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and Strategies after Rio+20**

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**ENERGY SUSTAINABILITY IN A DEVELOPING ECONOMY:  
THE NIGERIAN EXPERIENCE**

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# **ENERGY SUSTAINABILITY IN A DEVELOPING ECONOMY: THE NIGERIAN EXPERIENCE**

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# Introduction

- Nigeria, named after the river Niger due to her proximity to the river.
- Located in west Africa and shares land borders with the Republic of Benin in the west, Chad and Cameroun in the east, and Niger in the north. Its coast in the south lies on the Gulf of Guinea on the Atlantic Ocean
- The three largest and most influential ethnic groups in Nigeria are the **Hausa, Igbo and Yoruba**. In terms of religion Nigeria is roughly split half and half between Muslims and Christians with a very small minority who practice traditional religion.

- The Federal Republic of Nigeria comprises of **thirty-Six States** and has its **Federal capital Territory** at **Abuja**
- Its economy is **one of the fastest growing** in the world and the second largest in Africa.
- It is the **most populous country in Africa** with a population of over 170 million people, **the seventh most populous country in the world**.
- Located in west Africa and shares land borders with the Republic of Benin in the west, Chad and Cameroun in the east, and Niger in the north. Its coast in the south lies on the Gulf of Guinea on the Atlantic Ocean

- Nigeria is listed among the **“Next Eleven” economies**
- Total Area - 923,768 Km<sup>2</sup>
- Currency - Naira (NGN)
- GDP Growth - 7.72% (2011)
- Population Growth - 2.3% (2009)
- Life expectancy - 47 years
- At independence in 1960, Nigeria was a major producer and net exporter of six major agricultural products; **cocoa, rubber, palm oil, groundnut, cotton and palm kernel**. With small scale mining and quarrying.
- The total GDP for the year 1963/64 comprising the six aforementioned agricultural commodities stood at **69.4%**.

# **Commitment to Sustainable development**



- The Federal Republic of Nigeria is committed to the United Nations Commission on Sustainable Development (CSD) and the Rio+20 process. Nigeria welcomes the objectives and themes of Rio+20.
- Nigeria has not only participated in all the sessions on the CSD framework which culminated in the fourth implementation cycle of programmes aimed at ensuring sustainable development, but has also put in place a number of measures and initiatives in the various thematic areas and cross-cutting issues.

- Nigeria has participated in the following UN conference Preparatory for Sustainable Development;
  
- i. Intergovernmental Preparatory Meeting (IPM) of the CSD 19, New York, 28 February – 4 March, 2011
- ii. Africa Regional Meeting held in Addis Ababa, Ethiopia from 21 to 15 October, 2011
- iii. Second Intersessional Meeting , New York, 15-16 December, 2011
- iv. UNCSD Informal Consultations, New York, 16-18 January, 2012
- v. 12th Special Session of the UNEP Governing Council/Global Ministerial Environment Forum, Nairobi, Kenya, 20-22 February, 2012.
- vi. UNCSD, Rio de Janeiro, Brazil, 20-22 June 2012 (Rio +20)

# **Development and Energy use in Nigeria**

- Nigeria struck oil in commercial quantity in 1958 at Oloibiri in the Niger Delta region. This discovery will later change the course of Nigeria's history.
- In 1972, oil became Nigeria's major export commodity and the largest contributor to the GDP; it overtook all others as the major foreign exchange earner.
- Nigeria gained from the global market price of high-grade crude oil from low price of \$3.8 per barrel in October 1973 to a skyrocketing price of \$14.7 per barrel in January 1974 and in 1981 crude oil attained a high level of \$38.77 per barrel.
- Within this period (1975 – 1981), the total revenue accrued from oil ran into several billions of US Dollars in terms of both local and external reserves.

- ✘ As at today (2012) Nigeria's total oil production stand at slightly **over 2.70 million bl/d (the largest in Africa) and the proven crude oil reserves as of December 2010 is over 37 billion barrels.**
- ✘ Nigeria has the **ninth largest natural gas reserve in the world and the largest in Africa, with an estimated 187 trillion cubic feet (Tcf) of proven natural gas reserves as of December 2010**
- ✘ Due to security challenges in the Niger Delta (oil producing) region in the last two years 2009 - 2011, the country's daily oil and gas production was adversely affected. However, with the current improvement in the security situation production has returned to normalcy.

- The sources of energy generation in Nigeria are: gas, oil and hydro-electricity.
- Total installed grid capacity is about 8,000 MWe out of which about 4300MWe is generated.
- Lack of access is having adverse effect on the economic growth of the country since economic growth is related to power generation and consumption.
- With this gross inadequacy, Nigeria resolved to diversify her energy mix towards achieving greatness.

# **Electricity situation in Nigeria**

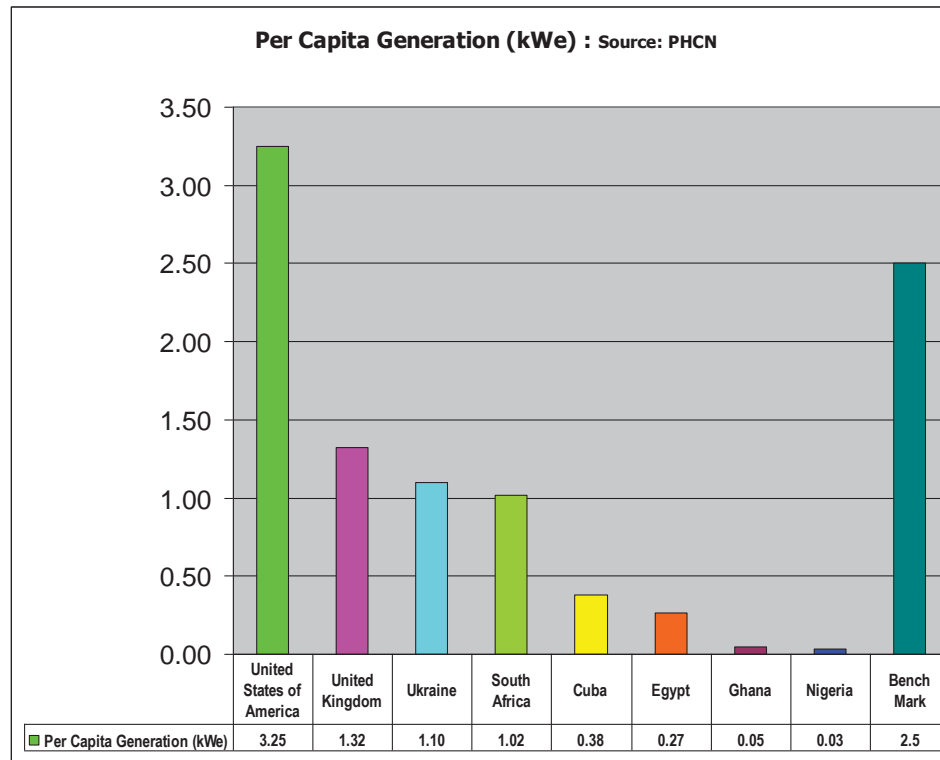
- The history of electricity in Nigeria dates back to 1896 when electricity was first produced in Lagos, fifteen years after its introduction in England, its development has been at an insignificantly slow rate.
- Nigeria with an estimated population of over 170 million and the national power generating capacity at present is about 4300MWe with only about 40% of the population have access to electricity.
- In previous past, new plants were not constructed and the existing ones were not properly maintained, bringing the power sector to a deplorable state





Aerial photograph of Africa at night

Source: Sambo 2010



To meet this national energy demand projection, industrialization and the shortfall in energy supply, Nigeria is increasing the available resources, while also introducing more stable, reliable and high-yield power sources such as nuclear power and renewable sources into the national energy mix.

# **Justification for National Energy plan**

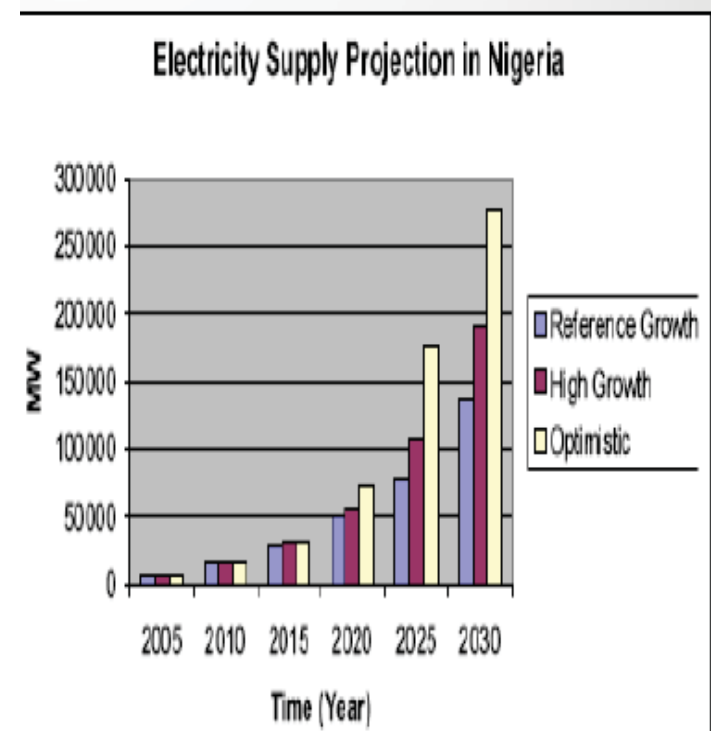
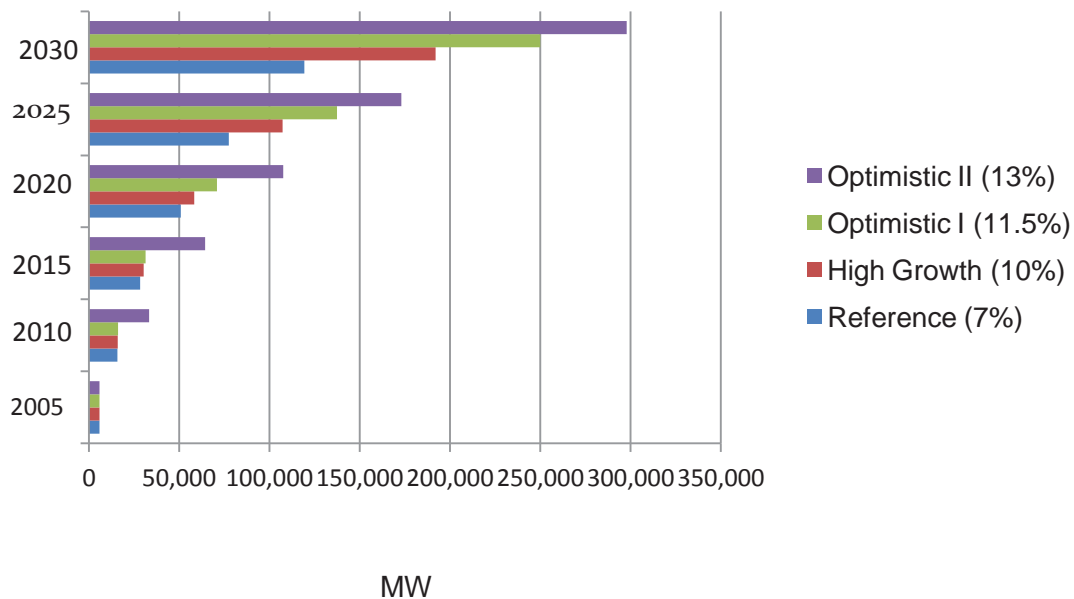


- According to statistical estimation over 60 million Nigerians use power generators of varying capacity. The average financial expenditure in fuelling these power generators has climbed to an all-time high of N1.56 trillion, about \$1.335 billion per annum.
- The crisis have deprived the country of economic activity worth \$1.30bn annually which is equivalent of more than half of gross domestic product;
- With this misnomer it become clear that the assurance of long term energy security cannot be attained accidentally, but:
  - Requires detailed energy analysis of both demand and supply, to provide realistic projections of both demand and supply potentials over time
  - Planning to ensure that supply is adequate to meet demands at the level of efficiency that ensures efficient economic performance
  - Results of such studies often form basis for conservative strategic national planning

- In a study conducted by the Country Study Team (CST) under the IAEA regional programme on Sustainable Energy Development for Sub-Saharan Africa, it was predicted that increase in electricity demand in Nigeria will be between 50,820 MWe for 7% reference growth and 107,600 MWe for 13% optimistic growth by the year 2020, which **translates to the construction of at least 3005MWe power plant** every year to meet the 2020 demand.

Scenario	2005	2010	2015	2020	2025	2030
Reference (7%)	5,746	15,730	28,360	50,820	77,450	119,200
High Growth (10%)	5,746	15,920	30,210	58,180	107,220	192,000
Optimistic I (11.5%)	5,746	16,000	31,240	70,760	137,370	250,000
Optimistic II (13%)	5,746	33,250	64,200	107,600	172,900	297,900

***It must be emphasized that the demand indicated for 2005 represents suppressed demand, due to inadequate generation, transmission, distribution and retail facilities. Suppressed demand is become non-existent by 2010.***



**Fig 1. Electricity Demand and supply peak Projection till 2030 (Sambo, 2008)**

## Nigeria Vision 20.2020

- In 2007 the Nigerian government produced a Seven Point Agenda which will serve as the framework and road map to become one of the 20 topmost economies in the world by the year 2020, in achieving this targets ; the followings were identified
  - Power and Energy
  - Food and Security
  - Wealth Creation
  - Transport Sector
  - Land Reform
  - Security
  - Education.

## (Realities of Climate Change)



- The changes in weather and climatic conditions are reactions to the fact that the planet is accumulating more heat than it gives off due to human factors, energy input and output and other green house gas emission activities.



- Preliminary studies on the vulnerability of various sectors of the Nigerian economy to Climate Change were evaluated according to natural and human systems identified by the IPCC, and condensed into five. They are:

- Human settlements and health;
- Water resources, wetlands and fresh ecosystems;
- Energy, industry, commerce, and financial services;
- Agriculture, food security, land degradation, forestry, and biodiversity;
- Coastal zone and marine ecosystem



- In Nigeria, climate change is now a reality, with deleterious effects: seasonal cycles are disrupted, as are ecosystems; and agriculture, water needs and supply, economy and food production are all adversely affected



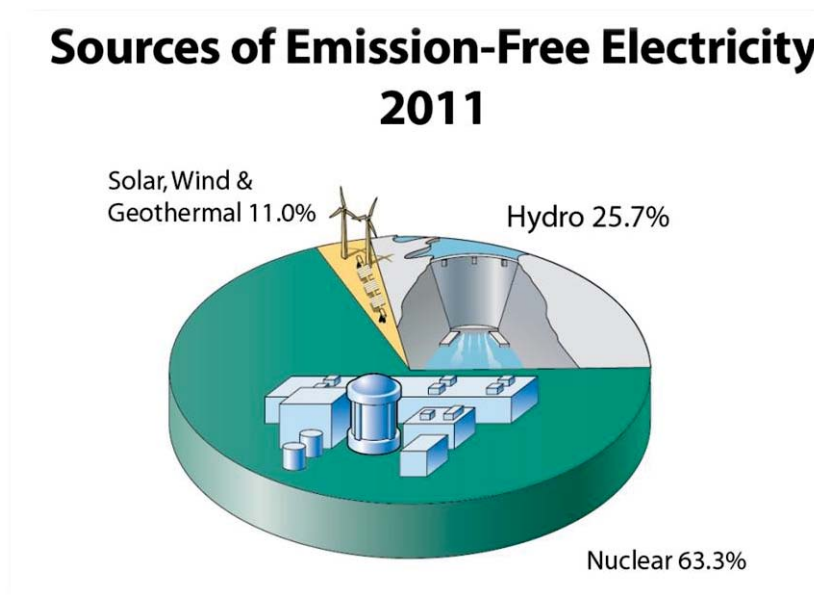
- The Nigerian economy is also adversely affected by the vulnerabilities of the climate change in the agriculture sector which contributes up to 40 per cent of the country's GDP, employing about 70 per cent of the country's total labour force
- In the face of this challenge therefore, it will be extremely difficult to achieve the targets of the Millennium Development Goals (MDGs)



# **Energy, Economy and Environment**

- The 3Es are the cornerstones that shapes the electricity industry today. Energy industries are been impacted by mitigation of increasing complex issues of environmental degradation in production and attaining sustainable development.
- The political and business leaders have also realized that ***Environment, Economy and Energy*** are out of balance, a situation which has led to persistence increase in poverty and unemployment in the last 25 years
- Matching the 3Es is very vital to any economic growth

- In achieving the synergy between energy, economy and environment, it is very necessary to consider energy resources that has very low environmental/carbon emission, safe operation and cost effective
- The United states Department of Energy through the Nuclear Energy Institute (NEI) defines “Emission Free” as any generating source that does not produce emissions of CO<sub>2</sub>, NO<sub>x</sub>, or SO<sub>2</sub> during its operations.
  - Solar
  - Wind
  - Geothermal
  - Hydro, and
  - Nuclear



# **Strategies for sustainability**

- Nigeria has continued with its ambitious blueprint to develop a thriving energy industry based on non-fossil fuels for industrial and sustainable growth.
- But the economy still remain dependent on the country's petroleum resources, even as the world moves towards cutting carbon emissions and away from fossil fuels.
- Nigeria is leveraging its other resources to ready itself for the new era in energy. Biofuels, solar hydro, wind and nuclear energy are all being developed to help grow the non-oil economy and create a sustainable future for Nigeria's energy sector.



- The Nigerian National Petroleum Commission (NNPC) has developed a biofuels programme which will see the country saving between USD100 million and USD130 million on energy every year when fully in place.
- With vast areas of arable land and an excellent climate for the cultivation of various crops, Nigeria's potential for biofuels production is virtually unparalleled on the continent.

## HYDROPOWER

- Nigeria has huge water resources potential estimated at 263.7 billion cubic metres (both surface and ground water) that will contribute to economic transformation
- The **2,600 MW Mambilla Plateau** Hydropower Project under construction will be the largest capacity of any dam in Africa, this project is also undergoing redesign to produce over **3,000MW**.



# SOLAR ENERGY

- Solar radiation being abundantly present in Nigeria, is one area of focus among the renewable energy resources. Nigeria receives an average solar radiation of about 7.0kWh/m<sup>2</sup>-day (25.2MJ/m<sup>2</sup>-day) in the far north and about 3.5kWh/m<sup>2</sup>-day (12.6MJ/m<sup>2</sup>-day) in the coastal latitudes
- This is equivalent to about 258.62 million barrels of oil produced annually and about 4.2 x 10<sup>5</sup> GWh of electricity production annually in the country



## NUCLEAR ENERGY

In recognition of role of Nuclear Energy in the electricity crises, the Government of Nigeria (GON) decided to implement the following:

- In 2006, reactivated Act 46 of 1976 which established the Nigeria Atomic Energy Commission (NAEC).
- The Act gave NAEC mandate of the *Focal Institution* to develop technical framework to harness and apply nuclear energy for peaceful uses.
- GON proposed 10 to 12 years schedule to have on-line electricity generation from nuclear

❖ Specifically, NAEC is mandated to:

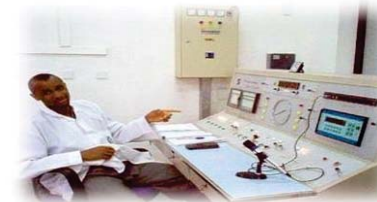
- Prospect for and mine radioactive minerals;
- **Construct and maintain nuclear installations for the purpose of generating electricity;**
- Produce, use and dispose of atomic energy and carry out research into matters connected with the peaceful uses of atomic energy;
- Manufacture or otherwise produce, buy or otherwise acquire, treat, store, transport, and dispose of any radioactive substances;
- Advise Federal Government on questions relating to atomic energy.
- Educate and train persons in matters connected with atomic energy and radioactive substances;
- Make arrangements with universities and other institutions or persons in Nigeria to conduct a research into matters connected with atomic energy or radioactive substances

Nigeria is developing appropriate ways and means of communicating effectively with the public and prepare their minds to be more receptive to the introduction and reinvigoration of existing and the new energy resources such as nuclear power and others in the country. The major issues for communication include:

- The economic advantage of generating electricity from NPPs vis-à-vis other sources and the relative environment-friendliness of nuclear power plants compared to fossil-fired plants, and other spin-off benefits.
  - Factual and concise appreciation and presentation of the relative risks entailed in the utilization of nuclear technology vis-à-vis other competing technologies.
  - Proper assessment of various accident/emergency scenarios in relation to inherent safety features of NPP and the national technical preparedness to manage situations, as well as the national plans for nuclear waste management.
  - Partnering with relevant agencies and media houses to develop and produce documentary films; Town Hall Meetings, Information Bulletins and Pamphlets on the benefits of the national NP programme are also planned.



1.7MVA Tandem Accelerator



Control room of the 30 KW NNRR -1



Gamma Irradiation Facility

- In 2009 government approved the establishment of two additional university based centers of excellence to further strengthen the training and development of critical mass of professionals in nuclear science and technology.



Centre for Nuclear Energy Studies at the University of Port Harcourt, Rivers State. [www.cnes.uniport.edu.ng](http://www.cnes.uniport.edu.ng)



University of Maiduguri

Center for Nuclear Energy Development

<http://www.unimaid.edu.ng/>

- These facilities have impacted positively on the socio-economic development of the nation and contributed significantly to HRD while also creating and promoting awareness in the peaceful uses of nuclear energy in the country



# **Accomplishments for Economic Growth**


- Electric Power Sector Reform Act (EPSRA) in 2005. EPSRA embodies radical reforms which if well implemented should produce a robust and competitive electricity industry where unreliable and inadequate service would be the exception rather than the rule.
- Nigerian Electricity Regulatory Commission, NERC, in 2005; and the unbundling of the industry into six generation, one transmission and eleven distribution companies in 2007.
- Development of the Renewable Energy Policy by the Energy Commission of Nigeria

- **Established the Nigeria Nuclear Regulatory Authority** with the responsibilities for nuclear safety and radiological protection regulation in Nigeria on 7th May, 2001. And the development of Regulatory framework for the implementation of the NPP
- Following the Koko toxic waste episode in Nigeria, the Federal Government promulgated the Harmful Waste Decree 42 of 1988, which facilitated the establishment of the then Federal Environmental Protection Agency (FEPA) through Decree 58 of 1988. This later transformed to the establishment of the The National Environmental Standards and Regulations Enforcement Agency (NESREA) on 30th July, 2007

- Nuclear Power Plant site characterization on going.
- 1000 MW electricity injection expected by 2022 with an addition of 3000MW thereafter



- United Nations Development Programme (UNDP), the Global Environmental Facility (GEF), Government of Nigeria and Government of Cuba (managed by the UNDP) is funding projects on the;
  - Improvement of the efficiencies of series of end-use equipment (refrigeration appliances, air conditioners, lighting, electric motors, fans etc) used in residential and public buildings in Nigeria through the introduction of appropriate energy efficiency policies and measures (such as Standards and Labels)
  - Introduction of demand-side management programs.
  - Provision of training to appliance and equipment professionals, and launching a public outreach campaign to promote energy efficiency in Nigeria.

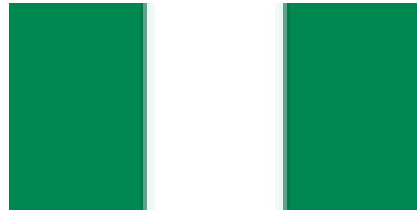
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- Ambitious National Integrated Power Project (NIPP), constructing several power plants in different regions of the country jacked up the daily peak delivery by about 1000 MW as at September 2012.
  - Upgrade of existing and construction new transmission lines to accommodate the new power plants including the expected implementation of the nuclear power programme
  - Increased gas delivery to power plants
  - Urban areas are receiving more power (Lagos 15hrs, Abuja 16hrs, Kano 11hrs, Port-Harcourt 12hrs, Kaduna 12hrs and Aba 11hrs)

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- An enabling environment is being created to sensitize the financial and investing community on the business opportunities in the national long-term energy development
  - New management contractor (Manitoba Hydro International) in place to take over Transmission Company of Nigeria.
  - Rural Electrification Agency strengthened
  - 7,744MW total output distribution capacity expected by December 2012

# Conclusion



- **Nigeria faces the grim reality towards self sufficiency and sustainable development amidst global economic meltdown, energy crisis and climate change. As a nation, we have considered and pursuing all feasible options in our long-term strategic plans for self-sufficiency.**
- **But cheap, clean and affordable energy supply is seen as the greatest stimulus for this sustainable economic development. Nigeria is investing, diversifying, deregulating and introducing additional sources of clean energy inputs into the mix needed to ease the energy bottlenecks towards the attainment of our national goal to be one of the 20 largest economies in the world by year 2020.**



**Nigeria, Good People, Great Nation.**

**Thank you**