

Contents

Abstract	v
Acknowledgements	vi
List of Figures	x
List of Tables	xi
1 Introduction	1
1.1 General	1
1.2 Definitions	3
1.3 State of Art	3
1.3.1 Generation Scheduling	4
1.4 Environmental Dispatch	5
1.5 Mix Generation Scheduling	9
1.6 Unit Commitment	10
1.6.1 Exhaustive Enumeration	10
1.6.2 Priority List	10
1.6.3 Dynamic Programming	11
1.6.4 Linear Programming	14
1.6.4.1 Dynamic and Linear Programming	14
1.6.5 Integer Programming	14
1.6.6 Branch and Bound	15
1.6.7 Lagrangian Relaxation	16
1.6.8 Expert System/Artificial Neural Network	18
1.7 Motivation	20
1.8 Thesis Organization	23

2	Generation Scheduling	24
2.1	Introduction	24
2.2	Basic Formulation	25
2.3	Derivation of Equivalent Cost Function	27
2.4	Equivalent Cost Function under Constraint Violation	30
2.5	Single Area Dispatch	31
2.5.1	Problem Formulation	32
2.5.2	Method of Solution	33
2.6	Multiarea Dispatch	35
2.6.1	Problem Formulation	36
2.6.2	Method of Solution	38
2.7	Generation Scheduling with Multiple Fuel Options	38
2.7.1	Problem Formulation	39
2.7.2	Method of Solution	39
2.8	System Studies and Results	42
2.8.1	Equivalent Cost Function	42
2.8.2	Correction of Equivalent Cost Function Under Constraint Violation	43
2.8.3	Single Area Dispatch	43
2.8.4	Multiarea Dispatch	43
2.8.5	Multifuel System	43
2.9	Conclusion	58
3	Mix Generation System	61
3.1	Introduction	61
3.2	Hydrothermal Scheduling	62
3.3	Formulation	63
3.4	Method of Solution	64
3.5	Decision of Hydro Plants as Peaking Plants	64
3.6	Corrections of Weighting Factors	65
3.7	Thermal Gas Co-ordination	66
3.8	Mix-Generation Scheduling	67
3.9	Problem Formulation	67
3.10	Solution Procedure	68

3.11 System Studies and Results	68
3.12 Conclusion	83
4 Optimum Priority Ordering of Units	84
4.1 Introduction	84
4.2 Unit Ordering Of Single Fuel System	85
4.2.1 Average Full Load Cost (AFLC) Method	85
4.2.2 Direct Forward Tracking Approach	87
4.2.3 Unit Ordering by AFLC and Heuristic Forward Tracking Approach	89
4.2.4 Unit Ordering by Back Tracking	90
4.2.5 Correction of Combination Order Table	91
4.3 Unit Commitment Procedure	92
4.3.1 Assessment of Security and Startup Cost	92
4.3.1.1 Security Assessment	92
4.3.2 Startup Cost Criteria	93
4.4 Merit Ordering of Units With Multifuel Options	93
4.4.1 Merit Ordering By Forward Tracking Based on AFLC	94
4.5 System Studies and Results	95
4.6 Conclusion	110
5 Environmental Dispatch	112
5.1 Introduction	112
5.2 Minimum Emission Dispatch (MED)	114
5.2.1 Problem Formulation	115
5.2.2 Method of Solution	115
5.3 Economic and Environmental Dispatch	115
5.3.1 Method of Solution	115
5.4 Estimation of Maximum Generation Level due to Emission Constraint	118
5.5 Combined Economic and Environmental Dispatch	118
5.5.1 Problem Formulation	118
5.5.2 Method of Solution	119
5.6 System Studies and Results	120
5.7 Conclusion	126

6 Unit Commitment 130

6.1 Introduction 130

6.2 Unit Commitment Strategy 131

6.3 Unit Commitment Thermal system 132

6.3.1 Problem Formulation 132

6.3.2 Method Of Solution 133

6.3.2.1 Unit Commitment Schedule of Thermal System 134

6.3.2.2 Emission Constrained Unit Commitment of Thermal System 135

6.4 Unit Commitment of Mix-generation System 137

6.4.1 Problem Formulation 137

6.4.2 Unit Commitment Schedule of Mix-Generation System 138

6.4.3 Emission Constrained Unit Commitment and Environment & Eco-
nomic Dispatch 139

6.5 System Studies and Results 139

6.5.1 Unit Commitment and Dispatch of Thermal System 140

6.5.1.1 Unit Commitment and Dispatch 140

6.5.1.2 Emission Constrained Unit Commitment and Dispatch . . 140

6.5.2 Unit Commitment of Mix Generation System 140

6.5.2.1 Unit Commitment and Dispatch 140

6.5.2.2 Emission Constrained Unit Commitment of Mix-system . 141

6.6 Conclusion 168

7 Conclusion 171

7.1 General 171

7.2 Summary of Important Findings. 172

7.3 Scope for Further Research 175

Bibliography 177