

TOWARDS A SUSTAINABLE ENERGY DRIVEN ECONOMY IN NIGERIA: ISSUES AND ROLE OF EDUCATION

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OUTLINE

- 1. Introduction**
- 2. Sustainable Energy Driven Economy (SEDE)**
- 3. Nigerian Economy and its Energy Situation**
- 4. Energy Sources and Potentials in Nigeria**
- 5. Current Issues and Developmental Efforts**
- 6. Role of Education**
- 7. Way Forward**
- 8. Concluding Remarks**

1 Introduction

“Energy is the golden thread that connects economic growth, increased social equity and an environment that allows the world to thrive. Energy enables and empowers. Touching on so many aspects of life, from job creation to economic development, from security concerns to the empowerment of women, energy lies at the heart of all countries’ core interests.”

- (Sustainable Energy for All, 2014)

- * Energy Commission of Nigeria (ECN) puts the energy demand of the country at 31,214 MW in 2015 at an optimistic GDP growth rate of 11.5 per cent while Less than 5,000 mw is being generated to serve a population of about 170m!**
- * In spite of a vast reserves of renewable and non-renewables resources, energy supply in Nigeria still remains grossly inadequate.**
- * With an increasing energy demand of a large population, the energy crisis in Nigeria has become a major clog in the wheel of industrial development.**

2

Sustainable Energy Driven Economy

Energy is a key driver of the socio-economic activities and development of any nation. Nigeria is not exempted.

A Sustainable Energy Driven Economy (SEDE) is a type of economy that focuses on the development and utilization of renewable resources and technologies that satisfy the energy need of the people and do not compromise the conservation of the environment.

3 Nigerian Economy & Energy Situation

In an early post-election era, Nigerian economy is dwindling owing to a number of factors including the recent plunge in the global oil price, systemic corruption, insecurity issues among others.

A major area of energy deficiency in Nigeria is access to clean and reliable electricity supply. While a significant part of the main urban areas are connected to the national grid, most of the rural areas are still mostly left out.

Between 60 and 70% of the Nigerian population does not have access to electricity while about 77% of Nigerians connected to electricity lack access to regular power and therefore still rely on alternative power sources.

Nigerian Electricity Transmission Network

Legend

— Nigeria Electricity Transmission Network

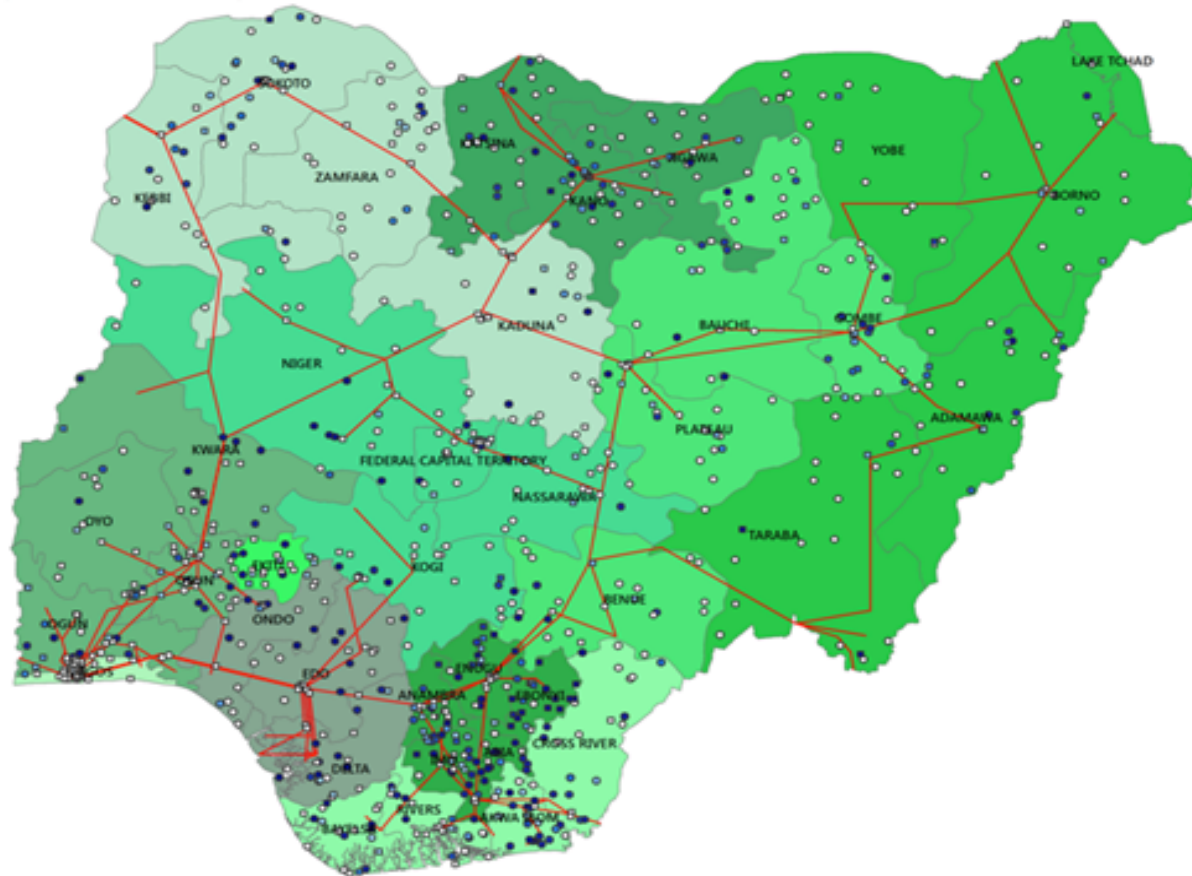
DHS Enumeration Areas

% electrified (urban are squares, rural are circles)

- 90-100
- 80-90
- 70-80
- 60-70
- 50-60
- 40-50
- 30-40
- 20-30
- 10-20
- 0-10

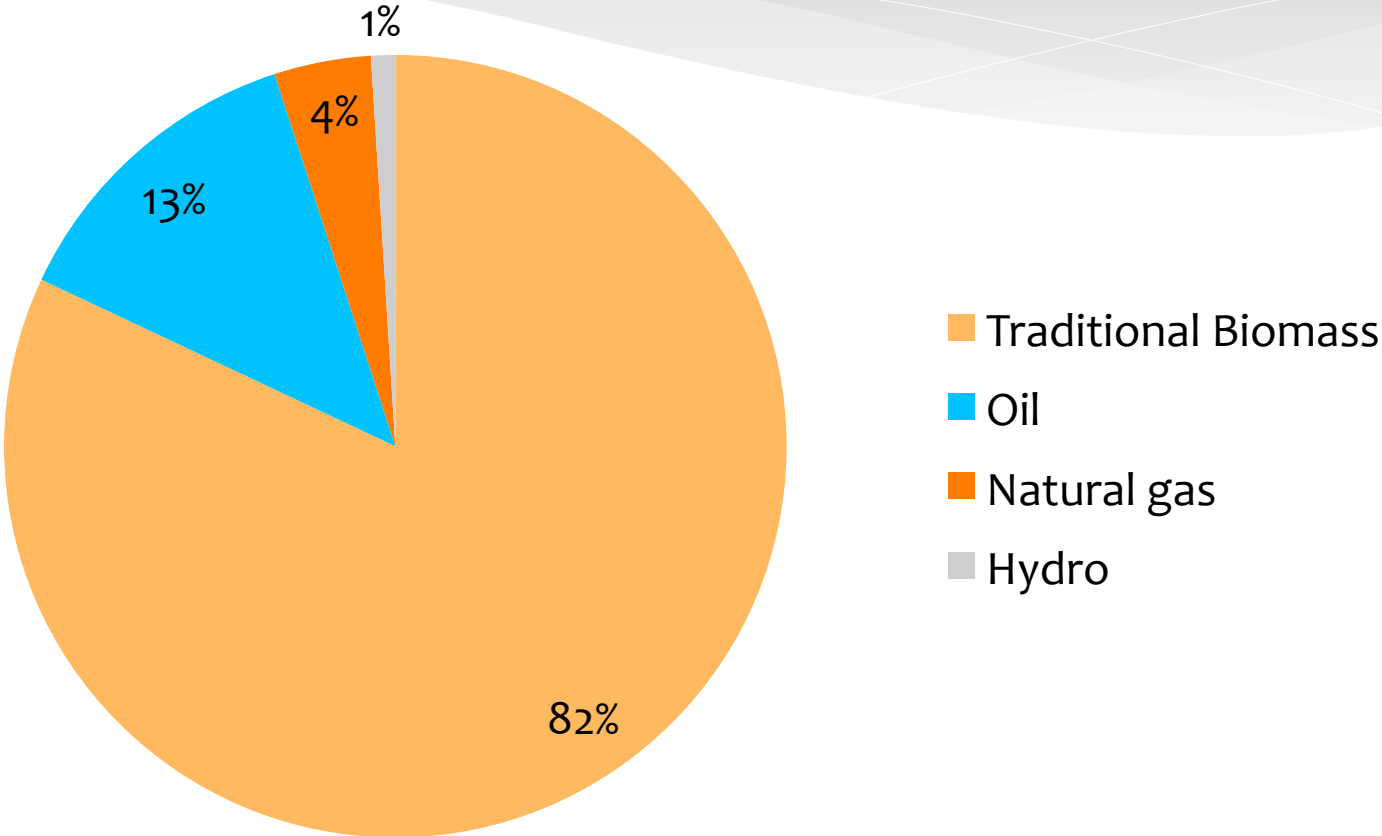
Distribution Company

- Abuja
- Benin
- Benin + Ibadan
- Eko + Ikeja
- Enugu
- Ibadan
- Jos
- Kaduna
- Kano
- Port Harcourt
- Yola



Demographic and Health Survey (DHS) Areas and National Power Grid in Nigeria
Source: (Leo, Kalow, & Morello, 2015)

Total energy consumption in Nigeria in 2010



Source: (Charles, 2014)

Nigerian Renewable Energy MasterPlan of 2005 (ECN-UNDP), sets the initial target of increasing the energy generation capacity from 5000 MW to 16000 MW by 2015 and decry the over-dependency on fossil fuels.



A significant part of the core urban areas are connected to the national grid while most of the rural areas are still left out

4

Energy Potentials in Nigeria

Nigeria's Energy Reserves/Capacity (December 2015)

S/N	Resource Type	Reserves	
1.	Crude Oil	36.2 billion barrels	
2.	Natural Gas	166 trillion SCF ^a	
3.	Coal and lignite	2.7 billion tonnes	
4.	Tar Sands	31 billion barrels of oil equivalent	
5.	Large Scale Hydropower	11,000 MW (0.0341/year)	
6.	Small Scale Hydropower ($< 30\text{MW}$)	3,250 MW (0.0101/year)	
7.	Solar Radiation	3.5 - 7.0 kW h/m ² /day	
8.	Wind	2 - 4 m/s annual average at 10m height	
9.	Biomass	Fuel wood	13,071,464 ha ^b
		Crop residue	83 million tonnes/year
		Animal waste	61 million tonnes/year

Adapted from Oyedepo (2012)

RE Energy Sources and Potentials in Nigeria



Hydropower - currently one of the major sources of electricity generation in Nigeria but largely underutilized. The total large-scale hydropower potential in Nigeria is projected to be over 10,000MW.



Solar Energy - Nigeria is a tropical country with a daily average amount of sunshine estimated at about 6.5h across the country. Given that 1% of Nigeria's land area is covered with a solar technology of 5% efficiency, about 333,480MW of electricity can be generated with 26% capacity factor.



Wind Energy - Nigeria is blessed with a vast potential for harnessing wind for electricity production. Wind is abundantly available, especially at the core northern states including mountainous areas in the central and eastern states, and the offshore region.



Bio-Power - biomass resources of Nigeria include wood fuels and by-products from crops, wastes from plants, animals (land and aquatic), municipal and industrial activities.



Geothermal Energy – resources are available in Nigeria, But are yet to be tapped for energy supply. Research works are ongoing on the viability of those found in Benue, through Nasarawa and Borno Basin.

5

Current Issues and Developmental Efforts

The potentials abound towards building a sustainable energy driven economy, but with a number of militating factors:

- * Inadequacy and inefficient grid based energy**
- * Societal attitudes and Lack of maintenance culture**
- * Insecurity: Crisis in the Niger Delta, Insurgency, Corruption**
- * Lack of political will/inconsistency in govt. policy, etc.**
- * Plunge in global crude oil prices**
- * Lack of specific roles for education**
- * Inadequate financing/High investment cost**

Public Private Partnerships

The Federal and State governments have established partnerships and signed MoU and pacts with more than 60 organizations and investors etc. within and outside Nigeria, among these are:

- * The Nigerian- German energy Partnership, Shell, UNDP, Oando, World Bank, First City Monument Bank, EMEL Group, International Centre for Energy Environment and Development (ICEED), NIPC, NERC, Federal Ministry of power, Carbon Quest Limited, ASO Savings & Loans Plc, ID Afrique, Synergent Power Share, Bank of Industry, CBN, First Bank, Shell, Santech Integrated Services, Green Carbon Afrique, Bhustan Renewable energy service, BYD Group, Federal Ministry of Power, Federal Capital Territory Administration.**

Various State Governments are currently developing a renewable energy projects.

- * Example of such States include Adamawa State Government, Lagos State government, Kwara state government, Kaduna state government, Kebbi State government, Cross River State government, Enugu State government, Ondo State government, Zamfara State government, Osun State government, Ebonyi State Government.**
- * The Osogbo 13 MWp Vergnet solar PV project currently installed in Osun State is a substantial solar power plant project in Nigeria.**
- * A 10MW onshore wind farm installed and nearly completed at Rimi Village in Katsina state is a notable wind power projects in Nigeria.**
- * Some emerging projects based on the use of bio-power includes the 5MW power generation from rice husk in Ebonyi state**

Institutional-based Developments on RE Education

A growing number of higher institutions in Nigeria are building common plans to embrace research and development in various aspects of alternative energy technologies and dissemination of appropriate information on relevant researches. Some of the developmental efforts are highlighted as follows:

- * The Federal University of Technology Akure has a Center for Renewable Energy Technology (CRET).**
- * University of Benin established a National Centre for Energy and Environment (NCEE).**
- * Abubakar Tafawa Balewa University, Bauchi has a National Centre for Petroleum Research and Development.**
- * Covenant University is collaborating with German Agency for International Cooperation on hands-on training and skill development in Renewable Energy.**
- * Obafemi Awolowo University, Ile-Ife – has a Centre for Energy Research and Development.**

- * University of Ibadan Electrical Engineering Department working with funding from MacArthur Foundation to fabricate devices.**
- * University of Nigeria, Nsukka has a National Centre for Energy Research and Development (NCERD) and has been involved in researches on solar and renewable energy**
- * University of Lagos established National Centre for Energy Efficiency and Conservation (NCEEC) and researches into energy efficiency.**
- * University of Ilorin - National Centre for Hydropower Research and Development (NCHRD) responsible for research in hydropower.**
- * The Usman Danfodiyo University, Sokoto, has Directorate of Science and Technology (under Step B) secured a grant from the World Bank to produce solar panels.**
- * Bayero University Kano (BUK) has been supported by FG establish a world-class Renewable Energy Research Centre.**

6

Role of Education

- * Experts in renewable energy say education can power renewable energy and is a key in the transition to a low-carbon society.
- * Disseminate information through seminars and workshops on the efficient and effective use of Renewable Energy.
- * Nigerian higher institutions have embarked on broad-based renewable energy education for innovation and growth.
- * Students and technicians are being trained and professionals are coming up in all aspects of renewable energy education.
- * Viable programs are now available in Engineering, Technology, Science Departments and research centers that cover a range of technology.
- * Universities in Nigeria are establishing collaborations and creating research platforms with other institutions and organizations within and outside Nigeria.
- * facilitate exchange of for staff and students with reputable institutions in renewable energy.
- * Initial training of engineers, scientists and researchers who will develop new systems, devices and technologies.

7 Way Forward

- * Presently there is inadequate dissemination of information on renewable energy technologies it is recommended that demonstration projects on various energy forms be established widely so that the performance and efficiency with which services are delivered can be sensitized.**
- * Nigeria should take advantage of global partnerships such as the REEEP initiative of UK, to help the country for creative integration of renewable energy systems.**
- * renewable energy funding/financing agency should be encouraged**
- * More funds should be provided for research and create demonstration plants**
- * Research at all levels of renewable energy education should be intensified**
- * Renewable energy education should be included in the curricula**
- * Embark on massive training of technologist, product designers, engineers, scientists and researchers who will develop new products, devices and systems.**
- * Effective strategy on maintenance culture should be put in place at all levels.**

8

Concluding Remarks

- * Identifying definite need for capacity building both at institutional and personnel level for acquiring technical, organizational, and managerial skills required for increased development of renewable energy.
- * The existing Research and Development centers and technology development institutions should be adequately strengthened to support the shift towards increased renewable energy utilization. Human resource development, critical knowledge and know-how transfer should be in focus for projects development, project management, monitoring and evaluation



THANKS FOR LISTENING!