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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND TO THE STUDY

The use of renewable energyincreased greatly just after the first big oil crisis in the late seventies. Atthat time, economic issues were the most important factors, hence interest insuch processes decreased when oil prices fell. The current resurgence ofinterest in the use of renewable energy is driven by the need to reduce thehigh environmental impact of fossil-based energy systems. Harvesting energy ona large scale is undoubtedly one of the main challenges of our time. Futureenergy sustainability depends heavily on how the capacity of renewable energy isimproved in the next few decades.

Although in mostpower-generating systems, the main source of energy (the fuel) can bemanipulated, this is not true for solar and wind energies (Valenzuela, et al,2004). The main problems with these energy sources are cost and availability,wind and solar power are not always available where and when needed. Unlikeconventional sources of electric power, these renewable sources are not“dispatchable”—the power output cannot be controlled. Daily and seasonaleffects and limited predictability result in intermittent generation. Somemanufacturers has released products to facilitate the integration of renewableenergy but the researcher is examining ways of improving the capacity ofrenewable power system using solar power panel (Camacho et al, 2007).

Industry must overcome a numberof technical issues to deliver renewable energy in significant quantities.Control is one of the key enabling technologies for the deployment of renewableenergy systems. Solar power requires effective use of advanced controltechniques. In addition, reliable electric supply cannot be achieved withoutextensive use of control technologies at all levels.

Solar power plant exhibitchanging dynamics, nonlinearities, and uncertainties—challenges that requireadvanced control strategies to solve effectively. The use of more efficientcontrol strategies would not only increase the performance of these systems,but would increase the number of operational hours of solar and wind plants andthus reduce the cost per kilowatt-hour (KWh) produced.

Thesolar have tremendous potential for fulfilling the world’s energy needs (WhiteHouse, 2010).

One of the greatest scientificand technological opportunities researchers are faced with is approaches to developingefficient ways to collect, convert, store, and utilize solar energy at anaffordable cost. The solar power reaching the earth’s surface is about 86,000TW. Covering 0.22% of our planet with solar collectors with an efficiency of 8%would be enough to satisfy the current global power consumption. Estimates arethat an energy project utilizing concentrating solar power (CSP) technologydeployed over an area of approximately 160 x 160 km in the Southwest U.S. couldproduce enough power for the entire U.S. consumption.

Solar-sourced electricity canbe generated either directly using photovoltaic (PV) cells or indirectly bycollecting and concentrating the solar power to produce steam, which is thenused to drive a turbine to provide the electric power (CSP).

Concentrating solar thermalsystems use optical devices (usually mirrors) and sun-tracking systems toconcentrate a large area of sunlight onto a smaller receiving area. Theconcentrated solar energy is then used as a heat source for a conventionalpower plant. A wide range of concentrating technologies exists, the

main onesbeing parabolic troughs, solar dishes, linear Fresnel reflectors, and solarpower towers. The primary purpose of concentrating solar energy is to producehigh temperatures and therefore high thermodynamic efficiencies.

Parabolic trough systems arethe most commonly used CSP technology. A parabolic trough consists of a linearparabolic mirror that reflects and concentrates the received solar energy ontoa tube (receiver) positioned along the focal line. The heat transfer fluid ispumped through the receiver tube and picks up the heat transferred through thereceiver tube walls. The parabolic mirror follows the sun by tracking along asingle axis. Linear Fresnel reflectors use various thin mirror strips toconcentrate sunlight onto tubes containing heat transfer fluid. Higherconcentration can be obtained, and the mirrors are cheaper than parabolicmirrors, but a more complex tracking mechanism is needed.

1.2 STATEMENT OF THE PROBLEM

The uncertainty andintermittency of solar generation are major complications that must beaddressed before the full potential of this renewable power system can bereached. The researcher provides anoverview of a solar power panel with an evolution of electricitynetworks toward greater reliance on communications, computation, and controlwhich is a way aimed at improving it.

Theapplication of advanced digital technologies (i.e., microprocessor-basedmeasurement and control, communications, computing, and information systems)which are expected to greatly improve the reliability, security,interoperability, and efficiency of the electrical grid, while reducingenvironmental impacts and promoting economic growth will be considered.

1.3 OBJECTIVES OF THE STUDY

Thefollowing are the objectives of this study:

1.To provide an overview on renewablepower system and its capacity.

2.To examine ways of improving thecapacity of renewable power system using the solar power panel.

3.To identify the limitations of solarpower system

1.4 RESEARCH QUESTIONS

1.What is renewable power system and itscapacity?

2.What are the ways of improving thecapacity of renewable power system using the solar power panel?

3.What are the limitations of solarpower system?

1.6 SIGNIFICANCE OF THE STUDY

Thefollowing are the significance of this study:

1.Findings from this study will educatestudents on renewable power system with emphasis on solar power system.

2.It will educate researchers on methodsof improving the existing solar power technology.

3.This research will also serve as aresource base to other scholars and researchers interested in carrying outfurther research in this field subsequently, if applied will go to an extent toprovide new explanation to the topic.

1.7 SCOPE/LIMITATIONS OF THE STUDY

This study will coverapproaches at improving the existing solar power technology with a view ofoptimizing the operation of the system and minimizing environmental impacts.

LIMITATION OF STUDY

1. **Financialconstraint**-Insufficient fund tends to impede the efficiency of the researcher in sourcingfor the

relevant materials, literature or information and in the process ofdata collection (internet, questionnaire and interview).

2. **Timeconstraint**- Theresearcher will simultaneously engage in this study with other academic work.This consequently will cut down on the time devoted for the research work.

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