

1. Record Nr.	UNINA9910555157803321
Autore	Araneo Rodolfo
Titolo	Electrical safety engineering of renewable energy systems // Rodolfo Araneo, Massimo Mitolo
Pubbl/distr/stampa	Hoboken, New Jersey : , : John Wiley & Sons, Incorporated, , [2022] ©2022
ISBN	1-119-62501-7 1-119-62505-X 1-119-62499-1
Descrizione fisica	1 online resource (302 pages)
Collana	IEEE Press Ser.
Disciplina	621.30289
Soggetti	Electric apparatus and appliances - Safety measures Renewable energy sources - Safety measures Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Intro -- Electrical Safety Engineering of Renewable Energy Systems -- Contents -- Preface -- Acknowledgments -- 1 Fundamental Concepts of Electrical Safety Engineering -- 1.1 Introduction -- 1.2 Electric Shock -- 1.2.1 Ventricular Fibrillation -- 1.2.2 The Heart-current Factor -- 1.3 The Electrical Impedance of the Human Body -- 1.3.1 The Internal Resistance of the Human Body -- 1.4 Thermal Shock -- 1.5 Heated Surfaces of Electrical Equipment and Contact Burn Injuries -- 1.6 Ground-Potential and Ground-Resistance -- 1.6.1 Area of Influence of a Ground-electrode -- 1.7 Hemispherical Electrodes in Parallel -- 1.8 Hemispherical Electrodes in Series -- 1.9 Person's Body Resistance-to-ground and Touch Voltages -- 1.10 Identification of Extraneous-Conductive-Parts -- 1.11 Measuring Touch Voltages -- 2 Safety-by-Design Approach in AC/DC Systems -- 2.1 Introduction -- 2.2 Class I PV Equipment -- 2.3 Class II PV Equipment -- 2.4 Ground Faults and Ground Fault Protection -- 2.5 Functionally Grounded PV Systems -- 2.6 Non-Ground-Referenced PV Systems -- 2.7 Ground-Referenced PV Systems -- 2.8 Fire Hazard in Ground-Referenced PV Systems -- 2.9 Faults at Loads Downstream the PV Inverter in Ground-referenced PV

Systems -- 2.10 Non-Electrically Separated PV System -- 2.11 PV Systems Wiring Methods and Safety -- 2.12 d.c. Currents and Safety -- 2.13 Electrical Safety of PV Systems -- 2.14 Rapid-Shutdown of PV Arrays on Buildings -- 2.15 Hazard and Risk -- 3 Grounding and Bonding -- 3.1 Introduction -- 3.2 Basic Concepts of Grounding Systems: The Ground Rod -- 3.3 The Maxwell Method -- 3.4 Multiple Rods: Mutual Resistance -- 3.5 Ground Rings and Ground Grid -- 3.6 Complex Arrangements: Rings and Ground Grids Combined with Rods and Horizontal Electrodes -- 4 Lightning Protection Systems -- 4.1 Review of Natural Lightning Physics, Modeling and Protection. 4.2 Lightning Protection of PV Systems -- 4.2.1 Ground-Mounted PV Systems -- 4.2.2 Rooftop Mounted PV Systems -- 4.2.3 Protection against Overvoltage -- 4.2.4 Surge Protective Devices (SPDs) -- 4.3 Lightning Protection of Wind Turbines -- 4.3.1 Lightning Protection System (LPS) -- 4.3.2 Step and Touch Voltages -- 4.3.3 Lightning Exposure Assessment -- 4.3.4 Assessment of the Average Annual Number of Dangerous Events NL Due to Flashes Directly to and near Service Cables -- 4.3.5 Lightning Protection Zones -- 4.4 High-Frequency Grounding Systems -- 4.4.1 Arrangement of Ground Electrodes -- 4.4.2 Effective Length of a Ground Electrode -- 4.4.3 Frequency-dependent Soil and Ionization -- 5 Renewable Energy System Protection and Coordination -- 5.1 Introduction -- 5.2 Power Collection Systems -- 5.3 Cable Connections -- 5.4 Offshore Wind Farm -- 5.5 Distributed Energy Resources: Battery Energy Storage Systems and Electric Vehicles -- 6 Soil Resistivity Measurements and Ground Resistance -- 6.1 Soil Resistivity Measurements -- 6.2 Wenner Method -- 6.3 Schlumberger Method -- 6.4 Multi-layer Soils -- 6.4.1 Ground Grid in Multi-layer Soil -- 6.4.2 Ground Rod in Multi-layer Soil -- 6.5 Fall-of-Potential Method for Ground Resistance Measurement -- 6.6 Slope Method for Grounding Resistance Measurement -- 6.7 Star-delta Method for Grounding Resistance Measurement -- 6.8 Four Potential Method for Grounding Resistance Measurement -- 6.9 Potentiometer Method for Grounding Resistance Measurement -- Appendix 1: Performance of Grounding Systems in Transient Conditions -- 1 Grounding System Analysis -- 2 Mathematical Model -- 3 Computation of Impedances -- 4 Green's Function -- 4.1 Static Formulation -- 4.1.1 One-Layer Ground -- 4.1.2 Two-Layer Ground -- 4.2 Dynamic Formulation -- 4.2.1 Equivalent Transmission Line Approach -- 5 Numerical Integration Aspects. 5.1 Singular Term -- 5.2 Sommerfeld Integrals -- Appendix 2: Cable Failures in Renewable Energy Systems -- 1 Cable Failures in Renewable Energy Systems: Introduction -- 2 Possible Solutions -- 2.1 Optimal Solutions -- 2.2 Termite Attacks Prevention -- 3 Non-destructive Methods for Cable Testing and Fault-locating -- 3.1 Insulation Resistance (IR) Test -- 3.1.1 IR Measurement of the Cable Insulation (XLPE) -- 3.1.2 IR Measurement of the Polyethylene (PE) Cable Jacket -- 3.2 High-Potential Test -- 3.3 LCR Test -- 3.3.1 Insulation Resistance (IR) -- 3.3.2 Dielectric Absorption Ratio (DAR) -- 3.3.3 Polarization Index (PI) -- 3.3.4 Quality Factor (Q) -- 3.3.5 Dissipation Factor (DF) -- 3.3.6 Time Domain Reflectometry (TDR) Test -- 3.3.7 Arc Reflection (ARC) Test -- 3.3.8 Bridge Methods -- 3.4 Cable Fault Analysis -- 3.4.1 Prelocation -- 3.4.2 Pinpointing -- 4 Sheath and Jacket Repairs -- 5 Termite Baiting Stations and Monitoring -- 6 Termite-proof Cables -- Index -- EULA.

---