

Book Review

Grid Connected PV System Design & Installation

Author & Publisher:

- (1) Global Sustainable Energy Solutions Pty Ltd. and
- (2) GSES India Sustainable Energy Pvt. Ltd.

Global Sustainability Energy Solutions (GSES), an internationally recognised engineering consultancy, education and training provider in the Renewable Energy (RE) Innovation and Technology sector has published the first Indian edition of 'Grid Connected PV System Design and Installation' as a part of its clean energy education programme in India.

This publication is a comprehensive handbook that contains detailed information on designing grid-connected photovoltaic (PV) systems. It provides methodical approach of designing and installation of grid connected PV systems. The book covers fundamentals of solar PV system, descriptions of the different components, sizing a system and matching different components. It also includes information on conducting site surveys of potential installations, system installation, troubleshooting, maintenance and the economics of grid-connected PV systems. This publication has been written around relevant Indian and international standards relating to grid connected solar systems. This extensive publication is also used as the information base for the GSES India online training program for Grid Connected PV Systems: Design & Installation.

Complete Book Review:

The book begins with a chapter on occupational health & safety issues and potential health hazard related to grid connected solar PV system, required safety equipment and explains how to carry out on-site risk assessment before installation of a PV system.

The next four chapters of the book cover electrical basics, solar radiation, PV module integration, and characteristics of solar cells. These chapters are extremely helpful for the beginners to understand about solar irradiation and peak sun hours, sun path diagram, position of the sun, solar altitude, geometric effects, tilting solar modules, electrical integration of PV modules and method of combining the modules to configure an array etc. Types and characteristics of solar cells including power characteristics, performance, electrical protection and reliability issues are discussed in details which provides essential engineering and scientific knowledge to the designers.

Chapters 6-8 cover details about inverters, mounting system and balance of systems for a grid connected PV system. Apart from basic understanding of purpose of inverter, types, grid-connected inverters vs. stand-alone inverters, types of grid-connected inverters the book provides detailed explanation about efficiency, inverter protection systems, power quality, monitoring and selection of inverters.

The highly illustrative chapter on mounting structure covers different types of mounting systems suitable for different type of roofs and ground, PV array row spacing calculating wind loading for solar array for different regions of India.

The balance of system equipment, i.e. the other components and enabling equipment, must be selected and installed correctly. If not, the system may have performance and reliability problems, premature faults etc. It can also lead to system failure.

The book explains the methodology and technical requirement for designing and selection of all key balance of system components including all DC and AC cabling, protection and disconnect switches – fuses, isolators and/or circuit breakers, lightning protection, PV array DC isolator and inverter AC isolator, metering and system monitoring.

Energy efficiency measures help in reducing energy consumption, saves in terms of energy cost paid to the utility and also contributes substantially in reducing renewable energy system size which will have direct impact on investment in renewable energy systems. Energy conservation and energy efficiency are given first preference before installing a renewable energy project. Considering this, the book includes a separate chapter on energy efficiency where different energy efficiency measures and passive solar design principles have been discussed.

The book contains step by step methodology to undertake site assessment to determine energy efficient initiatives, occupational health and safety (OHS) risks when working on that particular site, solar radiation and shading analysis, how the PV modules will be mounted, positioning of inverter and cable layout planning.

The design of a grid-connected PV system depends on the local operating conditions for the system's equipment. This process is intended to ensure that the array and the inverter are matched for those conditions. In general, the designer needs to ensure that these components match in terms of voltage, current and power. The book outlines the calculations required working out if the array and inverter are matched in terms of performance and safety in Chapter Eleven.

System protection in a grid-connected system is designed to serve as protection for both the cabling in the system and the photovoltaic modules. The book elaborately covers the forms of protection used within a photovoltaic array, the method of determining whether fault current protection is required and the sizing of fault current protection.

A well-designed photovoltaic system may have all the components sized appropriately and installed in safe environments, but the system will still only operate correctly if the cables are correctly selected. The designer will learn from the book the basic rules to follow for sizing and selection of DC and AC cable to ensure better performance of PV system.

There are a number of unavoidable losses or de-rating factors which causes loss in power generation from a PV system. The book discusses and explains methodology and steps to evaluate energy yield and performance ratio of a PV system considering losses from different factors like temperature, soiling, shading, manufacturer's tolerance, voltage drop through AC and DC cabling, inverter, tilt and orientation of the solar modules.

The book has one dedicated chapter for designing large grid connected PV systems, highlighting the additional issues that need to be considered when designing a larger system.

The book provides sample system documentation, system installation and pre commissioning checklist and test sheets for commissioning of individual components and complete system as per general procedural and electrical compliances.

The book also covers a brief section on maintenance and troubleshooting for a grid-connected PV system. The information in this chapter outlines how to streamline maintenance procedures.

The last two chapters of the book cover economics of PV system and fundamentals of smart grid. The book covers approach for developing basic financial models that can be considered when determining the economic viability of a grid-connected solar system. The smart grid chapter provide basic knowledge of smart grid concept, smart meters and how it can improve the reliability, efficiency, economics and sustainability of the production and distribution of electricity within the power industry.

All designers and installers of grid connected PV system must follow the rules and standards applicable as per electricity regulation for safety and quality purpose. The book covers all applicable standards and regulation followed in India and internationally for best practice design and installation.

Conclusion:

'Grid Connected PV System Design and Installation' is an extensive reference book relevant to solar PV professionals and experts as well as students specializing in this field. The book provides a structured approach to studying the design and installation of grid connected photovoltaic systems. The book is presented in sections; starting with the knowledge that is fundamental to understanding how solar systems work, then discussing the components of a system, and finally the design, installation and maintenance of a solar system. To make the most of this book we suggest that one works through the chapters in order, starting with the basics and building up his/her understanding of the material.

Book Price: INR2000.00

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