

Table of Contents

Introduction

Part I — Management and Control Systems in Power and Heat Generation

1. Power and Heat Systems and Their Operation

- Power and heat systems
- Load curves
- Power and energy balances
- Power reserves
- Power-system operation and dispatching

2. Management and Control Systems in the Power Industry

- Principles of power-system control
- Management structures
- Control subsystems
- Hierarchical control

3. Hardware and Software Components

- Computers in power-system control
- Control software
- Computer networks
- Data acquisition and transmission
- Frequency and active-power control

4. Management and Control of Power Systems, Plants and Networks

- Control of electric power systems
- Data processing and databases
- Telecontrol and remote measurements
- Daily operating schedules
- Operator–computer interaction
- Control of thermal power plants
- Control of hydroelectric power plants
- Control of substations and transmission networks

5. Mathematical Modeling in the Power Industry

- Mathematical models of power-system processes
- Modeling techniques
- Simplified and detailed models
- Continuous-process modeling
- Adaptive models
- Design models
- Multi-criteria optimization

- Hierarchical systems

Part II — Optimal Operation of Electric Power Systems and Plants

6. Optimal Distribution of Load in Power Systems

- Optimal allocation of generation
- Load distribution among thermal power plants
- Hydrothermal coordination
- Allocation among generating units
- Reactive-power optimization
- Pumped-storage power plants
- Overall system optimization

7. Characteristics of Power Plants

- Energy characteristics of generating equipment
- Thermal power-plant characteristics
- Hydro power-plant characteristics
- Equivalent characteristics
- Dynamic programming
- Statistical characteristics
- Network-loss considerations

8. Selection of Power-System Units

- Unit commitment
- Selection of thermal generating units
- Selection and operation of hydro units
- Optimization of generating-unit combinations
- Operating-regime optimization

9. Long-Term Optimization of Power Systems

- Long-term operating planning
- Reservoir optimization
- Cascaded hydroelectric plants
- Optimal use of water resources
- Fuel-supply optimization
- Generation planning
- Maintenance and repair scheduling

10. Short-Term Optimization of Power Systems

- Load distribution between interconnected systems
- Coordination of subsystems
- Hierarchical control
- Real-time control
- Spinning reserves
- Frequency regulation

11. Techno-Economic Indices of Power Plants and Systems

- Energy planning
- Load and generation forecasting
- Production balances
- Technical and economic indicators
- Computer-assisted planning

12. Effectiveness of Solutions to Operational Problems

- Evaluation of operating decisions
- Uncertainty in system data
- Errors in energy characteristics
- Optimization under uncertain conditions
- Economic effectiveness of control systems

13. Environmental Protection and Operation of Power Plants

- Environmental aspects of power generation
- Water-resource protection
- Atmospheric pollution
- Emission control
- Pollution-control equipment
- Environmentally constrained optimization