

Table of Contents

List of Figures	xxix
List of Tables	xxxi
1 Introduction	1
2 Conceptual framework and background	7
2.1 The power sector supply chain and regulatory environment of smart grids	8
2.2 The role of regulation and technological progress for the development of electric power systems	10
2.3 Smart grids – promising technological innovations	13
References	16
3 China’s way from conventional power grids towards smart grids	19
3.1 Historical perspective	20
3.2 Today’s power system and its most pressing challenges	22
3.2.1 Power generation	22
3.2.2 Power consumption	25
3.2.3 Power logistics	26
3.3 Smart grid development in China	27
3.3.1 Motivation for smart grids in China	27
3.3.2 China’s technological view of the smart grid	28
3.3.3 This study’s view on smart grids in China	30
3.4 The regulation of China’s electric power system	31
3.4.1 Policy setting and fundamental institutions	31
3.4.2 Market structure	34
3.4.3 Market design and RES integration	35
3.4.4 Development of infrastructure and network regulation	37
3.4.5 Coordination of generation and consumption	38
3.4.6 The role of information and communication	40
References	42
4 Germany’s way from conventional power grids towards smart grids	45
4.1 Historical perspective	46
4.2 Today’s power system and its most pressing challenges	49
4.2.1 Power generation	49
4.2.2 Power consumption	50
4.2.3 Power logistics	50
4.3 Smart grid development in Germany	52
4.3.1 Motivation for smart grids in Germany	52
4.3.2 Germany’s technological view of the smart grid	53
4.4 The regulation of Germany’s electric power system	57
4.4.1 Policy setting and fundamental institutions	57
4.4.2 Market structure	61
4.4.3 Market design and RES integration	66

4.4.4	Development of infrastructure and network regulation	70
4.4.5	Coordination of generation and consumption	71
4.4.6	The role of information and communication	72
	References	75
5	Recommended approaches for smart grid development in China	79
5.1	Define a long-term strategy for the electricity sector and establish an independent and powerful regulator	81
5.1.1	Background	81
5.1.2	International practice	83
5.1.3	Recommended approach for China	84
5.2	Create level playing fields for access to power system infrastructure and information ..	85
5.2.1	Background	85
5.2.2	International practice	87
5.2.3	Recommended approach for China	90
5.3	Introduce network regulation for efficient investment incentives for electricity grid expansion and upgrade	90
5.3.1	Background	91
5.3.2	International practice	92
5.3.3	Recommended approach for China	93
5.4	Coordinate network expansion planning for electricity grid expansion and upgrade ..	94
5.4.1	Background	94
5.4.2	International practice	95
5.4.3	Recommended approach for China	97
5.5	Improve grid integration of RES	98
5.5.1	Background	99
5.5.2	International practice	100
5.5.3	Recommended approach for China	103
5.6	Optimize the balancing of electricity generation and consumption	104
5.6.1	Background	104
5.6.2	International practice	106
5.6.3	Recommended approach for China	107
5.7	Facilitate the development of a unified view of smart grids	109
5.7.1	Background	109
5.7.2	International practice	110
5.7.3	Recommended approach for China	113
	References	114
6	Regulatory pathways for smart grid development in China	119
6.1	Government targets for China's future electric power system	120
6.2	Underlying scenarios	122
6.3	Drawing the roadmaps	122
6.3.1	Reliability/Security of Supply scenario	123
6.3.2	Ecological Sustainability scenario	128
6.3.3	Affordability/Competition scenario	132
6.4	Discussion of the three roadmaps	136
	References	138

Backmatter139

Appendix A – Tables and Figures140

Appendix B – Bottom-up view on China’s technological smart grid vision.....146

Appendix C – Integration levels of China’s power system components in 2012 and 2020. . . .150

Appendix D – Germany’s smart grid vision according to the study *Future Energy Grid*154

Appendix E – Extracts from specific laws157

Appendix F – Further results from the European Mandate M/490.....161

Regulatory Pathways For Smart Grid Development in
China

Brunekreeft, G.; Luhmann, T.; Menz, T.; Müller, S.-U.;
Recknagel, P. (Eds.)

2015, XXXI, 163 p. 40 illus. in color., Softcover

ISBN: 978-3-658-08462-2