

Photovoltaic Systems

third edition



James P. Dunlop



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QR Code Contents

- *Quick Quizzes®*
- *Interactive Glossary*
- *Media Clips*
- *Flash Cards*
- *Solar Radiation Data Sets*
- *Sun Path Charts*
- *Forms and Worksheets*
- *Solar Time Calculator*
- *ATPeResources.com*



Introduction

Photovoltaics, along with other renewable-energy technologies, is a rapidly growing sector of the energy market. *Photovoltaic Systems*, Third Edition, is a comprehensive guide to the design, installation, and evaluation of residential and commercial photovoltaic (PV) systems. The textbook covers the principles of photovoltaics and how to effectively incorporate PV systems into stand-alone or interconnected electrical systems. The content includes system advantages and disadvantages, site evaluation, component operation, system design and sizing, and installation requirements and recommended practices. Common scenarios and procedures are discussed throughout.

Each chapter begins with an overview of the covered material in the form of an introduction and chapter objectives. At the end of each chapter is a summary of key concepts, a listing of all definitions from that chapter, and review questions. Answers to odd-numbered review questions are included at the end of the book.

This new edition adds more detail to many illustrations, updates photographs, includes more review questions, and features the following significant content changes:

- Updated electrical requirements in accordance with the 2011 edition of the National Electrical Code®
- Expanded solar radiation and sun position content
- New and expanded coverage of various shading analysis methods
- Expanded safety and personal protective equipment (PPE) content

The *Photovoltaic Systems*, Third Edition, QR codes located throughout the book features interactive resources for independent study to enhance learning, including Quick Quizzes®, an Interactive Glossary, Media Clips, Flash Cards, several solar resources, and a link to ATPeResources.com. The Quick Quizzes® provide an interactive review of key topics covered in each chapter. The Interactive Glossary is a helpful reference to textbook definitions and media clips that augment the definition provided.

The solar resources are electronic resources for evaluating potential installation sites and for sizing PV systems, and include the following:

- Solar Radiation Data Sets, which include the National Renewable Energy Laboratory's complete solar radiation data for 239 sites around the United States in easily printable PDF format.
- Sun Path Charts, which are printable PDF charts of solar positions for selected latitudes. The related sun path chart spreadsheet can calculate additional charts as needed.
- Forms and Worksheets, which include a sample site survey form, inspection checklist, maintenance plan, and a set of sizing and financial analysis worksheets, all in PDF format. The sizing and analysis worksheets are also included in spreadsheet files that automatically perform calculations.
- Solar Time Calculator, which facilitates the conversion between standard time and solar time that is required for some solar analyses.

ATPeResources.com provides access to additional online technical content and a list of Internet links to manufacturer, organization, government, and ATP resources. Clicking on the ATP web site button (www.go2atp.com) or the ATP logo accesses information on related training products.

The Publisher

Photovoltaic Systems

Detailed, full-color illustrations explain the principles and operation of PV systems.

Factoids provide interesting technical tips or background information.

Chapter introductions provide an overview of chapter content.

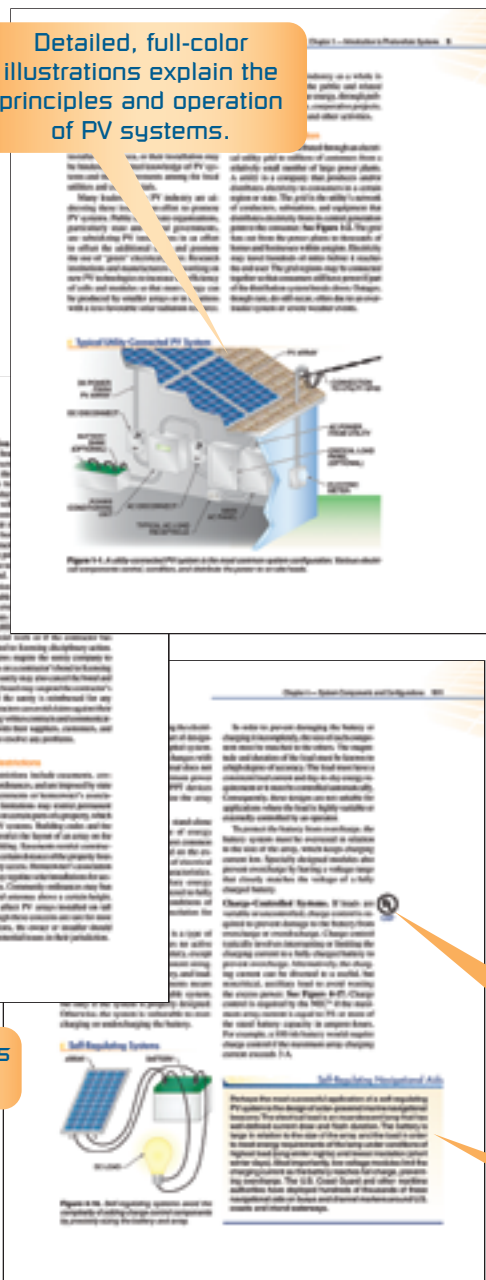


Chapter objectives list learning goals for the chapter.

UL category codes located throughout the book indicate listed products which can be found in the UL white book and on the UL website www.ul.com.

Vignettes supplement the text with additional technical, historical, or safety information.

Installation photographs depict best practices.



Features

Summaries highlight the key concepts of the chapter.

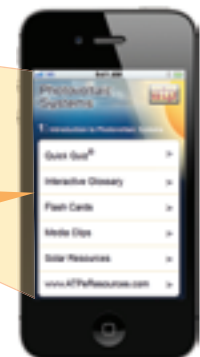
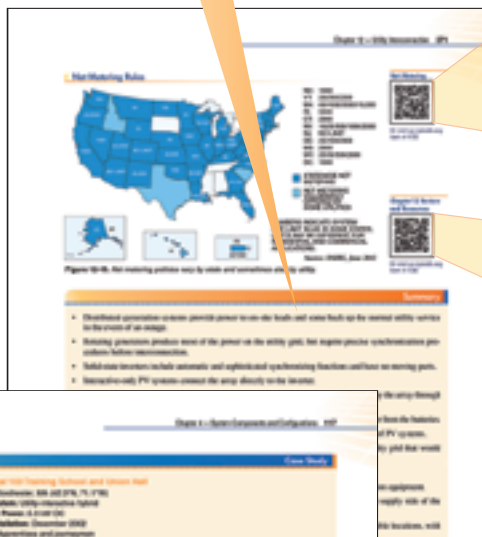
QR codes throughout the book provide technical information for PV systems

QR codes at the end of each chapter provide review material and additional resources.

Key terms are listed at the end of the chapter.

Case studies spotlight unique or chapter-relevant aspects of installed PV systems.

Review questions test for chapter comprehension.



Photovoltaic Systems

About the Author

Mr. Jim Dunlop was encouraged early to pursue a career in the electrical field by his high school electrical shop teacher George Patrick Shultz (author of several early NJATC textbooks), and when he attended the University of Florida, he planned to study electrical engineering. Jim's early experiences, however, led him into renewable energy systems. He was also influenced by courses on solar energy systems and direct energy conversion taught by renewable energy pioneer Dr. Erich Farber, founder of the University of Florida's Solar Energy Research Park.

Beginning his career at the Florida Solar Energy Center (FSEC), Jim became involved in the development and evaluation of photovoltaic (PV) systems, which had recently been included in the 1984 National Electrical Code®. Over his twenty-year career at FSEC under Director Jerry Ventre, Jim was involved in developing curricula and delivering numerous training programs on PV systems. In 2001, he led FSEC's efforts in attaining national accreditation for its PV training programs.

From 2001 to 2002, Jim served as the charter technical committee chairperson for the North American Board of Certified Energy Practitioners (NABCEP). As of 2005, Jim is again leading this committee. This position involves developing candidate entry requirements, task analyses, examinations, and study guides for a national PV-installer certification program.

In 2001, Jim became the first Master Trainer in PV systems certified by the Institute for Sustainable Power worldwide. In addition to creating training manuals and instructor materials, he has published over fifty papers and technical reports on the design, testing, and evaluation of PV systems and equipment. Jim recently served as a Curriculum Specialist for the NJATC and continues to be involved in the PV industry through providing training and consulting services for the specification, design, installation, and evaluation of PV systems.