Chapter 19
Solar Energy Education and Training Programs in the USA:
An Academic Perspective

Sohail Anwar
Pennsylvania State University – Altoona College, USA

Shamsa S. Anwar
Pennsylvania State University – Altoona College, USA

ABSTRACT

In the past, solar energy education was limited to scientists and engineers who could develop new technologies and conduct research. Later on, a need was recognized to educate those who design and construct buildings, because solar energy applications were well developed for such applications. At present, numerous solar energy applications have been developed. Solar energy is currently used for heating and cooling of buildings, production of electricity for stationary and mobile applications, solar lighting systems, crop drying, water treatment, and environmental cleanup. Given the expanding use of solar energy, there is a need to educate society about solar energy. Thus, solar energy education and training programs should be developed at different educational levels to fulfill this need. Such programs need to recognize the environmental value of solar energy and the life cycle advantages of solar energy systems. This manuscript provides an overview of the status of solar energy education and training in the United States. Though the focus of this chapter is on the solar energy education and training programs provided by the academic institutions in the USA, a short description of non-academic programs is also provided.

INTRODUCTION

A trademark of the economic growth in the United States is an ever-increasing demand for energy. Traditionally, this demand has been primarily fulfilled through the use of fossil fuels. However, the fossil fuels are non-renewable, that is, they draw on finite resources that will eventually dwindle, becoming too expensive or too environmentally damaging to retrieve. Thus, the quest for a clean, safe, and efficient environment has led to the search for alternative energy resources.

DOI: 10.4018/978-1-4666-1996-8.ch019

The energy resources such as solar, wind, geothermal, hydropower, and biomass have been identified as renewable energy. The climate change concerns coupled with high oil prices are driving increasing renewable energy legislation, incentives, and commercialization (Petrovic, Munukutla, & Robertson, 2007; European Renewable Energy Council, 2007; Al Kalaani, 2005; Al Kalaani & Rosentrator, 2007). The key benefits of renewable energy technologies include:

1. Utilize locally available resources
2. Enhance energy security by diversifying the energy portfolio, improving price stability in times of rising fossil fuel costs, and reducing risks associated with future energy cost uncertainties.
3. Match well to a variety of grid, off-grid, remote, and distributed applications.
4. Are environmentally beneficial, lacking the nitrogen and sulfur oxides that are harmful to human, animals, and plants, and carbon dioxide and methane emissions which contribute to climate change.

Solar energy is one form of renewable energy. It is clean, sustainable, and does not produce carbon dioxide or other harmful gases. The applications of solar energy include:

- Generate electricity by heating air to rotate turbines in a Solar updraft tower
- Generate electricity in geosynchronous orbit using solar power satellites
- Generate electricity using photovoltaic solar cells
- Generate electricity using concentrated solar power
- Generate hydrogen using photoelectrochemical cells
- Heat and cool air through use of solar chimneys
- Heat buildings, directly, through passive solar building design
- Heat food using solar ovens
- Heat water or air for hot water and space heating using solar-thermal panels
- Solar air conditioning

However, despite the global awareness and concerns regarding environmental degradation, the present public policies in many countries do not favor the use of solar energy over conventional fuels (Goswami, 2001). Using conventional financial tools, many solar energy applications do not appear cost effective. In order to develop effective public policies that recognize the environmental value of solar energy and the financial tools that demonstrate the life cycle advantage of solar energy systems, it is important to properly educate public policy makers, financial professionals, and the general public, In the United States, the solar energy education is available at the following competency levels:

- College Education (Undergraduate and Graduate)
- Technical Education (Certificate and Associate Degree)
- Schools (K – 12)
- Workshops and Seminars for general public

This chapter focuses on solar energy education in the United States (U.S.A.). The academic perspective is emphasized in the manuscript.

UNDERGRADUATE AND GRADUATE EDUCATION

Solar energy education at the college/university level is perhaps the most developed. Well developed curricula at the undergraduate and graduate levels are available at many colleges and

Related Content