

Chapter 01

INTRODUCTION

1.1. Background

There are many alternative energy sources other than fossil fuels. The decision of what type of energy source should be utilized in each case must be made on the basis of economic, environmental, and safety considerations. Because of the desirable environmental and safety aspects, it is widely believed that the solar energy should be utilized instead of other alternative energy forms. Solar energy can be utilized sustainably without harming the environment.

It is now generally believed in the world that renewable energy technologies can meet much of the growing demand at prices that are equal or lower than those usually forecast for conventional energy. By the middle of the 21st century, renewable sources of energy could account for three fifths of the world's electricity market and two fifths of the market for fuels used directly [1]. Moreover, making a transition to a renewable energy-intensive economy would provide environmental and other benefits not measured in standard economic terms. It is envisaged that by 2050 the global carbon dioxide (CO₂) emissions would be reduced to 75% of their 1985 levels, provided the energy efficiency and renewables are widely adopted [1]. In addition, such benefits could be achieved at no additional cost, because renewable energy is expected to be competitive with conventional energy.

In Sri Lanka too, a broad prolonged discussion has existed for at least three decades regarding renewables. Mini/micro hydros, solar PV systems and wind turbines have been in Sri Lanka for a certain period of time. However the possibility of large scale solar thermal power plants has not been considered. There are reasons for that. The first is that the most of these technologies are not mature enough and not widely available. The second is that the associated capital cost and the per unit energy cost are also higher.

However, the current situation in the world compels us to include these technologies into our future energy mix because of following reasons. The first is the uncertainty of oil prices. This was experienced in 2008 and the country suffered from the volatility. The cost of oil increased to unprecedented levels in no time, giving no space to breathe to developing economies like Sri Lanka. The second is as described above; the cost of solar thermal technologies will continue to decrease and will be competitive with other conventional technologies in the near future, say by 2020. The third is the energy security. It is said that the world is regionalizing into regions such as Europe, China, United States etc. There may be geo-political cold wars among these countries or regions. If we can secure our energy supply with available resources as much as possible, our economy will not be susceptible to external factors to the extent we experienced in the past. Further it will be able to harvest the benefits of carbon credit program while supporting the struggle against global warming.

1.2. The Objective

To study and develop a conceptual design for a central receiver type concentrating solar power plant near Hambantota, and examine the economic viability of the project.



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1.3. Scope of work

The scope of the work of this study is given below,

- In this study, the best available site having rich solar resources near Hambantota area to build a central receiver type concentrating solar power plant (power tower) will be assessed.
- The study will justify, giving reasons, the suitability of a power tower near Hambantota area.
- The impact of plant on the environment and possible mitigation techniques will be discussed.
- The capacity of the plant and its components will be estimated. The study will include heliostats field design, receiver design and thermal storage calculations.
- Economic analysis with a sensitivity analysis will be incorporated to the study and the economic feasibility of the plant will also be discussed.