small Hydro	279
17.3.8	Geothermal	279
17.3.9	Marine (Wave/Tidal)	279
17.4	Political Will Risk Index	279
17.4.1	Government Structure	279
17.4.2	Targets and Commitments	280
17.4.3	Public Sentiment	280
17.5	Grid Connection Risk Index	281
17.5.1	Functional Separation	281
17.5.2	Grid Capacity	281
17.5.3	Access and Connection Cost	282
17.6	Planning Permission Risk Index	282
17.6.1	Complexity and Expected Timescales	282
17.6.2	Local Opposition and Procedural Improvements	283
17.7	Conclusion	283
Chapter 18: Portugal		285
Executive Summary		285
Opportunities Indices		285
Risk Indices		285
18.1	Incentive Opportunities Index	286
18.1.1	Feed-in Tariff	286
18.1.2	Investment Support	287
18.2	Power Market Opportunities Index	288
18.2.1	Energy Consumption	288
18.2.2	Electricity Sector	289
18.3	Technology Opportunities Index	290
18.3.1	Renewable Electricity Generation	291
18.3.2	Resource Potential	292
18.3.3	Levelised Generation Costs	293
18.3.4	Wind Power	293
18.3.4.1	Onshore Wind Power	293
18.3.4.2	Offshore Wind Power	294
18.3.5	Biomass	294
18.3.5.1	Solid Biomass	294
18.3.5.2	Biogas	294
18.3.6	Solar Energy	295
18.3.6.1	Solar PV	295
18.3.6.2	Concentrated Solar-thermal Power	296
18.3.7	Small Hydro	296
18.3.8	Geothermal	296
18.3.9	Marine (Wave/Tidal)	296
18.4	Political Will Risk Index	297
18.4.1	Government Structure	297
18.4.2	Targets and Commitments	297
18.4.3	Public Sentiment	298

18.5 Grid Connection Risk Index.....	298
18.5.1 Functional Separation	298
18.5.2 Grid Capacity	299
18.5.3 Access and Connection Cost	299
18.6 Planning Permission Risk Index	300
18.6.1 Complexity and Expected Timescales	300
18.6.2 Local Opposition and Procedural Improvements.....	300
18.7 Conclusion.....	300
Chapter 19: Romania	301
Executive Summary	301
Opportunities Indices.....	301
Risk Indices	301
19.1 Incentive Opportunities Index.....	302
19.1.1 Tradable Green Certificates.....	302
19.1.2 Investment Support.....	303
19.2 Power Market Opportunities Index.....	303
19.2.1 Energy Consumption	304
19.2.2 Electricity Sector.....	304
19.2.3 Nuclear Power.....	306
19.3 Technology Opportunities Index.....	306
19.3.1 Renewable Electricity Generation	306
19.3.2 Resource Potential	307
19.3.3 Levelised Generation Costs.....	308
19.3.4 Wind Power	309
19.3.4.1 Onshore Wind Power	309
19.3.4.2 Offshore Wind Power	309
19.3.5 Biomass.....	309
19.3.5.1 Solid Biomass	309
19.3.5.2 Biogas	310
19.3.6 Solar Energy.....	310
19.3.6.1 Solar PV	310
19.3.6.2 Concentrated Solar-thermal Power	310
19.3.7 Small Hydro.....	310
19.3.8 Geothermal	311
19.3.9 Marine (Wave/Tidal)	311
19.4 Political Will Risk Index	311
19.4.1 Government Structure.....	311
19.4.2 Targets and Commitments	311
19.4.3 Public Sentiment	312
19.5 Grid Connection Risk Index.....	312
19.5.1 Functional Separation	312
19.5.2 Grid Capacity	313
19.5.3 Access and Connection Cost	313
19.6 Planning Permission Risk Index	314
19.6.1 Complexity and Expected Timescales	314
19.6.2 Local Opposition and Procedural Improvements.....	314
19.7 Conclusion.....	314
Chapter 20: Slovakia.....	315
Executive Summary	315
Opportunities Indices.....	315
Risk Indices	315
20.1 Incentive Opportunities Index.....	316
20.1.1 Feed-in Tariffs	316

20.1.2 Investment Support	317
20.2 Power Market Opportunities Index.....	318
20.2.1 Energy Consumption	318
20.2.2 Electricity Sector.....	319
20.2.3 Nuclear Power.....	320
20.3 Technology Opportunities Index	321
20.3.1 Renewable Electricity Generation	321
20.3.2 Resource Potential	321
20.3.3 Levelised Generation Costs	322
20.3.4 Wind Power	323
20.3.4.1 Onshore Wind Power	323
20.3.4.2 Offshore Wind Power	323
20.3.5 Biomass.....	323
20.3.5.1 Solid Biomass	323
20.3.5.2 Biogas	323
20.3.6 Solar Energy.....	324
20.3.6.1 Solar PV	324
20.3.6.2 Concentrated Solar-thermal Power	324
20.3.7 Small Hydro.....	324
20.3.8 Geothermal	324
20.3.9 Marine (Wave/Tidal).....	324
20.4 Political Will Risk Index	325
20.4.1 Government Structure.....	325
20.4.2 Targets and Commitments	325
20.4.3 Public Sentiment	326
20.5 Grid Connection Risk Index.....	326
20.5.1 Functional Separation	326
20.5.2 Grid Capacity	327
20.5.3 Access and Connection Cost	327
20.6 Planning Permission Risk Index	328
20.6.1 Complexity and Expected Timescales	328
20.6.2 Local Opposition and Procedural Improvements.....	328
20.7 Conclusion.....	328
Chapter 21: Spain	331
Executive Summary	331
Opportunities Indices.....	331
Risk Indices	331
21.1 Incentive Opportunities Index.....	332
21.1.1 Feed-in Tariffs and Premiums	332
21.1.2 Solar PV Feed-in Tariff.....	334
21.1.3 Investment Support	334
21.2 Power Market Opportunities Index.....	335
21.2.1 Energy Consumption	335
21.2.2 Electricity Sector.....	336
21.2.3 Nuclear Power.....	338
21.3 Technology Opportunities Index	339
21.3.1 Renewable Electricity Generation	339
21.3.2 Resource Potential	340
21.3.3 Levelised Generation Costs	341
21.3.4 Wind Power	342
21.3.4.1 Onshore Wind Power	342
21.3.4.2 Offshore Wind Power	343
21.3.5 Biomass.....	343
21.3.5.1 Solid Biomass	343

21.3.5.2 Biogas	344
21.3.6 Solar Energy.....	344
21.3.6.1 Solar PV	344
21.3.6.2 Concentrated Solar-thermal Power	346
21.3.7 Small Hydro.....	347
21.3.8 Geothermal	347
21.3.9 Marine (Wave/Tidal)	347
21.4 Political Will Risk Index	347
21.4.1 Government Structure.....	347
21.4.2 Targets and Commitments	348
21.4.3 Public Sentiment	348
21.5 Grid Connection Risk Index.....	349
21.5.1 Functional Separation	349
21.5.2 Grid Capacity	349
21.5.3 Access and Connection Cost	350
21.6 Planning Permission Risk Index	351
21.6.1 Complexity and Expected Timescales	351
21.6.2 Local Opposition and Procedural Improvements.....	351
21.7 Conclusion.....	352
Chapter 22: Sweden	353
Executive Summary	353
Opportunities Indices	353
Risk Indices	353
22.1 Incentive Opportunities Index.....	354
22.1.1 Tradable Green Certificates	354
22.1.2 Investment Subsidies.....	356
22.2 Power Market Opportunities Index.....	356
22.2.1 Energy Consumption	356
22.2.2 Electricity Sector.....	357
22.2.3 Nuclear Power.....	358
22.3 Technology Opportunities Index	359
22.3.1 Renewable Electricity Generation	359
22.3.2 Resource Potential	359
22.3.3 Levelised Generation Costs	361
22.3.4 Wind Power	361
22.3.4.1 Onshore Wind Power	361
22.3.4.2 Offshore Wind Power	362
22.3.5 Biomass.....	363
22.3.5.1 Solid Biomass	363
22.3.5.2 Biogas	363
22.3.6 Solar Energy.....	364
22.3.6.1 Solar PV	364
22.3.6.2 Concentrated Solar-thermal Power	364
22.3.7 Small Hydro.....	364
22.3.8 Geothermal	365
22.3.9 Marine (Wave/Tidal)	365
22.4 Political Will Risk Index	365
22.4.1 Government Structure.....	365
22.4.2 Targets and Commitments	366
22.4.3 Public Sentiment	367
22.5 Grid Connection Risk Index.....	367
22.5.1 Functional Separation	367
22.5.2 Grid Capacity	367
22.5.3 Access and Connection Cost	368

22.6 Planning Permission Risk Index	369
22.6.1 Complexity and Expected Timescales	369
22.6.2 Local Opposition and Procedural Improvements.....	369
22.7 Conclusion.....	370
Chapter 23: The United Kingdom.....	371
Executive Summary	371
Opportunities Indices.....	371
Risk Indices	371
23.1 Incentive Opportunities Index.....	372
23.1.1 Tradable Green Certificate.....	372
23.1.2 Feed-in Tariff for Microgeneration.....	375
23.1.3 Investment Support	376
23.2 Power Market Opportunities Index.....	378
23.2.1 Energy Consumption	378
23.2.2 Electricity Sector.....	379
23.2.3 Nuclear Power.....	381
23.3 Technology Opportunities Index	382
23.3.1 Renewable Electricity Generation	382
23.3.2 Resource Potential	383
23.3.3 Levelised Generation Costs	384
23.3.4 Wind Power	385
23.3.4.1 Onshore Wind Power	385
23.3.4.2 Offshore Wind Power	386
23.3.5 Biomass.....	387
23.3.5.1 Solid Biomass	387
23.3.5.2 Biogas	388
23.3.6 Solar Energy.....	389
23.3.6.1 Solar PV	389
23.3.6.2 Concentrated Solar-thermal Power	389
23.3.7 Small Hydro.....	389
23.3.8 Geothermal	389
23.3.9 Marine (Wave/Tidal).....	389
23.4 Political Will Risk Index	392
23.4.1 Government Structure.....	392
23.4.2 Targets and Commitments	392
23.4.3 Public Sentiment	393
23.5 Grid Connection Risk Index.....	393
23.5.1 Functional Separation	394
23.5.2 Grid Capacity	394
23.5.3 Access and Connection Cost	395
23.6 Planning Permission Risk Index	396
23.6.1 Complexity and Expected Timescales	396
23.6.1.1 Projects over 50 MW.....	397
23.6.1.2 Projects up to 50 MW	397
23.6.1.3 Offshore Projects	397
23.6.2 Local Opposition and Procedural Improvements.....	398
23.7 Conclusion.....	399
Chapter 24: Summary	401
Opportunity Indices	401
Year-on-year Opportunity Indices Changes	403
Risk Indices.....	404
Year-on-year Risk Indices Changes.....	406

Total Opportunity and Risk Index Comparison.....	407
Glossary	409

List of Tables

Table 1.1: EU member states' targets for the contribution of renewable energy to final energy consumption by 2020 (%).....	8
Table 1.2: Target interim increase in RE contribution to final energy consumption.....	10
Table 1.3: Renewable electricity incentive system comparison.....	13
Table 1.4: Summary of operating incentive systems used in the EU.....	14
Table 2.1: Projected electricity consumption in the EU-27 in 2020.....	20
Table 2.2: Projected generating capacity expansions from 2005-2020 (GW).....	20
Table 2.3: Renewable electricity installed capacity projections for 2010 and 2020 in the EU-27.....	21
Table 2.4: Renewable electricity consumption as a share of gross electricity consumption in the EU from 1998 until 2006 (where available) and the 2010 targets (per cent).....	22
Table 2.5: Levelised electricity generation costs by technology (EUR/MWh, in constant 2005 price)	23
Table 2.6: Global top 10 wind-turbine suppliers.....	25
Table 2.7: Offshore wind farms expected to be operational by 2015 as of January 2009 (MW).....	28
Table 2.8: Biomass conversion options for electricity generation	30
Table 2.9: Electricity generation from solid biomass in selected EU member states in 2006 and 2007.....	31
Table 2.10: The use of biogas for power generation in selected countries in the EU in 2006 and 2007 (GWh).....	31
Table 2.11: Total installed generating capacity of solar PV in selected countries of the EU (MW)	32
Table 2.12: Comparison of CSP parabolic trough and central receiver systems.....	35
Table 2.13: Operational concentrated solar power plants in Europe.....	36
Table 2.14: Geothermal electric power installed capacity at the end of 2008 in the EU.....	37
Table 2.15: Description of the electric power grid and operators	39
Table 2.16: Description of unbundling in the EU	40
Table 2.17: Number of TSOs and DSOs in each member state and their unbundling status.....	41
Table 2.18: Phase Two emissions caps under the ETS (annual, in millions of tonnes of CO ₂).....	44
Table 3.1: European renewable energy merger and acquisitions by country in 2008	51
Table 4.1: The feed-in tariff rates in Austria for new installations starting operation in 2009 (EUR/MWh).....	57
Table 4.2: Growth in renewable electricity generation supported by the FIT system in Austria from 2002 to 2008 (GWh)	61
Table 4.3: Growth in installed capacity for renewable power plants except hydropower in Austria from 2002 to 2008 (MW).....	61
Table 4.4: Potential renewable electricity deployment in Austria in 2020 under the EU's balanced scenario (TWh).....	62
Table 4.5: Comparison of the FIT rates in Austria for 2009 with levelised generation costs in 2007 (EUR/MWh).....	62
Table 4.6: Austrian government commitments.....	65
Table 5.1: Minimum purchase price for federal TGCs in Belgium.....	71
Table 5.2: Renewable electricity quota in Flanders	72

Table 5.3:	Minimum TGC prices (EUR/MWh) in Flanders, from 1 January 2006.....	72
Table 5.4:	Technology banding in Wallonia with the minimum purchase price.....	73
Table 5.5:	Renewable electricity generation in Flanders estimated based on green certificates awarded (MWh).....	77
Table 5.6:	Renewable electricity generation in Wallonia estimated based on green certificates awarded (MWh).....	78
Table 5.7:	Projected increase in renewable electricity generation by 2012 in Wallonia.....	78
Table 5.8:	Potential renewable electricity deployment in Belgium in 2020 under the EU's balanced scenario (TWh).....	79
Table 5.9:	Comparison of generation compensation in Belgium in 2008 (when TGCs are sold at market prices) with levelised generation costs in the EU in 2007 (EUR/MWh).....	79
Table 5.10:	Planned offshore wind power projects in Belgium.....	80
Table 5.11:	Belgian government commitments.....	82
Table 6.1:	Feed-in tariff rates in Bulgaria for new installations operating after 31 March 2009.....	88
Table 6.2:	Growth in capacity and generation of renewable electricity in Bulgaria from 2005 to 2008.....	93
Table 6.3:	Potential renewable electricity deployment in Bulgaria in 2020 under the EU's balanced scenario (TWh).....	94
Table 6.4:	Comparison of the FIT in Bulgaria in 2009 and levelised generation costs in the EU in 2007 (EUR/MWh).....	94
Table 6.5:	Bulgarian government commitments.....	98
Table 7.1:	Feed-in tariff rates and fixed premiums in the Czech Republic for projects commissioned after 1 January 2009.....	104
Table 7.2:	Renewable electricity generation in the Czech Republic from 2003 to 2007 (GWh).....	108
Table 7.3:	Potential renewable electricity deployment in the Czech Republic in 2020 under the EU's balanced scenario (TWh).....	109
Table 7.4:	Comparison of feed-in tariff rates and premiums in the Czech Republic with levelised generation costs in the EU in 2007 (EUR/MWh).....	109
Table 7.5:	Renewable electricity generated from biomass in the Czech Republic between 2003 and 2007 (MWh).....	110
Table 7.6:	Renewable electricity generated from biogas in the Czech Republic between 2003 and 2007 (MWh).....	111
Table 7.7:	Czech government commitments.....	113
Table 8.1:	Operation incentives in Denmark for installations commissioned from January 2009.....	118
Table 8.2:	Growth in renewable electricity generation in Denmark from 2004 to 2007 (GWh).....	123
Table 8.3:	Potential renewable electricity deployment in Denmark in 2020 under the EU's balanced scenario (TWh).....	124
Table 8.4:	Comparison of the generation compensation in Denmark in 2009 and levelised generation costs in the EU in 2007 (EUR/MWh).....	124
Table 8.5:	Status of offshore wind power projects in Denmark.....	127
Table 8.6:	Wave energy projects in Denmark.....	127
Table 8.7:	Danish government commitments.....	129
Table 9.1:	Renewable electricity subsidy in Finland from 2003 to present.....	134
Table 9.2:	Renewable electricity generation in Finland from 2005 to 2007 (GWh).....	139
Table 9.3:	Potential renewable electricity deployment in Finland in 2020 under the EU's balanced scenario (TWh).....	140
Table 9.4:	Comparison of the generation compensation in Finland in 2008 and levelised generation costs in the EU in 2007 (EUR/MWh).....	140

Table 9.5:	Annual increase in the number of wind turbines and capacity in Finland From 2002 to 2008.....	141
Table 9.6:	Onshore wind-farm capacity in Finland to be commissioned in 2009 and 2010.....	141
Table 9.7:	Offshore wind farms in operation, in the planning and feasibility stages in Finland as of May 2009.....	142
Table 9.8:	Finnish government commitments	145
Table 10.1:	The feed-in tariff rates in France for new installations in 2009	150
Table 10.2:	The feed-in tariff rates for solar PV in France for installations commissioned in 2009	151
Table 10.3:	Generating capacity mix in France from 2003 to 2008 (GW).....	153
Table 10.4:	Projected supply and capacity shortage in France by 2020	154
Table 10.5:	Net electricity generation by technology and consumption in France from 2003 to 2008 (TWh)	154
Table 10.6:	Gross renewable electricity generation in France from 2005-2008 (GWh)	155
Table 10.7:	Potential renewable electricity deployment in France in 2020 under the EU's balanced scenario (TWh).....	156
Table 10.8:	Comparison of the French FIT rates and levelised generation costs in the EU in 2007 (EUR/MWh)	157
Table 10.9:	Onshore wind power levelised generation costs in France based on load hours (EUR/MWh)	158
Table 10.10:	Offshore wind power projects in France.....	158
Table 10.11:	Levelised biogas generation costs in France (EUR/MWh)	159
Table 10.12:	Levelised generation cost for low-fall small hydropower in France on a 30 year operational basis (EUR/MWh)	161
Table 10.13:	French government commitments	163
Table 11.1:	Annual degression schedule for the latest FIT (for installations commissioned prior to 1 January 2010) in Germany	169
Table 11.2:	Generation compensation in Germany for installations commissioned in 2009	170
Table 11.3:	Renewable electricity generation in Germany from 2003 to 2008 (GWh)	175
Table 11.4:	Potential renewable electricity deployment in Germany in 2020 under the EU's balanced scenario (TWh).....	176
Table 11.5:	Comparison of the German feed-in tariff rates for 2009 and levelised generation costs in the EU in 2007 (EUR/MWh).....	177
Table 11.6:	Status of offshore wind power projects in Germany as of January 2009.....	178
Table 11.7:	German government commitments.....	183
Table 12.1:	Feed-in tariff rates in Greece for new installations in 2009 (EUR/MWh).....	188
Table 12.2:	Investment incentives offered by the Greek government (%)	189
Table 12.3:	Required growth in renewable electricity power generating capacity in Greece between 2008 and 2010 to achieve an EU target.....	192
Table 12.4:	Potential renewable electricity deployment in Greece in 2020 under the EU's balanced scenario (TWh).....	193
Table 12.5:	Comparison of the Greek FIT rates in 2009 and levelised generation costs in the EU in 2007 (EUR/MWh)	194
Table 12.6:	Total installed capacity of solar PV in Greece from 2006 to 2008 (MW)	195
Table 12.7:	Solar PV FIT rates in Greece from 2009 to 2014.....	196
Table 12.8:	Greek government commitments.....	198
Table 13.1:	Feed-in tariff rates in Hungary for projects commissioned after 1 January 2009.....	204

Table 13.2:	Renewable electricity generation in Hungary for 2004-2005 by technology (GWh).....	208
Table 13.3:	Potential renewable electricity deployment in Hungary in 2020 under the EU's balanced scenario (TWh).....	209
Table 13.4:	Comparison of peak FIT rates in Hungary in 2009 with levelised generation costs in the EU in 2007 (EUR/MWh)	209
Table 13.5:	Hungarian government commitments	213
Table 14.1:	Reference prices for REFIT projects in Ireland for projects commissioned in 2008 and 2009 (EUR/MWh)	219
Table 14.2:	Projected growth in generating capacity of the Republic of Ireland system until 2012 and in the all-island system from 2013 to 2015 (MW)	222
Table 14.3:	Total installed capacity of renewable electricity power generation in Ireland from 1990 to 2007 (MW).....	223
Table 14.4:	Renewable electricity generation from 1990 to 2007 in Ireland (GWh)	223
Table 14.5:	Potential renewable electricity deployment in Ireland in 2020 under the EU's balanced scenario (TWh)	224
Table 14.6:	Comparison of the Irish REFIT programme rates and levelised generation costs in the EU in 2007 (EUR/MWh)	225
Table 14.7:	Status of offshore wind power projects in Ireland as of January 2009.....	226
Table 14.8:	Irish government commitments	229
Table 15.1:	Renewable electricity quota obligation in Italy	234
Table 15.2:	Technology banding of the TGC in Italy from 31 December 2007	235
Table 15.3:	Feed-in tariff rates for solar PV in Italy installed in 2008 and 2009 (EUR/MWh)	236
Table 15.4:	Feed-in tariff rates for renewable-power microgeneration (≤ 1 MW) in Italy in 2008 (EUR/MWh).....	237
Table 15.5:	Total installed capacity of renewable power plants in Italy.....	240
Table 15.6:	Comparison of gross generation by renewable electricity sources in Italy in 2007 and 2008 (GWh)	241
Table 15.7:	Potential renewable electricity deployment in Italy in 2020 under the EU's balanced scenario (TWh).....	242
Table 15.8:	Comparison of generation compensation for generators over 1 MW in Italy in 2008 and levelised generation costs in the EU in 2007 (EUR/MWh)	242
Table 15.9:	Status of offshore wind power projects in Italy as of January 2009	243
Table 15.10:	Italian government commitments	247
Table 16.1:	The variable premium in the Netherlands for installation commissioning in April 2009.....	255
Table 16.2:	Generating capacity for the Netherlands from 2006 to 2015.....	257
Table 16.3:	Renewable electricity production in the Netherlands from 2005 to 2008 (GWh)	259
Table 16.4:	Potential renewable electricity deployment in the Netherlands in 2020 under the EU's balanced scenario (TWh)	260
Table 16.5:	Comparison of basic amount in the Dutch premium system for 2009 and levelised generation costs in the EU in 2007 (EUR/MWh).....	260
Table 16.6:	Planned and operational offshore wind power projects in the Netherlands as of January 2009	261
Table 16.7:	Dutch government commitments	264
Table 17.1:	Change in the renewable electricity quota in Poland from 2006 to 2017	270
Table 17.2:	Change in the renewable electricity generation in Poland from 2003 to 2007 (GWh).....	275
Table 17.3:	Potential renewable electricity deployment in Poland in 2020 under the EU's balanced scenario (TWh).....	276

Table 17.4: Comparison of generation compensation in Poland in 2008 and levelised generation costs in the EU in 2007 (EUR/MWh).....	277
Table 17.5: Polish government commitments	280
Table 18.1: Feed-in tariff rates in Portugal for installations commissioned in 2009	286
Table 18.2: Feed-in tariff rates in Portugal for microgeneration installations of up to 3.68 kW that produce both heat and electricity	287
Table 18.3: Renewable electricity generation in mainland Portugal from 2004 to 2008 (GWh).....	291
Table 18.4: Growth in total installed generating capacity of renewable electricity in mainland Portugal from 2004 to 2008 (MW).....	291
Table 18.5: Potential renewable electricity deployment in Portugal in 2020 under the EU's balanced scenario (TWh).....	292
Table 18.6: Comparison of the Portuguese FIT rates in 2009 and levelised generation costs in the EU in 2007 (EUR/MWh)	293
Table 18.7: Portuguese government commitments	298
Table 19.1: Technology banding in the TGC system in Romania, effective 1 January 2009.....	302
Table 19.2: Quota obligation in Romania from 2005 to 2020.....	303
Table 19.3: Changes in the renewable power capacity qualified for the TGC in Romania (2005–2008).....	307
Table 19.4: Potential renewable electricity deployment in Romania in 2020 under the EU's balanced scenario (TWh).....	308
Table 19.5: Comparison of the projected generation compensation for new facilities in Romania in 2009 and levelised generation costs in the EU in 2007 (EUR/MWh).....	308
Table 19.6: Romanian government commitments	312
Table 20.1: Feed-in tariff rates in Slovakia for renewable power installations commissioned after 1 January 2008.....	316
Table 20.2: Reduction in tariff levels in Slovakia based on EU or state funding.....	317
Table 20.3: Electricity consumption and domestic supply in Slovakia from 2009 to 2013	319
Table 20.4: Gross renewable electricity generation in Slovakia from 2003 to 2007 (GWh)	321
Table 20.5: Potential of renewable electricity deployment in Slovakia in 2020 under the EU's balanced scenario (TWh)	322
Table 20.6: Comparison of the FIT rates in Slovakia and levelised generation costs in the EU in 2007 (EUR/MWh)	322
Table 20.7: Slovak government commitments	326
Table 21.1: Feed-in tariff and premium rates for renewable power installations (excluding solar PV) commissioned in Spain in 2009 (EUR/MWh)	333
Table 21.2: The feed-in tariff system for solar PV installations commissioned after 29 September 2008	335
Table 21.3: Installed capacity and generation of renewable electricity in Spain from 2006 to 2008.....	340
Table 21.4: Potential renewable electricity deployment in Spain in 2020 under the EU's balanced scenario (TWh).....	341
Table 21.5: Comparison of the FIT and premium rates in Spain in 2009 and levelised generation costs in the EU in 2007 (EUR/MWh).....	342
Table 21.6: Planned offshore wind farm projects in Spain as of January 2009.....	343
Table 21.7: Electricity generation from solid biomass in Spain in 2006 and 2007 (GWh).....	343
Table 21.8: Electricity generation from biogas in Spain in 2005 and 2006 (GWh).....	344
Table 21.9: The feed-in tariff system for solar PV in Spain in 2008 and 2009	346
Table 21.10: Concentrated solar-thermal power development in Spain	346

Table 21.11: Spanish government commitments	348
Table 22.1: TGC prices and quota fulfilment in Sweden from 2003 until 2007	355
Table 22.2: Renewable power capacity and generation in Sweden under the TGC system from 2003-2007	359
Table 22.3: Potential renewable electricity deployment in Sweden in 2020 under the EU's balanced scenario (TWh).....	360
Table 22.4: Comparison of generation compensation in Sweden between 2007 and 2008 and levelised generation costs in the EU in 2007 (EUR/MWh).....	361
Table 22.5: Annual increase in the number of wind turbines and capacity in Sweden until 2008.....	362
Table 22.6: Onshore wind power installations in Sweden to be commissioned in 2009 and 2010	362
Table 22.7: Offshore wind power installations in operation and under construction in Sweden at the end of 2008.....	363
Table 22.8: Hydropower plants receiving TGCs in Sweden in 2006 and 2007	364
Table 22.9: Swedish government commitments	366
Table 23.1: The technology banding of the Renewables Obligation Certificates in the UK	373
Table 23.2: Renewable electricity quota obligation in Great Britain and Northern Ireland	374
Table 23.3: Proposed generation tariff rates for the proposed microgeneration FIT in the UK in 2010-11 (GBP/MWh)	376
Table 23.4: Growth in total installed generating capacity in the UK up to 2014/15 (MW).....	379
Table 23.5: Changes in total installed capacity of renewable power in the UK from 2003 until 2008 (MW)	382
Table 23.6: Changes in renewable electricity generation in the UK from 2003 to 2008 (GWh)	383
Table 23.7: Potential renewable electricity deployment in the UK in 2020 under the EU's balanced scenario (TWh).....	384
Table 23.8: Rough comparison of generation compensation (with the technology banding) in the UK with levelised generation costs in the UK and the EU (GBP/MWh)	385
Table 23.9: Status of onshore wind power projects in the UK as of 30 June 2009	386
Table 23.10: Status of offshore wind power projects in the UK as of 30 June 2009.....	386
Table 23.11: Generation from biomass in the UK from 2003 to 2008 (GWh)	387
Table 23.12: Marine energy projects deployed in the UK of January 2009	391
Table 23.13: UK government commitments	393
Table 23.14: Comparison of approval rates for onshore wind farms in the UK in 2008	396
Table 24.1 Total incentive and power market opportunities indices.....	402
Table 24.2 Total political wind, grid connection, and planning permission risk indices.....	404

List of Figures

Figure 1.1: Required increase in share of renewable energy to final energy consumption for EU member states (%).....	9
Figure 2.1: Primary energy consumption by source in the EU-27 in 2006 (Mtoe).....	17
Figure 2.2: Final energy consumption by sector in the EU-27 in 2006 (Mtoe).....	18
Figure 2.3: Total installed generating capacity in the EU-27 in 2006 (GW): Total 761 GW	18

Figure 2.4: Electricity generation by source in the EU-27 in 2006 (TWh): Total 3,358 TWh.....	19
Figure 2.5: Renewable electricity generation by technology in the EU-27 in 2006.....	21
Figure 2.6: Growth in total installed capacity of wind power in Europe from 2000 to 2008 (MW)	26
Figure 2.7: Breakdown of initial investment costs for a typical onshore wind farm development in Europe (%).....	27
Figure 2.8: Operational offshore wind farms in the EU as of January 2009 (MW).....	27
Figure 2.9: Breakdown of initial investment cost for offshore wind farms in Europe (%)	29
Figure 2.10: Yearly solar irradiation levels in a sample of European countries (kWh/m ²)	33
Figure 3.1: Global private equity/venture capital, public market and asset finance investments in clean energy from 2004 to 2008 (USD billions).....	48
Figure 3.2: The renewable energy financing continuum	49
Figure 3.3: Growth in global venture capital and private equity renewable energy investment by selected technology from 2003 to 2008 (USD millions).....	49
Figure 3.4: Global new third-party investment in renewable energy by technology in 2008 (USD billions): Total USD 121 billion	52
Figure 3.5: Required return on investment in renewable electricity.....	53
Figure 4.1: Primary energy consumption in Austria in 2006 (Mtoe): Total 34.09 Mtoe	59
Figure 4.2: Generating capacity mix in Austria as of 31 December 2008 (MW): Total 19,182 MW.....	59
Figure 4.3: Net electricity generation mix in Austria in 2008 (TWh): Total 66.9 TWh.....	60
Figure 5.1: Primary energy consumption in Belgium in 2006 (Mtoe): Total 60.41 Mtoe	74
Figure 5.2: Generating capacity mix in Belgium as of 31 December 2008 (MW): Total 16,719 MW	75
Figure 5.3: Electricity generation mix in Belgium in 2008 (TWh): Total 80.6 TWh.....	76
Figure 6.1: Primary energy consumption in Bulgaria in 2006 (Mtoe): Total 20.55 Mtoe	90
Figure 6.2: Generating capacity mix in Bulgaria as of 31 December 2008 (MW): Total 11,639 MW	91
Figure 6.3: Electricity generation mix in Bulgaria in 2008 (GWh): Total 45,000 GWh	92
Figure 7.1: Primary energy consumption in the Czech Republic in 2006 (Mtoe): Total 46.24 Mtoe	106
Figure 7.2: Generating capacity mix in the Czech Republic as of 31 December 2008 (MW): Total 17,724.1 MW	107
Figure 7.3: Electricity generation mix in the Czech Republic in 2008 (TWh): Total 83.5 TWh.....	107
Figure 8.1: Primary energy consumption in Denmark in 2006 (Mtoe): Total 20.91 Mtoe	120
Figure 8.2: Generating capacity mix in Denmark as of 31 December 2008 (MW): Total 12,618 MW	122
Figure 8.3: Electricity generation mix in Denmark in 2008 (TWh): Total 34.7 TWh.....	122
Figure 9.1: Primary energy consumption in Finland in 2006 (Mtoe): Total 37. 82 Mtoe	136
Figure 9.2: Generating capacity mix in Finland as of 31 December 2008 (MW): Total 16,953 MW.....	138
Figure 9.3: Electricity generation mix in Finland in 2008 (TWh): Total 74.2 TWh.....	138

Figure 10.1: Primary energy consumption by source in France in 2006 (Mtoe): Total 273.80 Mtoe	153
Figure 10.2: Projections of cumulative installed capacity of solar PV in France from 2008 to 2020 (MW).....	160
Figure 11.1: Primary energy consumption by source in Germany in 2006 (Mtoe): Total 349.03 Mtoe	172
Figure 11.2: Generating capacity mix in Germany as of 31 December 2008 (GW): Total 134.7 GW	174
Figure 11.3: Electricity generation mix in Germany in 2008 (TWh): Total 641.5 TWh.....	174
Figure 11.4: Growth in renewable electricity generation in Germany since 1995 (GWh)	175
Figure 11.5: Annual addition of installed capacity of solar PV in Germany from 1990 to 2008 (MW)	180
Figure 11.6: Annual turnover in the solar PV sector in Germany from 2000 to 2008 (in millions of EUR).....	181
Figure 12.1: Primary energy consumption in Greece in 2006 (Mtoe): Total 31.51 Mtoe	190
Figure 12.2: Generating capacity mix in the interconnected system in Greece as of 31 December 2008 (MW): Total 12,492 MW.....	191
Figure 12.3: Electricity generation mix in Greece in 2008 (GWh): Total 51,258 GWh.....	191
Figure 13.1: Primary energy consumption in Hungary in 2006 (Mtoe): Total 27.8 Mtoe	206
Figure 13.2: Generating capacity mix in Hungary as of 31 December 2008 (MW): Total 9,140 MW	207
Figure 13.3: Electricity generation mix in Hungary in 2008 (GWh): Total 36,408 GWh.....	207
Figure 14.1: Primary energy consumption in Ireland in 2006 (Mtoe): Total 15.5 Mtoe	220
Figure 14.2: Generating capacity mix in Ireland (MW): Total 7,465 MW.....	222
Figure 14.3: Growth in wind power capacity in Ireland since 2000 (MW)	226
Figure 15.1: Primary energy consumption by source in Italy in 2006 (Mtoe): Total 186.11 Mtoe	238
Figure 15.2: Generating capacity mix in Italy as of 31 December 2008 (MW): Total 98,419 MW.....	239
Figure 15.3: Electricity generation mix in Italy in 2008 (GWh): Total 305,540 GWh.....	239
Figure 15.4: Growth of solar PV installed capacity in Italy from 2000 to 2008 (MW).....	244
Figure 16.1: Primary energy consumption in the Netherlands in 2006 (Mtoe): Total 80.55 Mtoe	256
Figure 16.2: Generating capacity mix in the Netherlands as of 31 December 2008: Total 25,260 MW (MW)	257
Figure 16.3: Electricity generation mix in the Netherlands in 2008 (TWh): Total 104.4 TWh.....	258
Figure 17.1: Primary energy consumption in Poland in 2006 (Mtoe): Total 98.27 Mtoe.....	272
Figure 17.2: Generating capacity mix in Poland as of 31 December 2008 (MW): Total 36,162 MW.....	273
Figure 17.3: Electricity generation mix in Poland in 2008 (TWh): Total 144.4 TWh	274
Figure 18.1: Primary energy consumption in Portugal in 2006 (Mtoe): Total 25.3 Mtoe.....	288
Figure 18.2: Generating capacity mix in Portugal as of 31 December 2008 (MW): Total 14,916 MW.....	289
Figure 18.3: Electricity generation mix in Portugal in 2008 (GWh): Total 41,784 GWh	290
Figure 18.4: Increase in the installed capacity of solar PV in Portugal from 2000 to 2008 (MW).....	295

Figure 19.1: Primary energy consumption in Romania in 2006 (Mtoe): Total 40.90 Mtoe	304
Figure 19.2: Generating capacity mix in Romania as of 31 December 2008 (MW): Total 16,581 MW.....	305
Figure 19.3: Electricity generation mix in Romania in 2008 (GWh): Total 64,772 GWh.....	306
Figure 20.1: Primary energy consumption in Slovakia in 2006 (Mtoe): Total 18.8 Mtoe	318
Figure 20.2: Generating capacity mix in Slovakia as of 31 December 2008 (MW): Total 7,453 MW.....	320
Figure 20.3: Electricity consumption mix in Slovakia in 2008 (GWh): Total 29,830 GWh.....	320
Figure 21.1: Primary energy consumption in Spain in 2006 (Mtoe): Total 143.8 Mtoe	336
Figure 21.2: Generating capacity mix in peninsular Spain as of 31 December 2008 (MW): Total 89,944 MW	337
Figure 21.3: Electricity generation mix in peninsular Spain in 2008 (GWh): Total 287,088 GWh.....	337
Figure 21.4: Growth in electricity consumption in peninsular Spain from 1998 to 2016 (actual and projected) (TWh)	339
Figure 21.5: Growth in total installed generating capacity of solar PV in Spain from 2001 to 2008.....	345
Figure 22.1: TGC quota obligation in Sweden	355
Figure 22.2: Primary energy consumption in Sweden in 2006 (Mtoe): Total 50.34 Mtoe	357
Figure 22.3: Generating capacity mix in Sweden as of 31 December 2008 (MW): Total 34,181 MW.....	357
Figure 22.4: Electricity generation mix in Sweden in 2008 (TWh): Total 146.2 TWh.....	358
Figure 23.1: Shortfalls in the Renewable Obligation Certificate quota obligation in the UK	375
Figure 23.2: Primary energy consumption by source in the UK in 2006 (Mtoe): Total 229.38 Mtoe	378
Figure 23.3: Generating capacity mix in the UK for 2008/09 (GW): Total 79.9 GW.....	380
Figure 23.4: Electricity supply mix in the UK in 2008 (TWh): Total 381.48 TWh.....	380
Figure 23.5: Projected electricity generation mix in the UK in 2020 (%)	381
Figure 23.6: Required grid upgrades for onshore wind generation in Scotland.....	395
Figure 24.1: Incentive and power market opportunities indices	401
Figure 24.2: Combined incentive and power market opportunities indices	402
Figure 24.3: Year-on-year changes in opportunities indices	403
Figure 24.4: Political will, grid connection and planning permission risk indices	404
Figure 24.5: Combined political will, grid connection and planning permission risk indices	405
Figure 24.6: Year-on-year changes in risk indices	406
Figure 24.7: Comparison of combined opportunity and risk indices.....	407

List of Abbreviations

AD	Anaerobic digestion (biogas)
BIPV	Building-integrated photovoltaic
CHP	Combined heat and power
CSP	Concentrated solar-thermal power
DSO	Distribution system operator
ECX	European Climate Exchange, an ETS market
ETS	The EU Emissions Trading Scheme
EU	European Union
EUA	European Union emissions allowance under the ETS system
EU-15	The EU member states since 1995: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.
EU-25	The EU member states since 2004: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom.
EU-27	The EU member states since 2007: same as EU-25 plus Bulgaria and Romania.
FIT	Feed-in tariff
GDP	Gross domestic product
GHG	Greenhouse gases
IEA	International Energy Agency
Mtoe	Million tonnes of oil equivalent
NAP	National allocation plan under the ETS
NEA	Nuclear Energy Agency
OECD	Organisation for Economic Cooperation and Development
PV	Photovoltaic
RE	Renewable energy
RO	Renewables Obligation (UK)
ROC	Renewables Obligations Certificate (UK)
TGC	Tradable green certificates
TSO	Transmission system operator
UNEP	United Nations Environment Programme
VC	Venture capital
W_e	Watt electrical
W_p	Watt peak (maximum rated watt output, usually used for PV)