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in the Face of New Constraints: Impact of Decentralized Generation;

2.1. Introduction: a new paradigm

2.2. Structure of modern electric transmission and distribution networks

2.2.1. Modern transmission networks; 2.2.2. Electrical distribution networks;

2.3. Recent development in the European networks and new constraints;

2.3.1. Deregulation of the electricity market in accordance with European directives;

2.3.2. Reducing greenhouse gas emissions in the generation of electrical energy;

2.3.3. Generation of electricity using renewable energy sources;

2.3.4. Energy dependency of the European Union;

2.4. The specific characteristics of electrical energy

2.4.1. Storage and production/consumption balance

2.4.2. Laws of physics on flow of energy;

2.4.3. Strategic role of electrical energy;

2.4.4. Voltage regulation in the electrical transmission and distribution networks;

2.4.5. Ancillary services;

2.5. Decentralized power generation;

2.5.1. Definition;

2.5.2. Decentralized power generation techniques in Europe, potential and costs;

2.5.3. Decentralized power generation and CO₂ emissions, indirect emissions from so-called "zero emission" power plants;

2.5.4. Decentralized production and ancillary services

2.6. Specific problems in integrating decentralized production in the networks

2.6.1. Connection conditions;

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2.6.4. Stability problems;

2.6.5. Influence on the voltage plan;

2.6.6. Impacts on transmission networks;

2.6.7. Harmonic disturbances;

2.7. New requirements in research and development;

2.7.1. Technical domain;

2.7.2. Economics;

2.8. Conclusion: a challenge and an opportunity for development for the electrical sector;

2.9. Bibliography

Chapter 3. Planning Methods for Generation and Transmission of Electrical Energy

Sommario/riassunto

The creation of a European liberalized electricity internal market and EU commitments for the reduction of greenhouse gas emissions (Kyoto Protocol) and for the use of renewable energy generation technologies induce new important constraints and problems on the electric power systems in Europe. This then creates the need for more research and development to engage with these new challenges in order to preserve the reliability of these systems. This book aims to provide advanced tools, covering major aspects, for people involved with such research and development. Split into two parts (the f
