

Africa's Power Infrastructure

Investment, Integration, Efficiency

Anton Eberhard
Orvika Rosnes
Maria Shkaratan
Haakon Vennemo

Vivien Foster and Cecilia Briceño-Garmendia,
Series Editors



THE WORLD BANK
Washington, D.C.

Contents

<i>About the AICD</i>	<i>xvii</i>
<i>Series Foreword</i>	<i>xix</i>
<i>Acknowledgments</i>	<i>xxi</i>
<i>Abbreviations</i>	<i>xxvii</i>
Chapter 1	
Africa Unplugged	1
The Region's Underdeveloped Energy Resources	1
The Lag in Installed Generation Capacity	2
Stagnant and Inequitable Access to Electricity Services	5
Unreliable Electricity Supply	7
The Prevalence of Backup Generators	7
Increasing Use of Leased Emergency Power	10
A Power Crisis Exacerbated by Drought, Conflict, and High Oil Prices	12
High Power Prices That Generally Do Not Cover Costs	12
Deficient Power Infrastructure Constrains Social and Economic Development	16
Notes	19
References	19

Chapter 2	The Promise of Regional Power Trade	23
	Uneven Distribution and Poor Economies of Scale	24
	Despite Power Pools, Low Regional Power Trade	26
	The Potential Benefits of Expanded Regional Power Trading	28
	What Regional Patterns of Trade Would Emerge?	31
	Water Resources Management and Hydropower Development	33
	Who Gains Most from Power Trade?	33
	How Will Less Hydropower Development Influence Trade Flows?	38
	What Are the Environmental Impacts of Trading Power?	39
	Technology Choices and the Clean Development Mechanism	39
	How Might Climate Change Affect Power Investment Patterns?	40
	Meeting the Challenges of Regional Integration of Infrastructure	40
	Conclusion	50
	Note	50
	Bibliography	50
Chapter 3	Investment Requirements	53
	Modeling Investment Needs	54
	Estimating Supply Needs	55
	Overall Cost Requirements	58
	The SAPP	64
	The EAPP/Nile Basin	67
	WAPP	70
	CAPP	74
	Notes	77
	Reference	78
Chapter 4	Strengthening Sector Reform and Planning	79
	Power Sector Reform in Sub-Saharan Africa	80
	Private Management Contracts: Winning the Battle, Losing the War	85
	Sector Reform, Sector Performance	87
	The Search for Effective Hybrid Markets	88

	The Possible Need to Redesign Regulatory Institutions	94
	Notes	100
	Bibliography	101
Chapter 5	Widening Connectivity and Reducing Inequality	103
	Low Electricity Connection Rates	104
	Mixed Progress, despite Many Agencies and Funds	105
	Inequitable Access to Electricity	110
	Affordability of Electricity—Subsidizing the Well-Off	112
	Policy Challenges for Accelerating Service Expansion	119
	References	129
Chapter 6	Recommitting to the Reform of State-Owned Enterprises	133
	Hidden Costs in Underperforming State-Owned Enterprises	134
	Driving Down Operational Inefficiencies and Hidden Costs	135
	Effect of Better Governance on Performance of State-Owned Utilities	136
	Making State-Owned Enterprises More Effective	137
	Conclusion	147
	References	148
Chapter 7	Closing Africa’s Power Funding Gap	149
	Existing Spending in the Power Sector	151
	How Much More Can Be Done within the Existing Resource Envelope?	157
	Increasing Cost Recovery	158
	On Budget Spending: Raising Capital Budget Execution	160
	Improving Utility Performance	161
	Savings from Efficiency-Oriented Reforms	162
	Annual Funding Gap	164
	How Much Additional Finance Can Be Raised?	166
	Costs of Capital from Different Sources	178

	The Most Promising Ways to Increase Funds	180
	What Else Can Be Done?	180
	Taking More Time	180
	Lowering Costs through Regional Integration	181
	The Way Forward	182
	Note	183
	References	183
Appendix 1	Africa Unplugged	187
Appendix 2	The Promise of Regional Power Trade	199
Appendix 3	Investment Requirements	213
Appendix 4	Strengthening Sector Reform and Planning	239
Appendix 5	Widening Connectivity and Reducing Inequality	267
Appendix 6	Recommitting to the Reform of State-Owned Enterprises	291
Appendix 7	Closing Africa's Power Funding Gap	299
Index		305
Boxes		
2.1	The Difficulties in Forging Political Consensus: The Case of Westcor	42
2.2	The West African Power Pool (WAPP) and New Investment	45
2.3	Difficulties in Setting Priorities in SAPP	46
3.1	Definitions	61
4.1	Kenya's Success with Private Sector Participation in Power	83
4.2	Côte d'Ivoire's Independent Power Projects Survive Civil War	84
4.3	Power Sector Planning Dilemmas in South Africa	90
5.1	Ghana's Electrification Program	106
5.2	Residential Electricity Tariff Structures in Sub-Saharan Africa	116