



# **PROSPECTS AND CHALLENGES FOR PHOTOVOLTAIC POWER GENERATION IN NIGERIA**

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**BY**

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## **ABSTRACT**

Solar panels convert sun energy directly to electric energy using the principle of photovoltaic effect. Exploratory research and development has shown that Nigeria has high solar energy potential with an average sunshine of about 10 hours per day throughout the year. This huge renewable energy resource can be converted to electric energy for the benefit of mankind. The major challenges facing the development and implementation of photovoltaic power generation includes, finance, non-availability of process equipment, lack of funds for research and technical know-how, lack of policy formulation and implementation of photovoltaic power generation programs. Effective utilization of the huge solar energy potential in Nigeria for photovoltaic power generation to a large extent would address the problem of electric power supply shortage, thereby resolving the energy crisis. It will also create more employment opportunities, poverty reduction and human capacity building. since adequate and reliable electric power supply is a pivot for any sustainable development. It is recommended that government should create enabling environment for the development and implementation photovoltaic power generation programs.

**KEY WORDS:** Sun, Energy, Photovoltaic, Electric, prospects and challenges.

## INTRODUCTION

Nigeria is a country blessed with both human and natural resources. At present she has a population of over 150 million people with diverse cultures. Her natural resources spread across all the six geopolitical zones having different weathers and vegetations. Off all the natural resources available in Nigeria, the sun and the wind are on the average adequately available for all and sundry. These abundant energy resources had been available for mans usage from the time of creation, however adequate attention had not be given for the conversion of these energy to electric energy (Babatunde,1985).

Adequate and reliable electric power supply has been identified as a major pivot for sustainable socio-economic and technological advancement of any nation (Evbogbai, Okonigene and Obioru, 2004). The Nigerian electricity industry had been bedeviled with a lot of crises. These crises stem from inadequate power generation, obsolete transmission and distribution networks, sharp practices, non implementations of developmental plans and programs.

Out of the abundant energy resources convertible to electric energy, only the hydro and the hydrocarbon based fuel have been utilized for commercial purposes. Studies have shown that Nigeria is well endowed with solar energy due to its geographical location between latitudes 40 and 140 north of the equator (Evbogbai and Nsiah, 2008). The sun energy had only been used for heating, drying and illumination (Animalu,1983). The conversion of solar energy to electric energy is still at the experimental stage, inspite of the fact that it is the oldest, most promising, environmental friendly and sustainable energy resource (Gupta, 2007).

Photovoltaic effect was first recognised in 1839 by French physicist Alexandre-Edmond Becquerel ([HTTP://en.wikipedia.Org/wita/solar cell](http://en.wikipedia.org/wita/solar_cell),2008 ). However, it was not until 1883 that the first solar cell was built, by Charles Fritts, who coated the semiconductor selenium with an extremely thin layer of gold to form the junctions. The device was only around 1% efficient. The modern age of solar power technology arrived in 1954 when Bell Laboratories, experimenting with semiconductors, accidentally found that silicon doped with certain impurities was very sensitive to light. This resulted in the production of the first practical solar cells with a sunlight energy conversion efficiency of around 6 percent ([HTTP://en.wikipedia.Org/wita/solar cell](http://en.wikipedia.Org/wita/solar cell),2008 ). Russia launched the first artificial satellite in 1957, and the United States' first artificial satellite was launched in 1958 using solar cells created by Peter Iles in an effort spearheaded by Hoffman Electronics ([HTTP://en.wikipedia.Org/wita/solar cell](http://en.wikipedia.Org/wita/solar cell),2008). The first spacecraft to use solar panels was the US satellite Explorer 1 in January 1958. This milestone created interest in producing and launching a geostationary communications satellite, in which solar energy would provide a viable power supply. This was a crucial development which stimulated funding from several governments into research for improved solar cells ([HTTP://en.wikipedia.Org/wita/solar cell](http://en.wikipedia.Org/wita/solar cell),2008 ).

The quality of solar energy receives at any given point on the surface of the earth depends on its geographical location, time of the day, time of the year and local weather condition(Litifu, Nemet, Ushiyama, and Nagasaka, 2007). Photovoltaic generation varies readily with time and cloud transient (Evbogbai, Ogieva and Oshenvemwa, 2009). The direct conversion of sun energy to electric energy in Nigeria using solar panel revealed that it is time dependent and on the average, Nigeria 10 hours of sunshine per day for solar power generation (Evbogbai and Nsiah, 2008; Evbogbai, Anyasi and Omatahunde, 2010). Adequate arrangement has to be made to generate and store excess energy in a storage battery bank to cater for night time when the intensity of the sun is virtually zero for power generation. The energy conversion efficiency of a solar panel in Nigeria using a 100watt, 17.5volts Dc, type: MBF 100, photovoltaic module is 49.5% (Evbogbai, 2010; Evbogbai, Musa and Anyasi, 2010).

Inspite of the fact that photovoltaic power generation is feasible in Nigeria; adequate attention has not been given to photovoltaic power generation. This work therefore focuses on the prospects and challenges of photovoltaic power generation in Nigeria.

## **Benefits Of Development Of photovoltaic power generation In Nigeria**

The successful development and implementation of photovoltaic power generation in Nigeria will attract the following benefits:

- Create employment opportunities
- Create wealth for the nation
- Poverty alleviation
- lead to industrialization
- lead to socio-economic and industrial growth of Nigeria.
- It will promote the development and utilization of our solid minerals for the overall development of our great nation.
- It will equally encourage diversification of Nigerian economy

## **Challenges Facing The Development Of Photovoltaic Power Generation In Nigeria**

There are various challenges facing the development of photovoltaic power generation in Nigeria. They are as follows:

### **(i) Lack Of Technical Know How**

Inadequate trained personnel in the area are lacking. Also most of the higher institutions are poorly equipped and the private sector research institutes are not properly funded. The needed process technologies are not available in Nigeria at the moment. There is the need to encourage research and development in this area.

### **(ii) Lack Of Equipment**

Specialized equipment needed for the development of solar panels are not available in Nigeria.

### **(iii) Inadequate Funding**

Inadequate funding of research and developmental projects is a major contentious issue in tertiary and other research institutions. Where funds are even available, some of the institutions or organizations create bureaucracies to frustrate and discourage scholars that would have accessed the funds.

## **Policy Implementation**

Over the years the Nigeria Government has formulated policies on the electric power generation, but none of these policies reflect specifically on the development of photovoltaic power generation.

## **CONCLUSION**

The benefits of the development of photovoltaic power generation in Nigeria were presented. Also the major challenges facing the development of photovoltaic power generation were discussed. Exploratory research has shown that photovoltaic power generation is feasible and economical on the long run in Nigeria. The utilization of Nigeria's solar energy potentials in electric power would accelerate sustainable growth and development of human and physical capacity building for the overall benefit of all and sundry.

## **RECOMMENDATIONS**

The promotion of economic activities in the solid mineral sector is a fulcrum for research and capacity building, the Government, Corporate bodies, multinational and individuals, therefore should encourage research efforts in this direction.

It is recommended that the,

- (i) Government and the private sector should establish more mining and processing industries for the production of silicon and other additives for the production of solar panels for effective and maximum utilization of huge solid minerals reserve available in Nigeria. This will create wealth and employment opportunities for the country.
- (ii) Government should establish specialized research centers where research findings from research institutes, polytechnics and Universities can be translated to industrial production process.
- (iii) Collaborative efforts between indigenous and high-tech foreign Processing industries should be encouraged through regularly organized seminars, workshops and conferences for cross fertilizations of ideas and product exhibitions.
- (iv) Developmental result oriented research should be encouraged through adequate funding and organizational bureaucracy in accessing research grants should be minimized.
- (v) Adequate and regular monitoring of developmental projects and research sponsored by governmental or non-governmental agencies should be carried out to curb sharp practices in the process of disbursing and utilizations of the funds for specified project.
- (vi) Government should create enabling environment for the commercialization of the photovoltaic power generation

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