

Preface

Renewable energy power plants have been used to feed loads in remote areas as well as in central power plants connected to electric utility. Smart grid concepts used in the design process of the hybrid renewable power systems can reduce the size of components which can be translated to reduce the cost of generated energy. This book introduces a design methodology for stand-alone hybrid renewable energy system with and without applying the smart grid concepts for comparison purpose. The proposed hybrid renewable energy system contains wind, photovoltaic, battery, and diesel engine. The system is used in the beginning to feed certain loads, and the hybrid system should cover the load required completely. A novel methodology has been introduced taking the smart grid concept into account by dividing the loads into high- and low-priority parts. The high-priority part should be supplied at any generated conditions. But, the low-priority loads can be shifted to the time when the generated energy from renewable energy sources is greater than the high-priority load requirements. Results show that the using of this smart grid concept will reduce the component size and the cost of generated energy compared to the case without dividing the loads. Smart optimization techniques like particle swarm optimization (PSO) and genetic algorithm (GA) have been used to optimally design the hybrid renewable energy system.

This book will give the reader an excellent background about the renewable energy sources, optimal sizing and locating of hybrid renewable energy sources, the best optimization methodologies for sizing and designing the components of hybrid renewable energy system, and how to use smart grid concepts in the design and sizing of this system.

This book will be very interesting for the readers who look for using hybrid renewable energy system to feed loads in isolated areas. It will also help them to know about the dispatch methodology and how to connect different components of this system. Also, it will help them to understand the modeling of different components of the hybrid renewable energy system as well as the cost analysis of this system.

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