

## PROMOTING NIGERIA'S ENERGY EFFICIENCY DSM PROGRAMME THROUGH RENEWABLES/COGENERATION – WIND ENERGY PROSPECTS

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### INTRODUCTION

About 90% of the Nigerian economy is dependent on crude oil. Expectedly, most of her generating plants are thermal power stations which are presently operating below installed capacity. This article therefore looks at the prospects of wind energy in Nigeria as an aspect that can be seriously considered in Nigeria's Energy Efficiency programme. The wind speed data collected from some towns in Nigeria indicates that the country has good sites for the installation of wind energy conversion systems. The authors therefore recommend the incorporation of wind energy in the renewable energy resources development/energy efficiency programme in Nigeria (a developing economy) as this is a way of boosting her energy needs as well as accelerating the sluggish nature of the nation's rural electrification programs.

For the past ten years, the Federal government of Nigeria has embarked on aggressive rural electrification projects across the country. This laudable project is aimed at providing electricity to the rural dwellers where about 64% of the entire population live. By this programme also, the Federal government hopes to minimize, if not curb the rural –urban migration—thereby forcing young school leavers and graduates to remain in the village self-employed rather than moving to the urban areas seeking for white-collar jobs.

Often, however, the pace of rural electrification is far slower than rural people and the Federal government of Nigeria would like. Rural electrification is difficult because it is capital intensive and has unfavourable short term economic effects. As normally the case, with large central Power plants and grid-extension programs, rural electrification programs can easily fall victim to construction difficulties, routing impediments, competition from urban/industrial power demands, and a lack of implementation flexibility. This conventional system of using large centrally located power plants and grid extension for rural electrification is currently being challenged by the advent of smaller, modular technologies such as wind power, micro-hydro and photovoltaics. In this article we have considered conventional energy generation as well as the wind energy potential in Nigeria. We have highlighted the importance of wind energy as a way of accelerating the sluggish nature of the Federal government of Nigeria's rural electrification programs in order to promote energy efficiency. Relevant conclusions have been made using available wind speed data collected at the various sites in Nigeria.

### CONVENTIONAL ENERGY GENERATION IN NIGERIA

The bulk of the supply for electrical energy in the country has been from the Power Holding Company of Nigeria, PHCN and PHCN expands annually in order to meet the ever increasing demand [3]. Energy production and consumption in Nigeria has been on the increase.

At present, the installed and available electrical capacity in the Nigerian generating stations are shown in Table 1. Table 1 shows that despite a total grid capacity of 5924.7 MW, only 4586 MW is available. Thus 22% of the installed capacity is unavailable. This may be due to operational inadequacies and inability of units to operate at full capacities of the generating stations and their respective percentage contributions to the total energy products.

### **Merits and demerits of conventional energy generation**

The use of conventional methods in electrical power generation has a number of advantages:

- Hydro plants have lower operating and maintenance costs since no fuel and steam generators are needed.
- Hydro plants are quicker to start up on load and are also quicker to shut down for maintenance.
- Hydro plants are less prone to fire outbreak because of the absence of fuel.
- Thermal power stations which are built on much smaller areas of land than hydro stations have fewer resettlement and compensation problems
- Thermal stations have lower installation costs.
- Installation can more easily be brought closer to a load centre for thermal plants.
- The use of nuclear fuel does not require combustion air, avoiding thermal stack losses and related problems.

### **The demerits are:**

- ☒ Hydro plants depend for sustained operation on in-flow of water into the storage and this in-flow can be affected up stream by drought and outside the borders of this nation, by political or other considerations.
- ☒ The pollution arising in the case of thermal stations from combustion of fuel is not environment-friendly due to the fact that sulphur oxides, heavy metals, radio-active elements, hydro carbons and large quantities of carbon dioxide are emitted which leads to acid rain.
- ☒ Fossil and nuclear fuels are finite and non-renewable energy sources .
- ☒ Burned nuclear fuel is radioactive, it requires remote handling and special processing and disposal of toxic waste.
- ☒ Special system designs are required to prevent radioactivity release during normal operation or due to accidents.
- ☒ Major portions of a nuclear plant are radioactive during and after operation, requiring special precautions and advanced technology for maintenance of much of the plant.

### **CONCLUSION AND RECOMMENDATIONS**

By using metrological data collected from some selected weather stations in Nigeria, analysis of such data shows that wind power prospects in Nigeria is high. From the analysis also, it was clearly seen that

costal and hilly areas are excellent sites for wind power development. Therefore, using WECs for electric power generation and supply in Nigeria—especially around Sokoto axis with mean wind speed of about 3.78m/s, will be cost effective.

Considering the prospect of wind energy in a developing economy like Nigeria, the following recommendations are made:

- ☒ Excellent sites such as Jos and Sokoto should have a wind power plant for the generation of electricity which should be integrated with the existing national grid.
- ☒ Wind energy resources should be included in the renewable energy resources development programme of Nigeria.
- ☒ The Nation's energy centres should be encouraged through funding in order to stimulate research efforts on WECs and manufacture.
- ☒ Issues relating to energy should be handled by experts.
- ☒ The government should set up independent policy makers on renewable energy, whose tasks will be to monitor the Nation's energy centres as well as to encourage the Energy Commission of Nigeria, ECN to embark on intensive human resource training on areas of need.