



# Electricity Demand from Customers of INGA Hydropower Projects: The Case of Nigeria\*

**Prof. A. S. Sambo\*\***, OON, NPOM

Director-General,

Energy Commission of Nigeria

(Federal Ministry of Energy)

Plot 701C, Central Area, PMB 358, Garki, Abuja, Nigeria

Email: [dg@energy.gov.ng](mailto:dg@energy.gov.ng) or [assambo@yahoo.com](mailto:assambo@yahoo.com)

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\*\* Prof. A. S. Sambo is also the Vice Chair for Africa of WEC

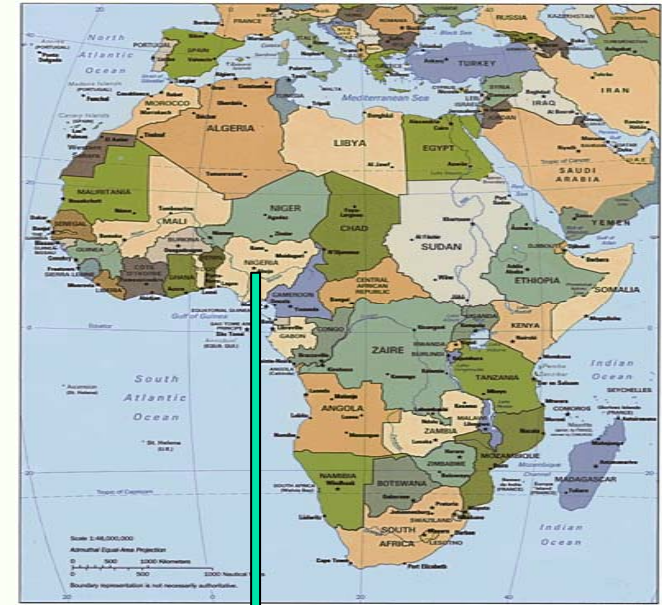


# Contents

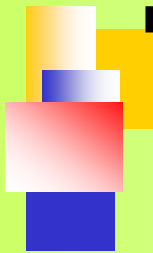
- Introduction
- The Nigerian Electricity Challenge
- Programmes to Improve Electricity Supply in Nigeria
- Electricity Demand and Supply Projections
- Nigeria as a Main Customer of INGA
- Conclusion

# 1.0 Introduction

- Location: Between Latitude 4° 1' N and 13° 9' N, longitude 3° 2' E and 14° 30' E
- Land Area: 923,768 Sq. Km
- Population/Growth rate: 140 million/3.2% in 2006
- Per Capita Electricity Consumption: Less than 200 kWh/annum
- Per Capita Conventional Energy Consumption: 332 kgoe/annum in 2004
- Temperature; 13°C – 41°C
- Relative Humidity: 7% - 36%
- Poverty Level: 54%
- Exchange rate: N1(Naira) = US \$0.0787
- GDP at Current Basic Prices /Growth rate/: N14,610.88 billion/7% in 2005.
- Government System: Democracy/Presidential system
- Nigeria has serious challenges in its electricity sector

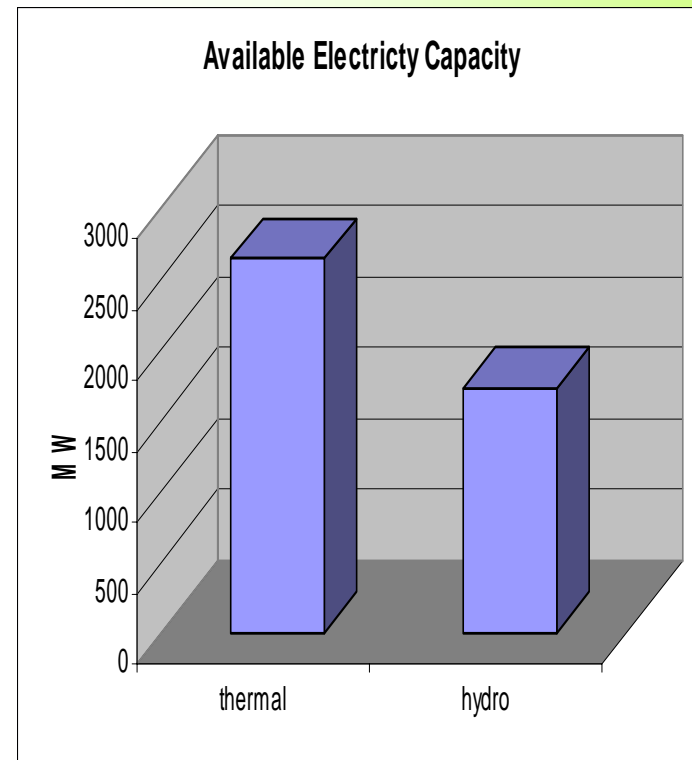
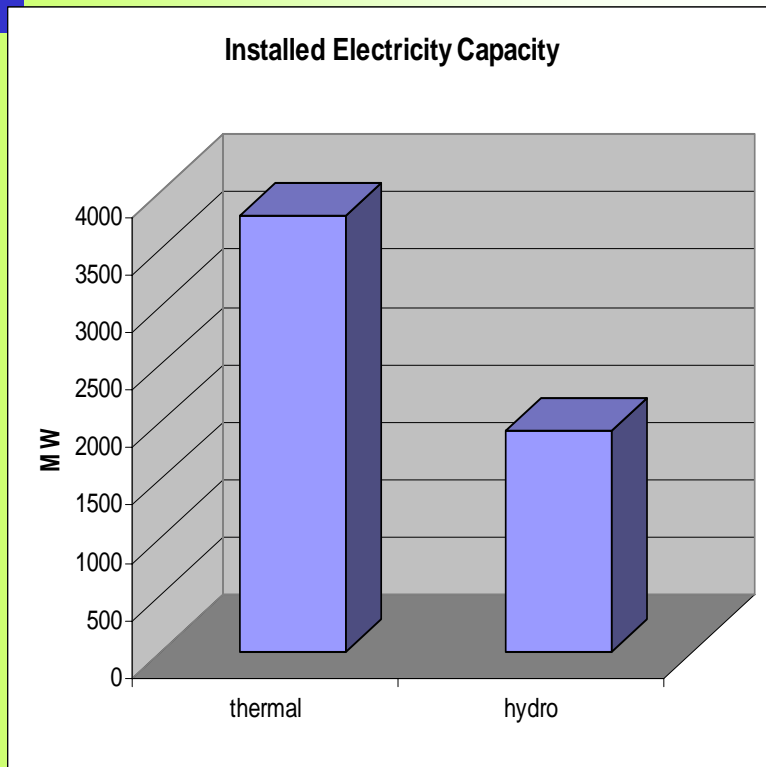


## 2.0 The Nigerian Electricity Challenge

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- Adequate and reliable electricity is a major input for achieving socio-economic development. Inadequate supply restricts socio-economic activities to basic human needs, limits economic growth and adversely affects quality of life
  - Electricity supply in Nigeria is grossly inadequate - Total installed capacity is far less than demand
  - Available capacity is barely above half of installed capacity
  - Per capita electricity consumption is too low for meaningful economic and social development

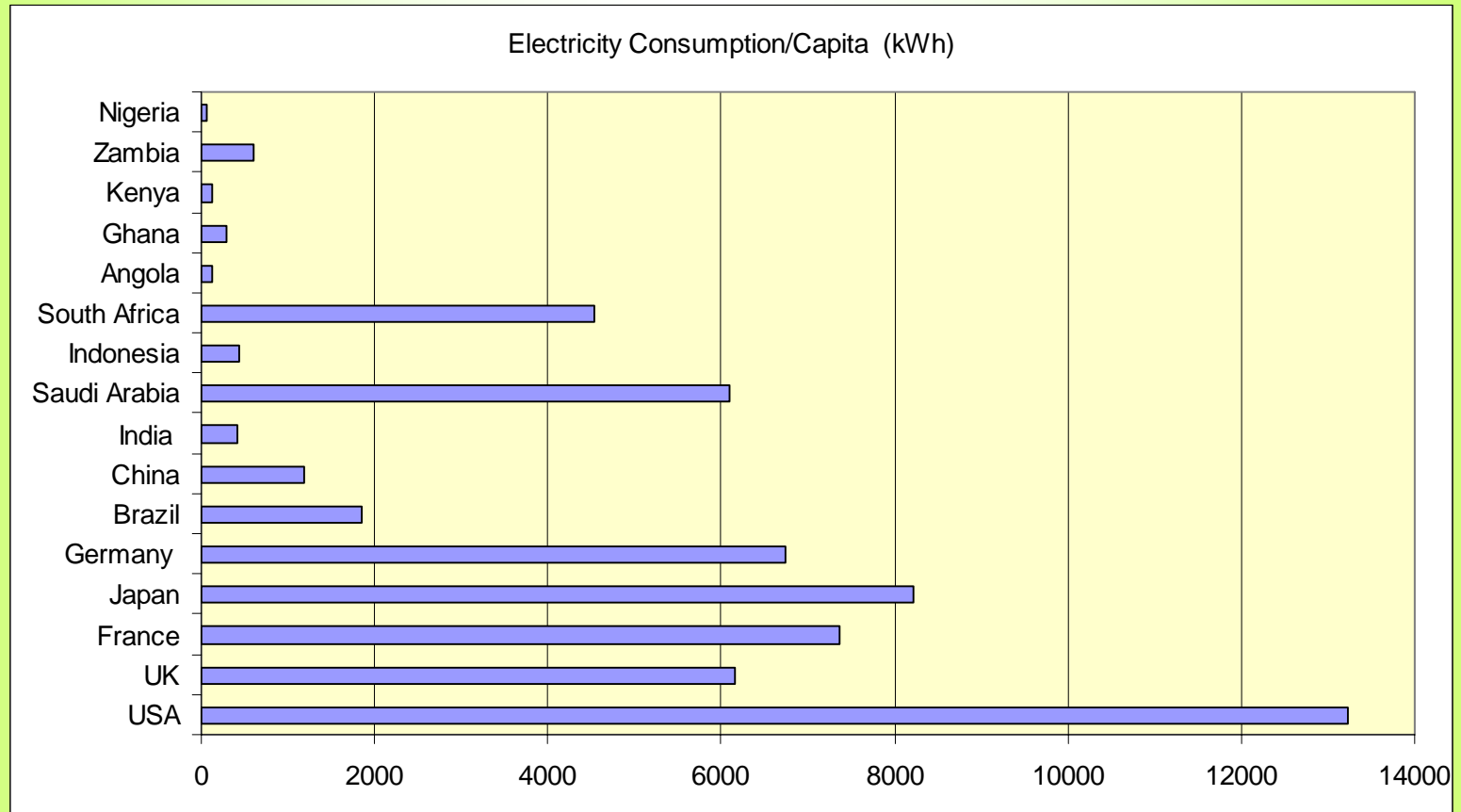
# 2.0 The Nigerian Electricity Challenge, contd.

## Nigerian Electricity Sector in 2007

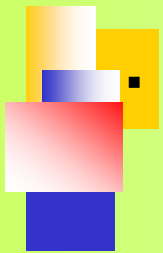


## 2.0 The Nigerian Electricity Challenge, contd.

### Comparison of Electricity Consumption/Capita



## 2.0 The Nigerian Electricity Challenge, contd.



- The current supply system relies on essentially 2 resources – natural gas and hydro (70:30) which are vulnerable to sabotage and adverse weather conditions


- Inadequate gas supply due to high cost or crises in oil producing zone of the country.
- Maintenance is often neglected and so the resulting associated costs as percentage of the total operational cost keep rising.
- In spite of inadequate supply of electricity to the economy, Nigeria must export about 70MW to Niger Republic which borders Nigeria to the North.

## 2.0 The Nigerian Electricity Challenge, contd.



- Nigeria is also a member of the West African Power Pool (WAPP). The transmission inter-connection between Nigeria and Niger Republic is expected to be upgraded to 142MW capacity by 2020 under the West African Power Pool Project
- It is also expected that the transmission inter-connection between Nigeria and Benin Republic will be upgraded from 560MW capacity at the commencement of the WAPP project and gradually built up to 2767MW capacity by 2020
- There is strong need to expand the energy mix for national generation, in accordance with National Energy Policy, to enhance energy security.

## 2.0 The Nigerian Electricity Challenge, contd.



Despite not being able to meet the current demand, the nation's electricity demand continues to grow in response to:

- ✓ ever increasing population,
  - ✓ urbanization,
  - ✓ improved living standard,
  - ✓ economic development.
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- Addressing all the challenges is critical to meeting the needs of a growing population, expanding our economy, and raising the standard of living of the people.


# 3.0 Programmes to Improve Electricity Supply in Nigeria



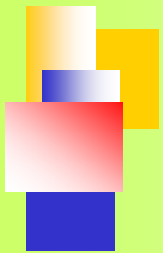
- Steps being taken by Nigeria to address the Challenges of electricity supply include:

- Continuous analyses of electricity demand and supply projections,
- Promoting energy conservation and efficiency,
- Increasing renewable energy contribution,
- Renovating and providing infrastructure for electricity supply,
- Adopting environmentally friendly technologies,
- Promoting Bilateral, regional and international cooperation.

## 3.0 Programmes to Improve Electricity Supply in Nigeria, contd.

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- In Nigeria, the Electric Power Sector Reform Act 2005 provides for:
    - Unbundling of the Power Holding Company of Nigeria (formerly National Electric Power Authority) into 6 generation companies, 11 distribution companies and one transmission company,
    - Establishing the Nigerian Electricity Regulatory Commission (NERC) for the regulation and licensing of the electricity market participants in areas of generation, transmission, system operation, distribution and trading of electricity,
    - Creating and operating a wholesale electricity market in Nigeria,

## 3.0 Programmes to Improve Electricity Supply in Nigeria, contd.

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- Establishing a Rural Electrification Agency to expand access to electricity to the rural areas,
  - Creating a Power Consumer Assistance Fund to subsidize the tariff for less-privileged consumers,
  - Gradual privatization of the newly established generation and distribution companies as separate entities,
  - Eventual adoption of a Management Contract for the Transmission Company.

# 4.0 Electricity Demand and Supply Projections

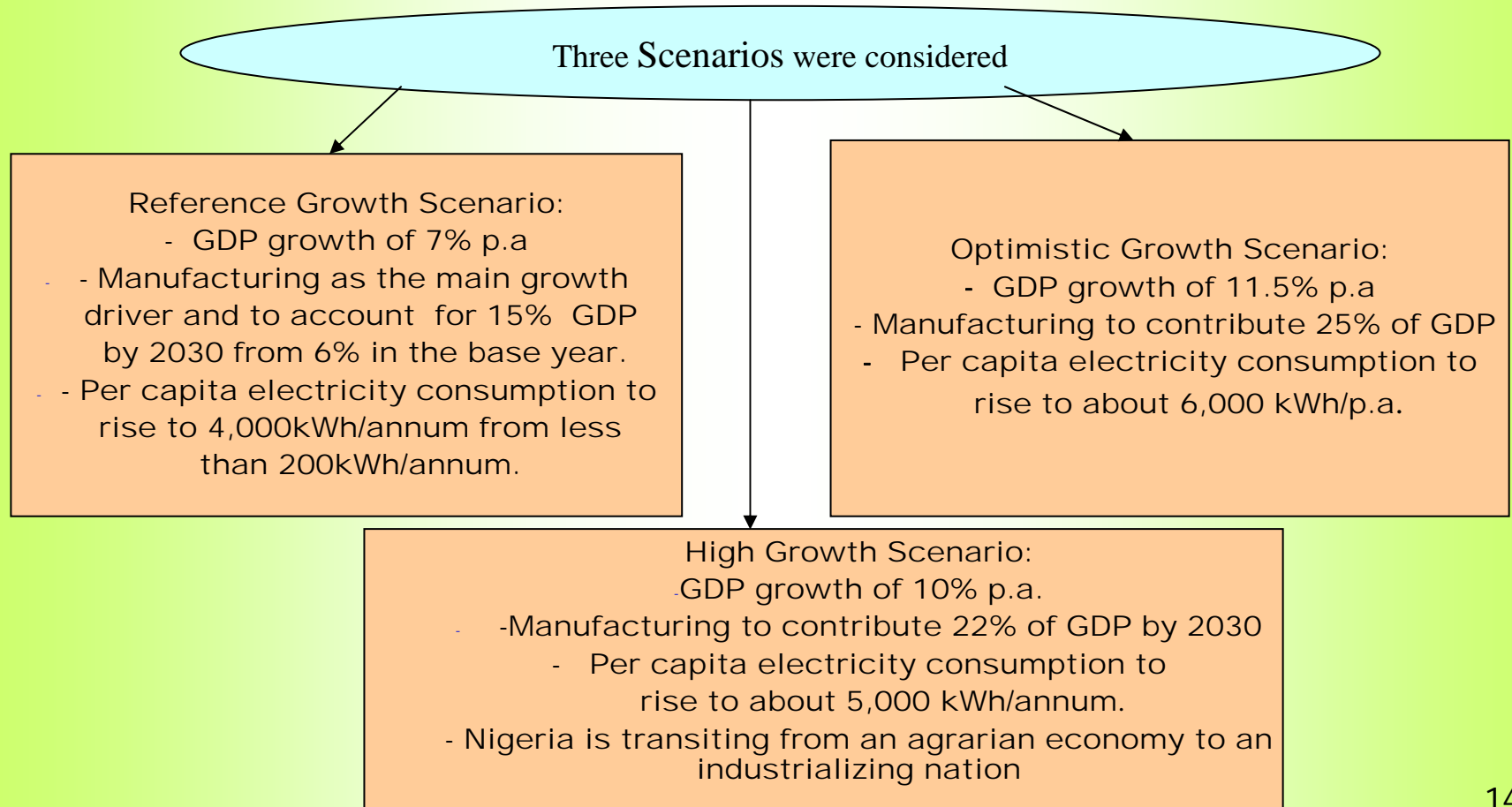


In 2006, the Federal Government set up a Presidential Advisory Committee on 25-Year Power Development Plan, to provide a realistic estimate of electricity demand over a 25-year period on which the power sector development would be based.

- The Committee drew substantially from the expertise of the Energy Commission of Nigeria built over the years in collaboration with the International Atomic Energy Agency
- The Model for Analysis of Energy Demand (MAED) and Wien Automatic System Planning Package (WASP) both developed by the IAEA were applied in undertaking studies on the electricity demand.

# 4.0 Electricity Demand and Supply Projection, contd.

The energy demand projections were computed using MAED with the key drivers of energy demand, namely demography, economy, life style and technology.

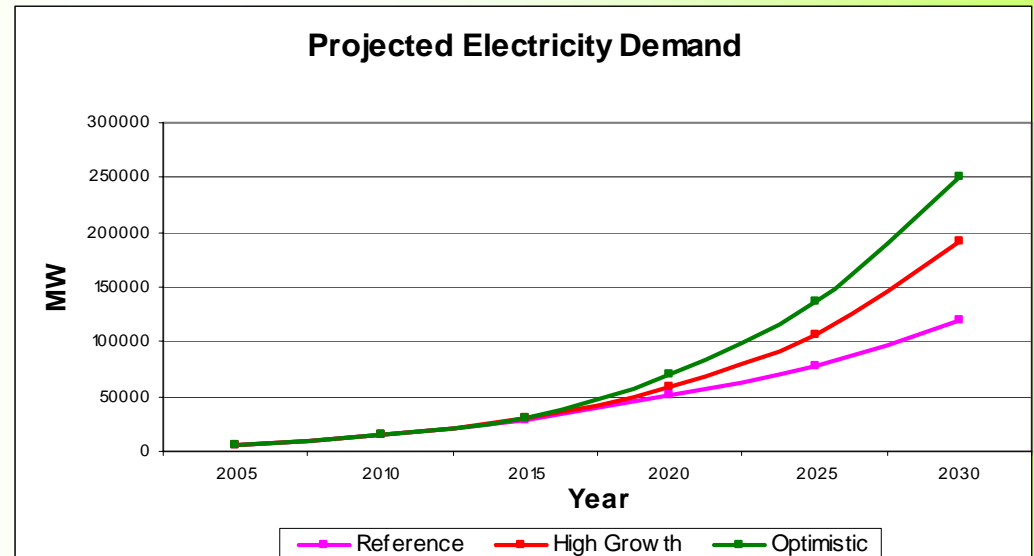


# 4.0 Electricity Demand and Supply Projection, contd.

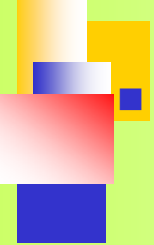
The electricity demand projections for the three economic growth scenarios, 7%, 10%, and 11.5% under industrializing conditions are as shown in Table 1

Table 1: Projected Electricity Demand, MW

Scenario	2005	2010	2015	2020	2025	2030
Reference	5746	15730	28360	50820	77450	119200
High Growth	5746	15920	30210	58180	107220	192000
Optimistic	5746	16000	31240	70760	137370	250000



## 4.0 Electricity Demand and Supply Projection, contd.



The study also suggested the percentage of electricity generation by fuel type as shown in Table 2

**Table 2: Electricity Generation Mix by 2030, %**

Scenario	Hydro	Coal	Gas	Nuclear	Renewable
Reference	10	6	72	2	10
High Growth	7	11	70	2	10
Optimistic	7	11	70	4	8

## 4.0 Electricity Demand and Supply Projection, contd.

Table 3: Nigeria's Energy Reserves /Capacity as at December 2007

ENERGY RESOURCE	RESERVE	UNIT
Crude oil	36.5	Billion barrels
Natural Gas	187.44	Trillion scf
Tar sands	30	Billion barrels of oil equivalent
Coal & lignite	4	Billion tonnes
Large hydropower	11,250	MW
Small hydropower	3,500	MW
Fuelwood	13,071,464	Hectares
Animal waste	61	Million tonnes/yr
Crop residue	83	Million tonnes/yr
Solar radiation	3.5 – 7.0	kWh/m <sup>2</sup> -day
Wind	2 - 4	m/s at 10m height

## 4.0 Electricity Demand and Supply Projection, contd.



These translate to hydropower requirements in 2030 of:

➤ Reference Scenario	11,900 MW
➤ High Growth Scenario	13,500 MW
➤ Optimistic Scenario	17,500 MW

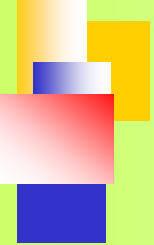
- Given the energy resources presented in Table 3, it is clear that Nigeria would not be able to meet its hydropower requirements from domestic resources.

# 4.0 Electricity Demand and Supply Projection, contd.

**Table 4: Projected Per Capita Electricity Demand, kWh/Cap**

Scenario	2005	2010	2015	2020	2025	2030	Reference, 2003	
							Algeria	SA
Reference	394	548	782	1153	1751	2734	800	4500
High Growth	394	556	842	1367	2362	4372		
Optimistic	394	558	875	1514	2845	5826		

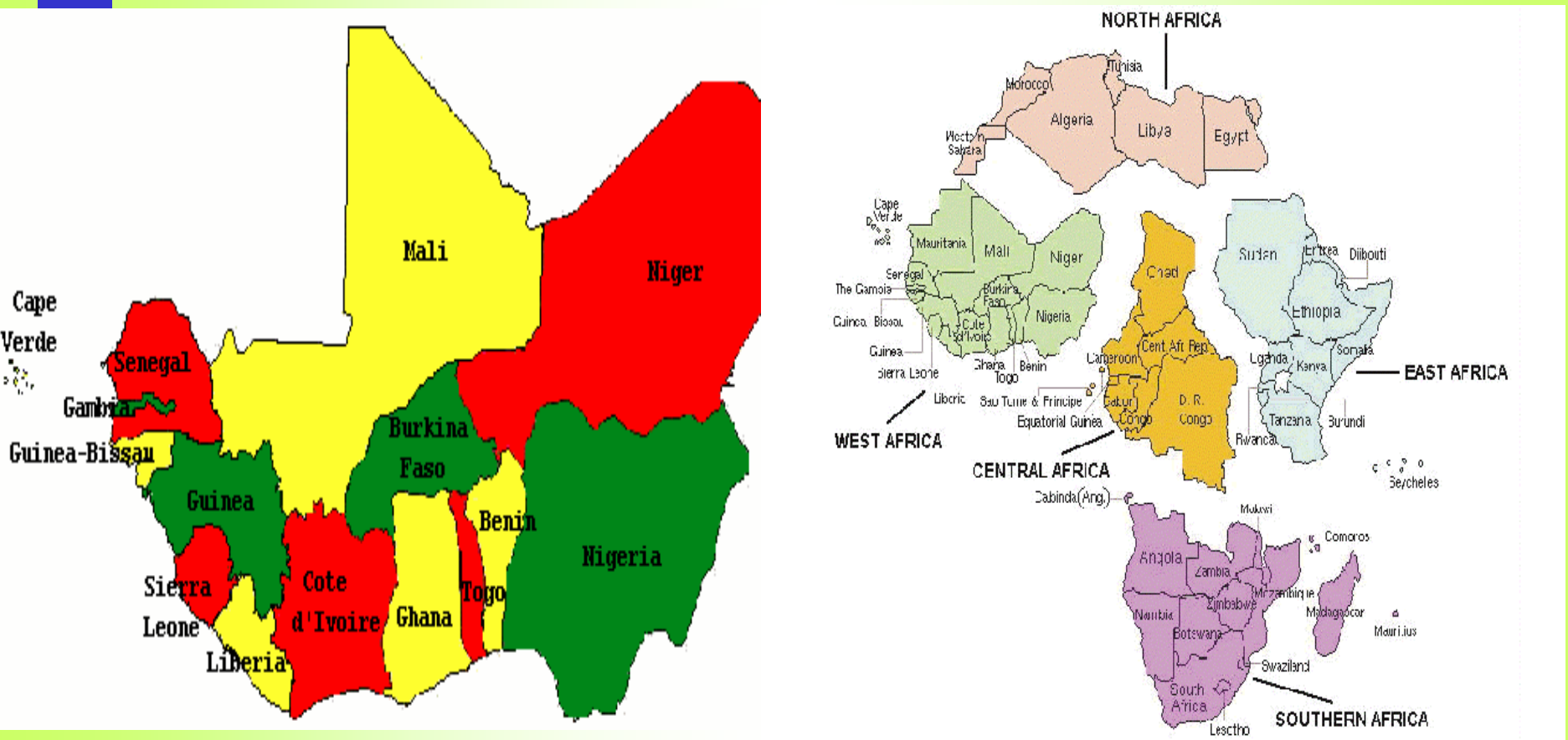
## 5.0 Nigeria As main Customer of INGA



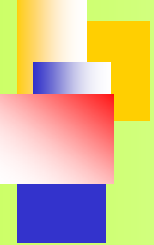
It is worthy of note that the Nigeria national electricity utility is already considering the importation of 5,000MW of electricity through Calabar from the INGA hydropower project beginning from 2015 via the western corridor. Nigeria definitely needs more than what is currently being negotiated.

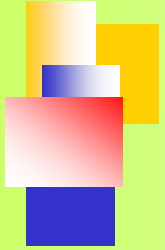
# 5.0 Nigeria As main Customer of INGA, Contd.

## INGA Hydropower Project and the West African Power Pool



# 6.0 Conclusion

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- There is need for all African nations and international funding agencies to finance the INGA hydropower so that the projected electricity demand for Africa could be met. This will enhance the chances of meeting the MDGs and even surpassing them.
  - It is important for African countries such as Nigeria that have resolved to import electricity from INGA, to put in place the appropriate facilities, regulatory policy and legal frameworks.
  - The completion of the INGA hydropower project and subsequent importation of electricity by Nigeria will go a long way in helping to meet the projected electricity demand in Nigeria.



***THANK YOU FOR YOUR ATTENTION***