Chapter I

Introduction and Literature Survey

I.1 Introduction

Presently the world's energy economy runs on fossil fuels, hydroelectric power and nuclear energy sources. There are problems facing the further development of generating methods based on any of these "conventional" fuels:

- The fossil fuels are rapidly diminishing and politically controlled.
- Hydroelectric power generation is restricted to geographically suitable areas.
- The possible hazards of nuclear power have been much publicized, particularly those concerning the storage and military use of fissile nuclear materials.

The need to develop an economical viable source of renewable energy becomes more urgent, utilization of solar energy is attracting much attention to obtain permanent and clean energy.

The sunlight received by a surface on earth can be divided into three different types [10]: direct, diffuse, and reflected, as shown in Fig.(I.1). Diffuse sunlight approaches a surface from all unobstructed angles, while direct-beam rays strike the surface from only one angle. In addition to diffuse and direct light, an angled surface can also receive reflected light from the ground or other appropriately positioned surfaces.

Fig.(I.2) shows the annual average solar radiation in the world, which has its maximum value 7 $kW.h/m^2.day$ in the Egyptian western desert[10]. Furthermore the total energy reaching the earth amounts to 3 x 10^{24} J/year, which is about ten thousand times as much as the energy

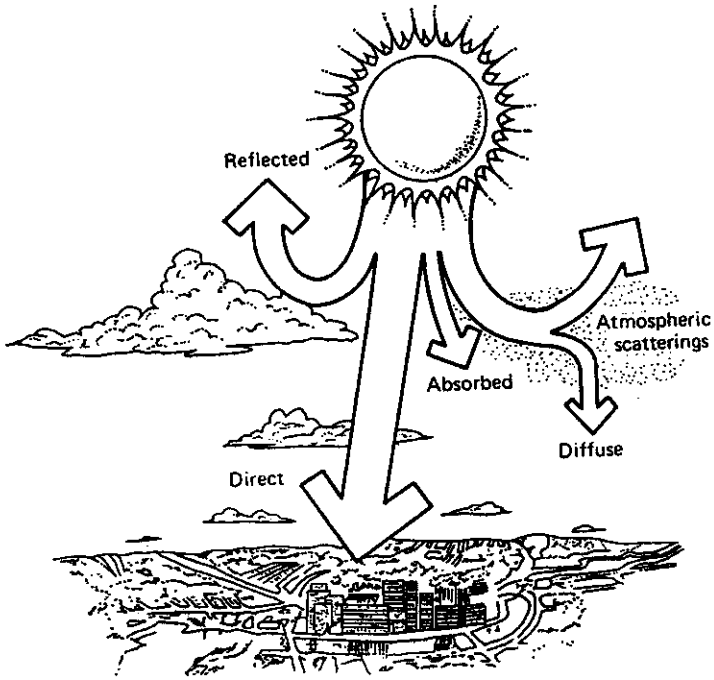

Fig. (I.1) Sunlight and the earth's atmosphere.

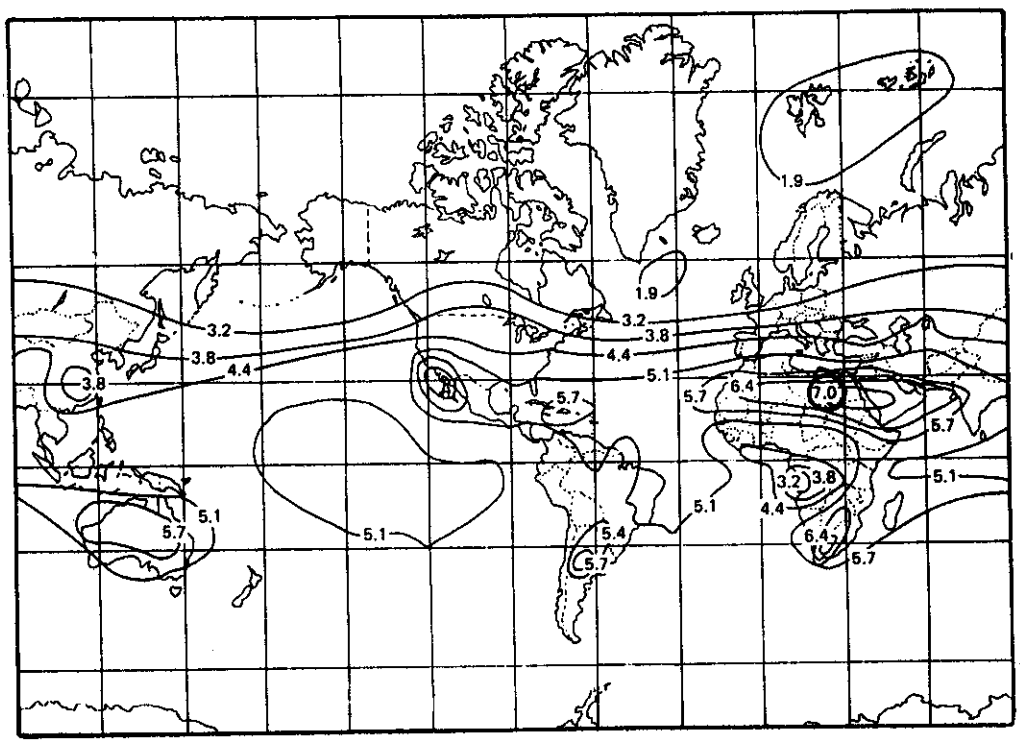

Fig. (I.2) World annual average solar energy on a horizontal surface ,kW. h /m^2.day.