

Contents

Page

1	Introduction.....	1
1.1	The role of energy efficiency in the framework of energy and climate policy	1
1.2	Monitoring and evaluation of energy efficiency targets and policies	6
1.3	Scope and outline of this thesis	12
	References	17
2	Dimensions of energy efficiency in a political context*	23
2.1	Introduction.....	24
2.2	Overview of the dimensions of energy efficiency	26
2.2.1	Definitions of energy efficiency	26
2.2.2	The various dimensions of energy efficiency	28
2.3	The reference evolution and baseline dimension	30
2.3.1	Motivation: comparison in time	30
2.3.2	Definition of reference evolution	31
2.3.3	Choosing a baseline	32
2.4	The accounting method dimension	34
2.4.1	Overview of applied methods to measure energy efficiency	34
2.4.2	The problem of normalization and correction	36
2.4.3	The problem of data availability	38
2.4.4	Importance of the accounting method.....	40
2.4.5	Importance of the baseline	44
2.4.6	Role of the lifetime.....	47
2.5	Summary and outlook.....	50
	References	51

3	Interaction between climate, emissions trading and energy efficiency targets*	59
3.1	Introduction.....	60
3.2	Methodology.....	63
3.2.1	Definition of the reference target system.....	63
3.2.2	Definition of the targets.....	67
3.2.3	Calculation of the distance to the target.....	69
3.3	Lessons from the 2020 target system of the EU.....	70
3.4	Design of a reference target system for 2030 - Results.....	73
3.4.1	Design proposal based on an EE and a RES target.....	73
3.4.2	Alternative design based on a GHG headline target.....	76
3.5	Discussion and conclusions.....	78
	References.....	82
4	Energy saving potential of information and communication technology*	87
4.1	Introduction.....	88
4.2	Methodology.....	89
4.3	Results.....	91
4.3.1	Results for the base year.....	91
4.3.2	Reference forecast.....	93
4.3.3	Green IT Scenario.....	94
4.4	Discussion.....	95
4.5	Conclusions.....	96
	References.....	99
5	Which role for market-oriented instruments for achieving energy efficiency targets in Germany?*	103
5.1	Introduction.....	104
5.2	Methodology.....	106

5.2.1	Design of the evaluated EE instruments	106
5.2.2	Calculation of EE potentials and derivation of the energy-saving target.....	109
5.2.3	Criteria for the qualitative analysis	112
5.3	Results	113
5.3.1	Suitability of the instruments investigated to achieve the targeted energy-savings	113
5.3.2	Costs of the instruments	118
5.3.3	Market conformity and competitiveness	120
5.3.4	Effects on the market for energy services	121
5.3.5	Secondary effects of the instruments	123
5.3.6	Interactions with existing instruments	126
5.3.7	Political acceptance	127
5.3.8	Scope for refinancing.....	128
5.4	Conclusions.....	129
	References	133
6	Understanding retailer compliance with product label regulations: A framework and empirical test for the European Energy Label'	139
6.1	Introduction.....	140
6.2	Theoretical framework: model of regulatory compliance	142
6.2.1	Instrumental models	142
6.2.2	Normative models.....	143
6.3	Empirical Study	147
6.3.1	Background on EU energy label	147
6.3.2	Fieldwork and data collection	149
6.3.3	Construct operationalization	150
6.3.4	Analyses and results	154
6.4	Discussion	158
6.5	Conclusions.....	159
	References	162

7	Energy management in the tertiary sector – An empirical analysis based on survey data from Germany	167
7.1	Introduction	168
7.2	Methodology	171
7.2.1	Survey methodology	171
7.2.2	Econometric model	173
7.3	Results.....	176
7.4	Discussion and conclusions	179
	References.....	181
	Appendix A.....	185
	Appendix B.....	186
8	Monitoring the “Energiewende” – Energy efficiency indicators for Germany	189
8.1	Introduction	190
8.2	Background to the German “Energiewende”	192
8.3	Methodology and statistical database	194
8.3.1	The ODYSSEE approach of monitoring energy efficiency targets.....	194
8.3.2	Statistical database for the German energy efficiency indicators	196
8.3.3	Choice of energy efficiency indicators for the monitoring of the German “Energiewende”	198
8.4	Results.....	200
8.4.1	Indicators for the overall economy.....	200
8.4.2	Indicators for the household sector	209
8.4.3	Indicators for the transport sector.....	215
8.4.4	Indicators for industry and manufacturing.....	220
8.4.5	Indicators for the tertiary and service sector.....	225
8.5	Discussion	228
8.5.1	Discussion of results	228

8.5.2	Discussion of methodology	230
8.6	Conclusions	233
	References	235
Appendix A:	Detailed description of the calculation of indicators in the ODYSSEE database	241
Appendix B:	Data sources for Germany in ODYSSEE	252
9	Summary and conclusions	253
9.1	Introduction and scope	253
9.2	Summary of the results	254
9.3	Conclusions and recommendations	267
	References	269
	Samenvatting en conclusies.....	271
	Introductie en scope	271
	Samenvatting van de resultaten.....	272
	Conclusies en aanbevelingen	287
	Acknowledgements	291
	Curriculum vitae	293