

CHAPTER 1

INTRODUCTION

The development of renewable energy sources (RES) is necessary for the sustainable development of any country due to depleting fossil fuel level, climbing fossil fuel prices across the world and more recently pressure for reduction emission level. Among various renewable energy sources based technologies, the solar photovoltaic technology (PV) for power generation is considered well-suited technology particularly for distributed power generation. The large introduction of PV systems may replace or postpone the extension of conventional central stations of electricity production and the investment in grid reinforcement having a positive overall economic impact. The PV system electric power is of particular value when it coincides with the peak demand, as during the summer afternoon peak due to the use of air conditioning units. In addition to this, solar photovoltaic (PV) systems can also increase the reliability of the system to which they are connected, can also reduce transmission and distribution losses as they generate the electricity close to the point where it is consumed.

PV systems are designed and sized to meet a given load requirement. PV system sizing exercise involves the determination of the size and capacity of various components, like PV panels, inverter, batteries, etc. PV system design also involves a decision on which configuration is to be adopted to meet the load requirement. Once the system configuration is decided then the size or capacity of the various components are calculated. A low quality component (charge controller, for instance) may be cheaper initially but probably will be less efficient and may not last longer. On the other hand, a relatively expensive but higher quality component is more likely to perform better (saving energy and thus cost) and may be able to recover its cost in the long run.

Most parts of India receive solar energy of 5 Kwh/m² per day over 280 clear days per annum. Even if 1% of this land is used to harness solar energy at an overall efficiency of 10%, as much as 429×10^9 KWh/year of electricity can be generated. One

of the states of India, Karnataka is rich in solar resources and solar energy will complement the conventional sources of energy in a large way. The state of Karnataka is blessed with about 240 to 300 sunny days with good solar radiation of 5.4 to 6.2 kWh/m²/day.

To harness the potential of solar resources in the state, Government of Karnataka had issued a solar policy for the period 2014-2021 with the objective to achieve 3% contribution from solar source out of total energy consumption. All solar power projects (solar PV and solar thermal) established in the state of Karnataka shall be eligible for benefits under the policy. The different projects applicable under this policy are

- Grid connect, utility scale projects
- Grid connect, roof top projects
- Off grid projects

In grid connect roof top project, all residential/institutional/commercial/government building owners, industrial units are eligible to set up solar power plant within the prescribed capacity limit.

The solar market for power generation is still relatively new and not completely understood. There are a limited number of technology providers and access to technical data is restricted. There is a need to analyze the energy impact of these systems before large scale implementation of the technology.

In the ongoing work the potential and the cost-effectiveness of a solar photovoltaic power plant for meeting the energy demand of PES campus, one of the educational institution situated near Shivamogga (Karnataka) is to be analyzed. PES institute of shivamogga comprises of seven blocks of buildings. Electricity is needed for lighting gadgets, fan, air conditioners and to run various equipment and machineries.

The average energy demand of the institution is 4.79MW and it varied monthly. These days getting a continuous and uninterrupted supply of energy has become the largest problem for institution. The backup diesel generators have a very high operation cost and are not a clean source of energy either. So there is great need for a sustainable and clean source of energy. Solar energy is the largest available carbon-neutral renewable energy source which can meet the energy demand of institution.