SHORT COMMUNICATION
GLOBAL JOURNAL OF PURE AND APPLIED SCIENCES VOL. 10, NO. 1, JANUARY 2004: 223-225
COPYRIGHT© BACHUDO SCIENCE CO. LTD. PRINTED IN NIGERIA. ISSN 1118-8579

SOLAR ENERGY AND ITS APPLICATIONS IN NIGERIA.

J. O. COKER

(Received 29 April 2002; Revision accepted 17 Sept. 2003)

ABSTRACT

Solar energy is the energy transmitted from the sun in the form of electromagnetic radiation, which requires no medium for its transmission. The earth receives about one – half of one billionth of the total solar output. The sun is largely responsible for almost all of our conventional energy sources. For example, photosynthesis of plants and algae supported ancient life that later became fossils fuels. Even, hydroelectric power would not be possible without the evaporation of water. Unfortunately, solar energy itself has not been fully accepted as a safe, efficient and understandable source of energy. The time is ripe, however, for all of us to become aware of the direct contributions solar energy can make to our lives and economy, most especially during this time of erratic power supply by the National Electric Power Authority (NEPA).

Some of the applications of solar energy in Nigeria are in Village electrification, residential / commercial building, water pumping and purification, agricultural utilization, heating sources, and industrial utilization etc.

INTRODUCTION

There are different forms of energy in the universe but the solar energy is the energy from the sun that is the primary source of energy. There can never be a true " energy shortage" as demonstrated by Einstein, everything in the universe is energy, heat, light, matter and as one energy is used up it is been replaced by another form of energy that is, transformation of energy.

If a good solar station is designed with efficient storage system and if the Federal Government could subsidize solar energy production to make it less difficult to compete with other fuel energy industries this natural energy cannot become scarce in future.

Hence, Solar energy is the alternative energy resource without environmental degradation and safety risk compare with nuclear of fossil energy. The objectives of the paper is to consider the conversion of solar energy to electrical energy (through photovoltaic cell), solar energy storage, review of solar energy and current, and possible future applications in Nigeria.

METHODOLOGY

(a) SOLAR ENERGY CONVERSION.

Solar energy can be converted to electrical energy through Photovoltaic solar cells.

Photovoltaic Solar Cells or Modules: as the word implies (photo = light , voltaic =electricity) convert in ex-haustible Solar energy (sunlight) directly into electric energy (electricity). This cells are made of special materials called Semiconductors such as Silicon, which is currently the most common used.

Single crystal Silicon isn’t the only material used in photovoltaic cells. Poly crystalline Silicon or Amorphous Silicon can be used in an attempt to cut manufacturing costs. Other materials used include gallium arsenide, copper indium diselenide and cadmium telluride.

Basically, when light, in the form of photons, hits the cell, an electron is set loosed, and result in a free hole as well. If free electron and free hole happen to wander into its range of influence, the field will send the electron to the N side and the hole to the P side.

This causes further disruption of electrical neutrality, and if an external current path is provided, electrons will flow through the path to their original side (the P side) to unite with holes that the electric field sent there, doing work along the way. The electron flow provides the current, and the cells electric field causes a voltage and both defines the power that the solar cell can produce.

Photovoltaic systems are wonderful technology that makes it possible to fully enjoy the power of sunlight, independent, reliable, ecologically safe energy sources that operate everywhere the sun shines.
(b) SOLAR ENERGY STORAGE
This is very important especially when the sun
isn't shining or during the rainfall cloudy days, as
well as altitude, humidity and other more subtle
factors. Therefore, to have enough electricity
supply all the year, we need energy storage in
form of batteries.

The most commonly used deep cycle batteries
are lead – acid batteries (both sealed and vented)
and nickel – cadmium batteries although
expensive, but last longer and can be discharged
more completely without harm.
Generally, photovoltaic batteries have to
discharge smaller current for a longer period
(such as all night), while being charged during the
day.

An inverter is also needed in the system, a device
that converts direct current to alternating current
used by the household appliances.

APPLICATIONS OF SOLAR ENERGY IN NIGERIA
Nigeria is a West African nation of approximately
130 million people. It is a developing nation, as is
made clear by its high birth and death rates, low
literacy rate, lack of powerful and effective
Federal Government, and minimal infrastructure.
In an attempt to improve the infrastructure of Nigeria,
the Nigeria Government has tried to privatize the
communication and energy (i.e. electric power
plants and oil refineries) industries.

Electrical infrastructure is extremely scarce in
Nigeria. Only 40% of Nigerians have access to
electricity. Although more than 70% of the
population lives in rural areas, only 10% are
connected to the grid. Hence, electric consumers
have had to figure out other ways of generating
electricity. Increasing inflation rates and foreign
exchange rates have increased the cost of
materials and labour needed for grid extensions
by at least 400% since 1989.

In view of this, the Nigerian Government has
recognized the need to seek decentralized
technologies, in order to meet the increasing
electricity demands of the people. Hence solar
photovoltaic is an attractive method to try and
solve Nigeria's energy problems because it offers
modularity and requires no fuel, which makes it
much more suitable for rural environments.
Additionally, photovoltaic plants require very basic
and relatively simple operation and maintenance
and have long life times with very little
performance degradation.

One of the primary uses of photovoltaic
applications in Nigeria was in water pumping and
purification, which began, in the early 1980's. In
1982, a cost comparative study on photovoltaic
system proved that photovoltaic was much less
expensive even, in terms of maintenance to
diesel powered water pumping system of the
same power output which required fuel and
services due to wear and tear.
One of the most important benefits of photovoltaic
pumping is the ability to shut down the common
open wells, which frequently expose the people to
dises, which frequently expose the people to
diseases. It also significantly reduced the
distance that the rural dwellers had to travel to
to obtain clean water. The photovoltaic water
pumping system efficiency is very high, and the
system is durable and long lasting.

In 1991, Nigeria Telecommunications (NITEL)
powered the first two stations in Nigeria, the
Ugonoba and the Gwagabawa repeater stations,
with solar photovoltaic systems. By 1997, more
than 50 repeater stations in the Nigerian network
were powered by solar photovoltaic systems.

The first installation of 22 photovoltaic – powered
cellular phone systems was successfully installed
across the country. The introduction of
photovoltaic technology rids the country of the
frequent failures associated with the long distance
routes of the current telecommunications
network, and provides a reliable source of energy
even in the most remote areas of Nigeria. Hence,
the benefit of photovoltaic powered
telecommunications in relation to the existing
network has been tremendous.
advancement towards a much more stable energy infrastructure.

In order for photovoltaic power to have wide spread use in Nigeria, the government needs to employ educational activities promoting the benefits of photovoltaic – power: cost, social, and environmental.

CONCLUSION
One of Nigeria’s main challenges, similar to many other developing countries, is how to provide energy to a rapidly growing population and industry that do not have a reliable source of electricity due to epileptic power supply and this has affected the economy of the nation. Nowadays, to start any business even on a small scale, you have to think of generating plant which has constitute noise and air pollution to the environment.

The 400% increase in the cost of the electricity materials for grid connections and the increasing cost of fuel and petroleum also presents a favourable case for photovoltaic power in Nigeria. Therefore, solar energy as an alternative energy source should be considered to be the optimal energy to provide the population of Nigeria with low cost energy required for lighting, supplying water and working of home appliances. This will enable us to conserve our valuable non – renewable fossil resources for future generations to enjoy and we can all live in a world of abundant energy without pollution.

REFERENCES
http:// www.epstein.org / cells.html “How solar cells work”.