

Contents

List of Figures	vi
List of Tables	vii
List of Algorithms	viii
I Introduction	1
I.1 Motivation	1
I.2 Challenges in Dynamic Programming	3
I.3 Outline.....	6
I.4 Contributions.....	8
II Incorporating Demand Response with Load Shifting into Stochastic Unit Commitment	11
II.1 Introduction	11
II.2 Literature Review.....	13
II.2.1 Unit Commitment Models	13
II.2.2 Solution Approaches	15
II.3 Problem Description	16
II.4 Model	18
II.4.1 Stochastic Unit Commitment Model.....	18
II.4.2 Demand Side Resources Model	23
II.4.3 Integrated Model.....	24
II.5 Solution Approach.....	25
II.5.1 Solution Approach for Deterministic Demand Realization	25
II.5.2 Stochastic Demand and Stochastic Load Shifting	28
II.5.3 Approximating the Stochastic Dynamic Program	29
II.5.4 Stochastic Proximal Point and Stochastic Progressive Hedging Algorithm	32
II.5.5 Lower Bound on the Optimal Solution	36
II.6 Computational Results	38
II.6.1 Base Case	38
II.6.2 Solution	41

II.6.3	Sensitivity	43
II.7	Conclusion	45
II.8	Notation	47
II.9	Supplementary Material	49
II.9.1	Proofs of Statements	49
II.9.2	Additional Propositions.....	55
 III Optimization of Battery Charging and Equipment Purchasing at Electric Vehicle Battery Swap Stations		59
III.1	Introduction	59
III.2	Literature Review.....	62
III.3	Single Station	64
III.3.1	Model	64
III.3.2	Properties	68
III.3.3	Lower Bound.....	70
III.3.4	Properties of the Optimal Solution.....	72
III.4	Network of Stations.....	73
III.4.1	Model	73
III.4.2	Properties	75
III.5	Solution Approach.....	76
III.5.1	Single Station.....	76
III.5.2	Station Network.....	78
III.6	Computational Results	83
III.6.1	Data and Parameters	84
III.6.2	Single Station.....	86
III.6.3	Station Network.....	90
III.7	Conclusion	94
III.8	Notation	95
III.9	Proofs of Statements	96
 IV Inventory Control in Multi-Channel Retail		103
IV.1	Introduction	103
IV.1.1	Literature Review	105
IV.1.2	Background Results	107

IV.2 Modeling	108
IV.2.1 Basic Cost Components	109
IV.2.2 General Order Process Model	109
IV.3 Inventory Control for the General Order Process Model	111
IV.4 Poisson Arrivals	113
IV.4.1 Model	113
IV.4.2 Analysis	116
IV.4.3 Discussion	118
IV.4.4 Numerical Study	118
IV.5 Demand Channel Batch Arrivals	121
IV.5.1 Upper and Lower Bounds	125
IV.5.2 Numerical Study	126
IV.6 Concluding Remarks	127
IV.7 Proofs of Statements	128
V Conclusion	145
References	147