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Participation in Energy Markets; 2.7.3 Mathematical Formulation; 2.7.4 Solution Methodology; 2.7.5 Study Case; 2.7.6 Results; 2.8 Decentralized Control; 2.8.1 Multi-Agent System Theory; 2.8.2 Agent Communication and Development; 2.8.3 Agent Communication Language; 2.8.4 Agent Ontology and Data Modeling; 2.8.5 Coordination Algorithms for Microgrid Control; 2.8.6 Game Theory and Market Based Algorithms; 2.8.7 Scalability and Advanced Architecture 2.9 State Estimation; 2.9.1 Introduction; 2.9.2 Microgrid State Estimation; 2.9.3 Fuzzy State Estimation; 2.10 Conclusions; Appendix 2.A: Study Case Microgrid; References; 3 Intelligent Local Controllers; 3.1 Introduction; 3.2 Inverter Control Issues in the Formation of Microgrids; 3.2.1 Active Power Control; 3.2.2 Voltage Regulation; 3.3 Control Strategies for Multiple Inverters; 3.3.1 Master Slave Control Scheme; 3.3.2 Multi-Master Control Scheme; 3.3.3 Droop Control Implementation in the VSI; 3.3.4 Ancillary Services; 3.3.5 Optional Secondary Control Loops
3.4 Implications of Line Parameters on Frequency and Voltage Droop Concepts; 3.4.1 Power Transmission in the LV Grid; 3.4.2 Comparison of Droop Concepts at the LV Level; 3.4.3 Indirect Operation of Droops; 3.5 Development and Evaluation of Innovative Local Controls to Improve Stability; 3.5.1 Control Algorithm; 3.5.2 Stability in Islanded Mode; 3.5.3 Stability in Interconnected Operation; 3.6 Conclusions; References; 4 Microgrid Protection; 4.1 Introduction; 4.2 Challenges for Microgrid Protection; 4.2.1 Distribution System Protection; 4.2.2 Over-Current Distribution Feeder Protection

Sommario/riassunto

Microgrids are the most innovative area in the electric power industry today. Future microgrids could exist as energy-balanced cells within existing power distribution grids or stand-alone power networks within small communities. A definitive presentation on all aspects of microgrids, this text examines the operation of microgrids - their control concepts and advanced architectures including multi-microgrids. It takes a logical approach to overview the purpose and the technical aspects of microgrids, discussing the social, economic and environmental benefits to power system operation.