

The major unconstrained optimization approaches that are used in power system operation are the gradient method, line search, Lagrange multiplier method, Newton-Raphson optimization, trust-region optimization, quasi-Newton method, double dogleg optimization, conjugate gradient optimization, and so on.

5.6.2 Economic Power Dispatch--Stage One / 194 5.6.3 Economic Power Dispatch--Stage Two / 195 5.6.4 Evaluation of System Total Fuel Consumption / 197 5.7 Security-Constrained ED by Genetic Algorithms / 199 Appendix: Network Flow Programming / 201 References / 209 6 Multiarea System Economic Dispatch 211 6.1 Introduction / 211

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During these years, I have explored new areas in power system studies. The main purpose of this book is to share these experiences with other researchers/students or industry employees who might need a powerful computation tool for their studies. This book covers a broad range of topics in power system studies as follows:

This book is intended to meet the needs of a diverse range of groups interested in the application of optimization techniques to power system operation. It requires only an elementary knowledge of numerical techniques and matrix operation to understand most of the topics.

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This book provides a detailed description of the flexibility of the power system with high share of variable renewable generation, including power system flexibility modeling, flexibility-based economic dispatch, demand side flexibility response, large-scale distributed flexible resources aggregation and market design for enhancing the flexibility of the power system, etc.

The application of optimization to power systems has become so common that it deserves treatment as a distinct subject. The abundance of optimization problems in power systems can give the impression of diversity, but in truth most are merely layers on a common core: the steady-state description of power flow in a network.

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