

Contents

1	Problem Statement	1
1.1	Key Points of Large Technical Systems Sustainable Development Management	1
1.2	Criteria of LTS Sustainable Development Management	3
1.3	Development Optimization Principles under Uncertainty Conditions	5
1.4	Problem of Optimal D-Plan Selection	8
	References	10
2	Mathematical Basics of LTS Sustainable Development Dynamic Management	11
2.1	Principal Concepts	11
2.2	Graphical Model of Development Process	15
2.3	Mathematical Formulation of Development Process Optimization Task	18
2.4	Algorithmization Aspects of Development Management Process	20
	References	24
3	Modeling LTS D-Process	25
3.1	LTS Modeling Principles in Development Management Process	25
3.2	Modeling Methods of LTS D-State in Development Optimization Process	27
3.3	Formation Methods of LTS D-Process	32
3.4	Conclusion	34
	References	34

4	LTS D-Process Dynamic Optimization on all D-states	35
4.1	Recursive Equation Calculation Algorithm	35
4.2	Algorithm Programming Aspects	38
4.3	System D-Process.	40
	References	44
5	Optimal Initial States Method.	45
5.1	Dynamic Programming Application for LTS Sustainable Development Management	45
5.2	Recursive Equation for Optimal Initial State Method	48
5.3	Algorithmization Principles of OIS Method.	52
	References	55
6	Optimal Initial States Searching Methods	57
6.1	Characteristics of Optimal Initial States Searching Methods . .	57
6.2	System Development Constraint States Set Searching Method.	63
6.3	Constraint Set Searching Algorithms.	70
6.4	Maximal Effect Method	73
	References	79
7	LTS Sustainable Development Management	
	Approximate Methods	81
7.1	Approximate Optimization Methods for Development Management	81
7.2	Optimal Initial States Number Limitation Methods.	82
7.2.1	Optimal Initial States Set Limitation Method.	82
7.2.2	Limitation Method of Optimal Initial States Searching Process.	83
7.3	Dynamic Development Tasks Solution Iteration Methods	87
7.3.1	Direct and Iteration Methods	87
7.3.2	Dynamic Optimization Tasks Formalized Dispersing Method	89
7.4	Optimization Method in Adaptation Period	93
8	Information Technology for Sustainable Development of Electric Power Systems	97
8.1	Information Technology Functions and Tasks to be Solved . . .	97
8.2	Basic Principles of System Optimization.	101
8.3	Information Technology Structure and Main Module Functions.	104

8.4	Subsystem Functioning Models	105
8.4.1	Functioning Model of Electric Power Plants	105
8.4.2	Transmission Network Functioning Model	109
	References	112
9	The Database	115
9.1	Information Flow amongst Database and Software System for Management of Sustainable Development	115
9.2	Database Structure and Relevant Operations	116
9.3	Block <i>Parameter Catalogues</i> : The Significance and Structure	119
9.4	Block Network: The Structure and Operation with Network Scheme	119
9.5	Object Input.	120
9.6	Block Task: The Significance and Structure	122
	References	129
10	System for Sustainable Development Management.	131
10.1	Software Complex for Technical Aspects Analysis.	131
10.1.1	Significance of Block Technical Analysis in Sustainable Development Management Software System	131
10.1.2	Flows, Voltages, Loads and Operational State Summary Indicators (Power Balance, Number of Overloaded Lines)	133
10.1.3	Calculation of State with Changed Power Balance Generation System	135
10.1.4	Calculation of Operational State Active Power Balance.	136
10.1.5	Analysis of Operational State with Outages.	136
10.1.6	Switchgears Reliability	137
10.1.7	330, 110 kV Network Reliability	138
10.2	Software Complex for Economic Aspects Analysis	139
10.2.1	Structure of Complex, Components Function.	139
10.2.2	Block Technical Economic Analysis of Plans Assigned by User: Calculation Results and Its Output File	142
10.2.3	Block Plans Sensitivity Analysis	144
10.3	Complex of Software for Dynamic Development Optimization	146
10.3.1	Functions of Optimization Complex, Optimization Methods and External Links	146
10.3.2	Structure of Optimization Block.	147
10.3.3	Sub-block Dynamic Optimization.	147

10.3.4	Sub-block Quasidynamic Optimization	152
10.3.5	Optimization Results Analysis	152
10.3.6	Optimization Results and Decision Making Under Information Uncertainty Conditions	152
10.3.7	Sub-block Risk Analysis	153
Conclusion	159
Index	161

Dynamic Management of Sustainable Development
Methods for Large Technical Systems

Krishans, Z.; Mutule, A.; Merkuryev, Y.; Oleinikova, I.

2011, XXXII, 164 p., Hardcover

ISBN: 978-0-85729-055-7