
Introduction

This manual is about making solar electricity available to rural Africans. It was developed from lesson notes produced for a 1985 training programme conducted in south Meru District, Kenya, by Harold Burris and myself. At the time, Harold Burris and a number of Kenyan electricians (their company was called *Solar Shamba*) were designing and installing solar electric systems tailored to the expectations of rural home owners. During the USAID-financed training programme, a dozen Meru-based electricians learned the *jua kali* (cottage industry) approach to solar electric technology pioneered by *Solar Shamba*. Five years later, these and other rural-based electricians have completed thousands of solar electric installations throughout East Africa.

Solar electricity is generated directly from sunshine using devices called solar cell modules. All over the world, people are taking up the technology to provide power for many remote and rural applications. Since 1984, small solar companies have installed hundreds of thousands of systems in developing countries, from Kenya to the Dominican Republic, and from Sri Lanka to the South Pacific Islands. While the prices of petroleum products have been unstable over the last decade, prices of solar electric equipment have been steadily declining. Today, more solar modules are being produced than ever before. Countries as diverse as Brazil, Germany, the United States, Japan, China, and India have solar cell production facilities. Installation and assembly of solar electric systems is fast becoming a village level technology.

The pages that follow describe how solar electricity can provide power for the small-scale applications found in East African rural homes, schools and industries. With the assistance of a

trained electrician, you should be able to follow this book's guidelines to design and install a solar electric system to power lights, appliances and small tools in a home, institution or business.

The success of any solar electric system depends on how well it is designed, installed, managed, and maintained. In order to design large systems, a full understanding of solar electric system theory is necessary. However, you do not need to be a highly trained engineer to design, install or service small solar electric systems. Only a few weeks' training provides skills sufficient to design and install effective small-scale systems.

First, you need to know a bit about electricity. You also need to know how much solar energy can be collected at what cost, how to store and distribute the energy, how to choose appliances and how to maintain the system. This book contains all the above information. Once you have mastered these basic principles, it is relatively simple to design and install a system that suits your needs.

Many good manuals have been written about solar electricity for the requirements of Western electricians and consumers (see References). But the energy consumption patterns, the appliances available and the budgets of East Africans are very different from those in developed countries.

Rural African schools, institutions and health centres require quality lighting to maintain acceptable levels of performance. Tea shops and kiosks demand electric power for radios, televisions and lights to attract customers. Cottage industries demand small amounts of electric power for sewing machines, small tools and work area lighting. Additionally,

teachers, farmers and extension workers desire power for the radios, televisions and music systems that connect them with the rest of the world and make rural living more pleasant.

The following chapters answer questions that might be asked by rural teachers or businessmen, such as "What is the cheapest system that I could install to power two lights and a radio?" and "Do I really need a charge controller for my system?" It provides resources to rural solar electricians such as sizing worksheets, wiring guides and local meteorological information. For the extension agent or development worker, it gives a general idea of what solar electric equipment is available in East Africa and what is required to complete an installation.

Like improved stoves, biogas digesters, agroforestry systems or any other technology that benefits rural people, solar electricity relies on a wide network of people involved in its dissemination and development. No individual can take all credit for success that is the work of many. This book thus owes a great debt to rural solar practitioners such as Daniel Kithokoi of Solar Electric Systems (Meru), Dickson Muchuri of Alpa Nguvu (Nairobi), Silas Kinyua of Chuka Solar Agents (Chuka), and Charles Rioba of Solar World (Kisii and Nairobi). Their hard work has proven beyond doubt that solar energy is a practical technology for rural Africa. This book is dedicated to them, and to others like them seeking ways to solve the rural energy crisis in Africa.

Mark Hankins
Nairobi
February 1991
