Nigeria power sector: opportunities and challenges

ABSTRACT

Constant power supply is the hallmark of a developed economy. Any nation whose energy need is epileptic in supply prolongs her development and risks losing potential investors. Nigeria, a country of over 160 million people has for the past 33 years of establishment of the National Electric Power Authority (NEPA) - an agency empowered with the electricity generation, transmission and distribution witnessed frequent and persistent outages.

Presently, the federal government has embarked on power sector reform with the intention of improving the above unpalatable scenario and in turn reducing the scope of monopoly control of the nations' power industry.

This paper therefore looks at the overall power sector and it's reforms as well as evaluates its opportunities and challenges; while advocating introduction and effective checks and management of NIPPs and IPPs as a step in the right direction.

INTRODUCTION

Nigeria is a vast country with a total of 356,667 sq. miles (923,768 sq km), of which about 98.6% is of land mass. The nation is made up of six Geo-political zones subdivided into 36 states and the Federal Capital Territory (FCT). Furthermore, the vegetation cover, physical features and land terrain in the nation vary from flat open savannah in the north to thick rain forest in the south, with numerous rivers, lakes and mountains scattered all over the country [6-9]. These national physical and political attributes themselves present challenges for the effective provision of power needs to all nooks and crannies of the country. To provide adequate power to ensure Nigeria is among the industrialized nations, three critical activities must be effectively achieved:

1. Adequate power must be generated
2. The power must effectively be transmitted to all parts of the country; and
3. Finally be efficiently distributed to the consumers.

Since development and population growth in any country are highly dynamic, these three activities must also be carefully addressed in a dynamic, creative and logical manner [10-12].

Adequate power supply is an unavoidable prerequisite to any nation's development, and electricity generation, transmission and distribution are capital-intensive activities requiring huge resources of both funds and capacity. In the prevailing circumstances in Nigeria where funds availability is progressively dwindling, creative and innovative ideas are necessary to address the power supply problem [13-16].

The administration of President Umaru Musa Yar'adua unveiled a mission, setting an agenda of industrializing Nigeria by 2020, which is about next 6 years.

This research therefore presents a brief history of the attempts and efforts to supply power to the nation. It also briefly reviews the current status of energy resources, energy demand and supply, power generation, transmission and distribution, power sector reforms, opportunities and major challenges and also role of power in attainment of vision 2020 .

1.1 HISTORY AND OVERVIEW

To discuss the power sector in Nigeria in a realistic and practical context, some brief review is necessary to give an insight into the sector from inception.

The history of electricity production in Nigeria dates back to 1896 when electricity was first produced in Lagos, fifteen years after its introduction in England (Niger Power Review, 1985). The total capacity of the generators used then was 60KW. In other words, the maximum demand in 1896 was less than 60KW.

In 1946, the Nigerian Government Electricity Undertaking was established under the jurisdiction of the Public Works Department (PWD) to take over the responsibility of electricity supply in Lagos State.

In 1950, a central body was established by the legislative council which transferred electricity supply and development to the care of the central body known as the Electricity Corporation of Nigeria (ECN). Other body like the Nigerian Electricity Supply Company (NESCO) also had license to produce electricity in some locations in Nigeria [17,18].

There was another body known as the Niger Dams Authority (NDA), which was established by an act of parliament. The Authority was responsible for the construction and maintenance of dams and other works on the River Niger and elsewhere, generating electricity by means of hydro power, improving navigation and promoting fish brines and irrigation (Manafa, 1995). The electricity produced by NDA was sold to ECN for distribution and sales at utility voltages.

In April 1972, the operation of ECN and NDA were merged in a new organization known as the National Electric Power Authority (NEPA). Since ECN was mainly responsible for distribution and sales and the NDA created to build and run generating stations and transmission lines, the primary reasons for merging the organizations were (Niger Power Review, 1989):

- It would result in the vesting of the production and the distribution of electricity power supply throughout the country in one organization which would assume responsibility for the financial obligations.
- The integration of the ECN and NDA should result in the more effective utilization of the human, financial and other resources available to the electricity supply industry throughout the country.

Since inception of NEPA, the authority expands annually in order to meet the ever-increasing demand. Unfortunately, the majority of Nigerians still has no access to electricity and the supply to those provided were not regular (Okoro & Madueme, 2004). It is on this backdrop that the federal government has embarked on aggressive power sector reforms with the intention of resuscitating NEPA and it making it more efficient, effective and responsive to the yawning of the teeming populace [19,20].

In March 2005, President Olusegun Obasanjo signed the Power Sector Reform Bill into law,

enabling private companies to participate in electricity generation, transmission, and distribution. The government has separated PHCN into eleven distribution firms, six generating companies, and a transmission company, all of which is privatized. Several problems, including union opposition delayed the privatization process.

President Umaru Musa Yar Adua, immediately after he was sworn in on may 29th 2007, recognized the urgency of the emergency on the power Sector by specifically addressing the problems of the Sector in an urgent and immediate basis and eliminating the usual bureaucratic time wasting procedures of treating issues of the sector, while ensuring that Due Process is not compromised. The following were his target for power sector:

• Maintaining a minimum generation and transmission capacity of 20,000MW by 2020
• Reduce Transmission and Distribution power outages by at least 75%;
• Reduce Transmission and Distribution technical losses;
• Increase revenue collection in PHCN by 50%;
• Improve on Customer Service Delivery in the Distribution and Marketing section of PHCN; and

• Improve on Health, Safety and Environmental measures in generation, transmission and distribution of electricity.

Nigerian government is to increase foreign participation in the electric power sector by commissioning independent power projects (IPPs) to generate electricity and sell it to PHCN. In April 2005, Agip's 450-MW plant came online in Kwale in Delta State. The NNPC and Joint Venture (JV) partners, ConocoPhillips and Agip, provided the $480 million to construct the plant.

Some IPPs currently under construction include the 276-MW Siemens station in Afam, Exxon Mobils 388-MW plant in Bonny, ABBs 450-MW plant in Abuja, and Eskoms 388-MW plant in Enugu. Several state governments have also contacted oil majors to increase generation eg Rivers State, which contracted Shell to expand the 700-MW Afam station. The Nigerian government also approved the construction of four thermal power plants (Geregu, Alaoji, Papalanto, and Omotosho), with a combined capacity of 1,234 MW to meet its generating goal Chinas EXIM Bank Su Zhong and Sino Hydro have committed to funding the Mambilla (3,900-MW) and Zungeru (950-MW) hydroelectric projects.

.Also, NNPC, in a joint venture with Chevron are to construct a 780-MW gas-fired thermal plant in Ijede, Lagos State. The project is expected to be constructed in three phases, with the first two phases expected to have capacity of 256 MW each. Umaru Musa Yardua administration was cut short by death due to ill health.

1.2 CURRENT STATE OF THE SECTOR

Currently, there are 23 grid-connected generating plants in operation in the Nigerian electricity supply industry (NESI) with a total installed capacity of 10,396.0MW and available capacity of 6,056MW. Most generation is thermal based, with an installed capacity of 8,4576MW (81% of the total) and an available capacity of 4,996 MW. (83% of the total). Hydro power form three major plants accounting for 1,938.4 MW of the total installed capacity (an available capacity of 1,060 MW). Of all these generation only about 4000MW is efficiently transmitted as at June 2014

The national grid is made up of 4,889.2km of 330kV line, 6,319.33km of 132kV line, 6,098MVA transformer capacity at 330/132kV and 8,090MVA transformer capacity at 132/33kV. These plants has a generating capacity of

1.2.1 GENERATION

The Total Installed Capacity of the currently generating plants is about 10,396 MW but the Installed available Capacity is less than 4,000MW as at JULY 2014. Seven of the fourteen generation stations are over 20 years old and the average daily power generation is low. As a result, the nation experiences massive load shedding.

Though the planned generation capacity projects for a brighter future; the current status of power generation in Nigeria presents the following challenges:

i. Inadequate generation availability;
ii. Inadequate and delayed maintenance of facilities;
iii. Insufficient funding of power stations etc.

1.2.2 TRANSMISSION

The transmission system in Nigeria system does not cover every part of the country. It currently has the capacity to transmit a maximum of about 4,000 MW and it is technically weak thus very sensitive to major disturbances and challenges.

1.2.3 DISTRIBUTION & MARKETING

In most locations in Nigeria, the distribution network is poor, the voltage profile is poor and the billing is inaccurate. As the department, which inter-faces with the public, the need to ensure adequate network coverage and provision of quality power supply in addition to efficient marketing and customer service delivery cannot be over emphasize. In summary some of the major problems identified are:

i. Weak and Inadequate Network Coverage;
ii. Overloaded Transformers and bad Feeder Pillars;
iii. Substandard distribution lines;
iv. Poor Billing System;
v. Unwholesome practices by staff and very poor Customer relations;
vi. Inadequate logistic facilities such as tools and working vehicles;
vii. Poor and obsolete communication equipment;
viii. Low staff morale and lack of regular training
ix. Insufficient funds for maintenance activities.

STRUCTURE, DEREGULATION AND LIBERALISATION OF THE ELECTRICITY INDUSTRY

The concept of privatization often sometimes interchanged with liberalization is multidimensional in outlook. In the first place, privatization could be used to mean the tendency where government shares are sold to private investors. This definition means that such government enterprises and its ownership are now being transferred to individuals while government only steps aside as a regulatory agent (Pan Africa Summit, 2000). By extension therefore, the concept of privatization does not in any way suggests outright sale of government property per se. It however partially removes government from the scene as rightful owner while at the same time, ensuring government's regulatory roles to check abuses of the market focuses (Wogu, 2007).

> *That privatization is an adaptation of liberalization; the two concepts, however, are mutually reinforcing, liberalization in its real sense therefore could mean some level of openness, removal of obstacles, restrictions, excessive tariff and regulation. Therefore, we can also say that a liberalized economy is an open economy, free and competitive economy where everyone is at liberty to compete in a free market system aimed at profit maximization (Cook and Patrick, 2000).*

It is maybe of this view to reviving the comatose power sector that President Goodluck Ebele Jonathan formed the NERC (Nigerian Electricity Regulatory Commission) as a supervisory body for the Electric Power Sector reforms which was been delayed by previous administration.

The Electric Power Sector Reform Act of 2005 established NERC's authority to impose mandatory reliability standards on the power sector and to impose penalties on companies that manipulate the electricity markets. The EPSRAct of 2005 gave NERC additional responsibilities as outlined in NERC's Wide Important Goals as part of that responsibility, NERC:

2.2 ROLES OF NERC:

- Regulates the generation, transmission, distribution and marketing of electricity in Nigeria (and with Nigeria);
- Licenses and inspects private and corporate electric power projects (10MW and above; where 1-10MW are issued Captive Licenses);
- Ensures the reliability of generation plants, high voltage transmission system and the zonal distribution system;
- Ensures occupational health and safety of persons involved with electricity in the whole sector.
- Monitors and investigates energy markets;
- Uses civil penalties and other means against energy organizations and individuals who violate NERC rules in the energy markets;
- Administers accounting and financial reporting regulations and conduct of regulated companies.

2.3 STRUCTURE OF NERC

The Nigerian Electricity Regulatory Commission is governed by a tenured Board of Commissioners, headed by a Chairman. The Nigerian President nominates one nominee Commissioner to represent his/her geopolitical zone in the country for a fixed tenure of 4years, renewable once only. The Chairman/CEO, however has a period of 5years, also renewable once only. The nominees are duly screened by the Senate of the Federal Republic. The Board of Commission of NERC issues orders on electricity matters in Nigeria. It make regulatory decisions and issues final license to investors/operators. It also settles industrial disputes through its ADR mechanism in an open hearing. NERC is divided into seven Divisions:

- Office of the Chairman/CEO,
- Engineering, Standards and Safety Division,
- Finance and Management Services Division,
- Government and Consumer Affairs Division,
- Legal Licensing and Enforcement Division,
- Market Competition and Rates Division, and the
- Renewable Energy/Research and Development Division.

The Legal Support and Licensing Division is charged with the primary responsibility of:

- Overseeing the processing of license applications, including issuance, amendment, renewal, suspension, or cancellation of licenses

- Advising the Commission on legal matters and provision of legal input in the drafting of licenses, regulations, contracts etc.
- Facilitating the establishment of participatory Dispute Resolution Panels/Committees with responsibility for formalized mediation, arbitration and resolution of disputes
- Articulating the Commission's response on legal questions and disputes including representation before other judicial bodies.

2.4 LICENSING FRAMEWORK OF NERC

Under the EPSR Act[1], NERC is empowered to license all industry participants involved in the following activities:

- Electricity Generation in excess of 1MW
- Electricity Distribution in excess of 100KW
- Electricity Transmission
- System Operation
- Trading
- Electrical Installation/Wiring

The Act makes it an offense punishable by a term of imprisonment or imposition of fine for any person to undertake these activities without a license.

The players in the Nigerian electricity market are often referred to as market participants. In order to carry on business as a market participant, it is imperative that such entity obtain the appropriate license from NERC. A summary of the applicable licenses along the electricity value chain is provided below:

i. Electricity Generation License
ii. Distribution License
iii. Transmission license
iv. System Operation License
v. Trading License

The scope of this paper has limited further explanation on these licenses.

2.5 LEGAL AND REGULATORY FRAMEWORK FOR NIGERIAN POWER SECTOR:

The key regulatory agencies include:

A. Federal ministry of power

B. Nigerian Electricity Regulatory Commission

C. Energy Commission of Nigeria

D. Rural Electrification Agency

E. Presidential Task Force on Power

Each of these agencies is charged with different responsibilities which the scope of this research cannot cover.

2.6 KEY INSTITUTIONS IN THE LIBERALISED POWER SECTOR

A. Niger Delta Power Holding Company Limited

B. Nigerian Bulk Electricity Trading Plc.

C. Operator of the Nigerian Electricity Market

D. Nigerian System Operator

E. Gas Aggregation Company Nigeria Limited

F. National Power Training Institute of Nigeria

G. Nigeria Electricity Liability Management Company Limited

EXISTING POWER PLANTS, IPPs AND NIPPs

The Nigerian power sector privatization is reputed to be one of the boldest privatisation initiatives in the global power sector over the last decade, with the transaction cost of about $3.0bn.

Over the past decade, the Federal Government has been able to complete the privatization process. The federal government retains the ownership of the transmission assets (management under concession) with the generation and distribution sectors fully privatized. The subsequent segments shed more light on the various power sub-sectors detailing current capacity, trends and key sector statistics to aid the understanding of the sector as a whole.

The Nigerian power sector is made up of 3 major subsectors the generation, transmission and distribution.

3.1 GENERATION COMPANIES

There are currently 23 grid-connected generating plants in operation in the Nigerian electricity supply industry (NESI) with a total installed capacity of 10,396.0MW and available capacity of 6,056MW. Most generation is thermal based, with an installed capacity of 8,4576MW (81% of the total) and an available capacity of 4,996 MW. (83% of the total). Hydro power form three major plants accounting for 1,938.4 MW of the total installed capacity (an available capacity of 1,060 MW). In total, about 4000MW is efficiently transmitted as at JULY 2014. Reasons pointed towards shortage of gas to fire plants.

TABLE 1: SIX EXISTING GENCOS IN NIGERIA, THEIR NAMES AND INSTALLED CAPACITIES

S/N	GENERATION COMPANY	PLANT TYPE	CAPACITY (MW)
1	Afam power plc (1-V)	Thermal	987.2
2	Egbin Power Plc	Thermal	1320
3.	Kainji/Jebba Hydro Electric Plc	Hydro	1,330
4	Sapele power plc	Thermal	1,020
5.	Shiroro hydro Electric Plc	Hydro	600
6.	Ughelli Power Plc	Thermal	942

3.1.1 INDEPENDENT POWER PRODUCERS (IPPS):

IPPs are power plants owned and managed by the private sector. Although there were independent power producers (IPPs) existing in Nigeria prior to the privatization process, the Nigerian Electricity Regulatory Commission (NERC) has recently issued over 70 licenses to independent power producers in order to improve the power situation in the country. The

existing IPPs include shell- Afam VI (642MW), Agip – Okpai (480MW) and AES barges (270MW).

3.1.2 NATIONAL INTEGRATED POWER PROJECTS:

The National Integrated Power Projects (NIPP) is an integral part of Federal Government's efforts to combat the power shortages on the country. It was conceived in 2004 as a fast-track public sector funded initiative to add significant new generation capacity to Nigeria's electricity supply system along with the electricity transmission and distribution and natural gas supply infrastructure required to deliver the additional capacity to consumers throughout the country. There are 10 NIPPs with combined capacity of 5,455MW scheduled for completion (for ongoing projects) and privatization. So many others are in the pipeline. The NIPPs are:

TABLE 2: 10 NIPPS, CAPACITY AND COMMISSIONED DATE

S/N	NIPP	Capacity (MW)	Commissioned Date
1.	Alaoji generation company Nigeria limited	1,131	August 2013
2.	Benin generation company limited	508	June 2014
3	Calabar generation company limited	634	June 2014
4.	Egbema generation company limited	381	June 2014
5.	Gbaran generation company limited	254	June 2014
6.	Geregu generation company limited	506	May 2013
7.	Ogorode generation company limited	508	All units commissioned
8.	Olorunsogo Generation Company limited	754	All units commissioned
9.	Omoku generation company limited	265	June 2014
10.	Omotosho generation company limited	513	All units commissioned

The federal government has set aside N50 billion in escrow accounts in 3 Nigerian Banks to serve as a buffer for losses that the GENCOS may suffer in the course of power transmission. Draw-downs are only possible where the stipulated conditions are met. The Nigerian Bulk Electricity Trading (NBET) will manage the accounts.

3.2 TRANSMISSION COMPANY

The transmission company of Nigeria (TCN) is a successor company of PHCN following the unbundling of the sector, and is currently being managed by a management contractor, **MANITOBA HYDRO INTERNATIONAL (CANADA).** Manitoba is responsible for revamping TCN to achieve technical and financial adequacy in addition to providing stable transmission of power without system failure. Currently, the transmission capacity of the Nigerian Electricity Transmission system is made up of about 5,523.8km of 330KV lines and 6,801.49km of 132kv lines.

The TCN is made up of two major departments; the system operator and market operator. The market operations (MO) is a department under TCN charged with the responsibility of administering the wholesale electricity market, promoting efficiency and where possible, competition. The system operator is focused on system planning, administration and grid discipline.

- Implementing and enforcing grid code, draft/implementation of operating procedures as may be required for the proper functioning of the system operator controlled grid and system planning.
- Implementation and supervising open access to the system operator controlled grid.

The responsibilities of the market operator include market administration and implementation of market rules.

3.3 DISTRIBUTION COMPANIES (DISCOS)

There are 11 electricity distribution companies (Discos) in Nigeria. The coverage areas of the 11 companies are indicated in the map below. **FIXED CHARGES** & **ENERGY CHARGES** of these **DISCOS** has been highlighted in the Appendix of this work.

FIG 1: MAP OF COVERAGE AREA OF GENCOS

TABLE.3:

PERCENTAGE LOAD ALLOCATION OF 11 DISCOS

S/N	DISCO	%AGE LOAD ALLOCATOR
1	ABUJA DISTRIBUTION COMPANY	11.5%
2.	BENIN DISTRIBUTION COMPANY	9%
3.	EKO DISTRIBUTION COMPANY	11%
4.	ENUGU DISTRIBUTION COMPANY	9%
5.	IBADAN DISTRIBUTION COMPANY	13%
6.	IKEJA DISTRIBUTION COMPANY	15%
7.	JOS DISTRIBUTION COMPANY	5.5%
8.	KADUNA DISTRIBUTION COMPANY	8%
9.	KANO DISTRIBUTION COMPANY	8%
10.	PORT HARCOURT DISTRIBUTION COMPANY	11.5%
11.	YOLA DISTRIBUTION COMPANY	11.5%

TABLE 4 COMPREHENSIVE LISTS OF ALL POWER STATIONS

(EXISTING AND NEWLY LICENSED) AND DISTRIBUTION COMPANIES IN NIGERIA AND THEIR CAPACITIES

Name	**LICENSE Type**	**Site Location**	**Capacity**
Abuja Electricity Distribution Co Plc	Distribution	Loma-Mansa Street, Wuse Zone 4, Abuja	FCT, Niger, Kogi and Nassarawa
AES Nigeria Barge Limited	270 MW Generation on-grid		

Name	LICENSE Type	Site Location	Capacity
Afam Power Plc	Generation On-grid	Afam, Rivers State	987.2MW
African Oxygen & Industrial Gases Limited	Generation Off-grid	Ikorodu, Lagos State	19MW
Agbara Shoreline Power Limited	Generation on-grid	Agbara, Ogun	100MW
Akute Power Limited	Generation Off-Grid	Lagos Water Corporation	13MW
Alaoji Generation Co. Ltd (NIPP)	Generation on-grid	Alaoji,Abia State	1074MW
Anita Energy Limited	Generation on-grid	Agbara, Lagos State	90MW
Azura Power West AFrica Limited	Generation on-grid	Ihovbor Benin,Edo State	450MW
Benin Electricity Distribution Co Plc	Distribution	5 Akpakpava Street, Benin City, Edo State	Edo, Delta, Ondo and Ekiti
Benin Generation Company Limited	Generation On-grid	Ihonvbor, Edo State	450MW
Calabar Generation Company Limited	Generation On-grid	Calabar, Cross Rivers State	561MW
Century Power Generation Limited	Generation On-grid	Okija, Anambra State	495MW
CET Power Projects (Ewekoro)	Generation off-grid	Wapco Ewekoro,Ogun State	6MW
CET Power Projects Ltd.	Generation off-grid	Tinapa, Cross River State	20MW
CET Power Projects Ltd.	Generation off-grid	Nigerian Breweries Limited, Iganmu, Lagos	5MW
CET Power Projects(Sagamu)	Generation off-grid	WAPCO Sagamu,Ogun State	7MW
ContourGlobal Solutions (Nig) Ltd	Generation Off-Grid	NBC Bottling Plant,Ikeja	10MW
ContourGlobal Solutions (Nig) Ltd	Generation Off-Grid	NBC Bottling plant,Apapa	4MW
ContourGlobal Solutions (Nig) Ltd		NBC Bottling Plant,Benin	7MW
Coronation Power and Gas Limited	Generation off-grid	Sango Otta	20MW
Delta Electric Power Limited	Generation on-grid	Oghareki,Etiope West LGA	116MW

Name	LICENSE Type	Site Location	Capacity
DIL Power Limited	Generation Off-grid	Cement factory, Ogun State	114MW
DIL Power Plc	Generation on-grid	Obajana, Kogi State	135MW
Egbema Generation Company Limited	Generation On-grid	Egbema Imo State	338MW
Egbin Power Plc	Generation On-grid	Egbin, Lagos State	1320MW
Eko Electricity Distribution Co Plc	Distribution	24/25, Marina Lagos	Lagos South
Eleme Petrochemical Company Limited	Generation On-grid	Eleme Complex,P.H Rivers	135MW
Energy Company of Nigeria (NEGRIS)	Generation on-grid	Ikorodu, Lagos State	140MW
Energy Company of Nigeria Limited	Generation off-grid	Nestle,Agbara,Ogun State	3MW
Energy Company of Nigeria Plc	Distribution	Lateef jakande Road, Ikeja, Lagos State	Marina, Lagos State
Enersys Nigeria Limited	Generation On-grid	Ado-Ekiti, Ekiti State	10MW
Enugu Electricity Distribution Co Plc	Distribution	12 Station Rd, Enugu State	Engu, Abia, Imo, Anambra and Ebonyi
Ethiope Energy Limited	Generation on-grid	Ogorode, Sapele, Delta State	2800MW
Ewekoro Power Ltd	Generation off-grid	Ewekoro, Ogun State	12.5MW
Farm Electric Supply Ltd	Generation on-grid	Ota, Ogun State	150MW
First Independent Power Co. Ltd	Generation on-grid	Omoku, Rivers State	150MW
First Independent Power Co. Ltd	Generation on-grid	Trans-Amadi, Rivers State	136MW
First Independent Power Co. Ltd	Generation on-grid	Eleme, Rivers State	95MW
Name	LICENSE Type	Site Location	Capacity
Fortune Electric Power Co. Ltd	Generation On-grid	Odukpani, Cross River State	500MW
Gateway Electricity Limited	Distribution Off-grid	VI, Lagos	Certain locations not covered by PHCN in ogun State

Name	LICENSE Type	Site Location	Capacity
Gbarain Generation Company Limited	Generation On-grid	Gbarain, Bayelsa State	225MW
Geometric Power Ltd	Generation on-grid	Aba, Abia State	140MW
Geregu Generation Company Limited	Generation On-grid	Geregu II, Kogi State	434MW
Geregu Power Plc (BPE)	Generation On-grid	Geregu, Kogi State	414MW
Hudson Power Limited	Generation on-grid	Warawa, Ogun State	150MW
Ibadan Electricity Distribution Co Plc	Distribution	Capital Building, 115 Ring road, Ibadan, Oyo state	Oyo, ogun, Osun and kwara
Ibafo Power Station Limited	Generation on-grid	Ibafo, Ogun State	200MW
Ibom Power Ltd	Generation on-grid	Ikot Abasi, Akwa Ibom State.	190MW
ICS Power Ltd	Generation on-grid	Alaoji, Abia State	624MW
Ikeja Electricity Distribution Company	Distribution	Ikeja, Lagos State	Lagos North
Ikorodu Industrial Power Ltd	Distribution for Ewekoro Cement	Ikorodu, Lagos State	
Ikorodu Industrial Power Ltd	Embedded Generation	Ikorodu, Lagos State	39MW
Ilupeju Power Limited	Generation off-grid	Academy Press,Ilupeju	2MW
Income Electrix Limited	Generation off-grid	NPA,PH,Rivers State	6MW
Island Power LImited	Embedded generation	Marina,Lagos State	10MW
Isolo Power Generation Limited	Generation On-grid	Isolo Lagos State	20MW
JBS Wind Power Limited	Generation On-grid	Maranban Pushit, Mangu, Plateau State	100MW
Jos Electricity Distribution Company	Distribution	Ahmadu bello Way, Jos, Plateau State	Plateau, Bauchi, Benue and Gombe
Name	LICENSE Type	Site Location	Capacity
Kaduna Electricity Distribution Company Plc	Distribution	The Managing DirectorKaduna Electricity Distribution Company	B/Kebbi, Doka, Gusau, Mak

Name	LICENSE Type	Site Location	Capacity
		PlcNagwamatse BuildingAhmadu Bello WayKadunaTel: 062242213	
Kaduna Power Supply Company Limited	Embedded Generation	Kudenda Ind.Area,Kaduna	84MW
Kainji Hydro Electric Plc (Jebba Station)	Generation On-grid	Jebba, Niger State	570MW
Kainji Hydro Electric Plc (Kainji Station)	Generation On-grid	kainji, Niger State	760MW
Kano Electricity Distribution Co Plc	Distribution	Niger street, kano, kano State	Kano, jigawa and katsina
Knox J&L Energy Solutions Limited	Generation on-grid	Ajaokuta,Kogi State	1000MW
Lotus & Bresson Nigeria Limited	Generation on-grid	Magboro, Ogun State	60MW
Mabon Ltd	Generation	Dadinkowa, Gombe State	39MW
MBH Power Limited	Generation on-grid	Ikorodu,Lagos State	300MW
Minaj Holdings Ltd	Generation on-grid	Agu-Amorji Nike, Enugu East LGA, Enugu State	115MW
Nigerian Agip Oil Co. Ltd	Generation on-grid	Okpai, Delta State	480MW
Nigerian Bulk Electricity Trading Plc	Bulk procurement and Resale of Electricity		
Nigerian Electricity Supply Corporation (Nigeria) Limited (NESCO)	Generation on-grid	Bukuru, Plateau State	30MW
Notore Power Ltd	Generation on-grid	Onne, Rivers State	50MW
Ogorode Generation Co. Ltd (NIPP)	Generation on-grid	Ogorode,Delta State	450MW
Olorunshogo Generation Co. Ltd (NIPP)	Generation on-grid	Oluronshogo,Ogun State	750MW
Olorunsogo Power Plc (BPE)	Generation On-grid	Olorunsogo, Ogun State	335MW
Omoku Generation Company Limited	Generation On-grid	Omoku, Rivers State	250MW

Name	LICENSE Type	Site Location	Capacity
Omotosho Generation Company Limited	Generation On-grid	Omotosho II, Ondo State	500MW
Omotosho Power Plc (BPE)	Generation On-grid	Omotosho, Ogun State	335MW
Paras Energy & Natural Resources Development Limited	Generation On-Grid	Ogijo,Ogun State	96MW
PH Electricity Distribution Co Plc	Distribution	Rumuigbo, Port harcourt, Rivers State	Rivers, Cross River, Bayelsa and Akwa Ibom
PZ Power Company Limited	Generation Off-grid	PZ Cussons Aba Factory, Abia State	4MW
Sapele Power Plc	Generation On-grid	Sapele, Delta State	1020MW
Shell Petroleum Dev. Co. Ltd	Generation on-grid	Afam VI,	642MW
Shiroro Hydro Electricity Plc	Generation on-grid	Shiroro, Niger State	600MW
Shoreline Power Company Limited	Generation Off-grid	Lafarge Wapco,Sagamu,Ogun	9MW
Supertek Electric Limited	Genration On-grid	Ajaokuta, Kogi State	500MW
Supertek Nig. Ltd	Generation on-grid	Akwete, Abia State	1,000MW
Tower Power Abeokuta Limited	Generation off-grid	Abeokuta,Ogun State	20MW
Tower Power Utility Limited	Generation off-grid	Ota Industrial Estate, Ota, Ogun State	20MW
Transmission Company of Nigeria	Transmission	Zambezi street, maitama-Abuja	36 states of the federation
Ughelli Power Plc	Generation On-grid	Ughelli, Delta State	942MW
Unipower Agbara Limited	Generation off-grid	Unilever, Agbara,Ogun St.	6MW
Wedotebary Nigeria Limited	Generation off-grid	Kuru, Jos	5MW
Westcom Technologies & Energy Services Ltd.	Generation on-grid	Sagamu, Ogun State	1000MW

Name	LICENSE Type	Site Location	Capacity
Yola Electricity Distribution company	Distribution	No 2 Atiku Abubakar Road Jimeta, Yola State	Yola, Adamawa, Borno, Taraba and Yobe
Zuma Energy Nigeria Ltd (Gas Plant)	Generation on-grid	Ohaji Egbema,Owerri,Imo	400MW
Zuma Energy Nigeria Ltd(Coal Plant)	Generation on-grid	Itobe,Kogi State	1200MW

OPPORTUNITIES AND CHALLENGES OF THE NIGERIAN POWER SECTOR

4.1 INTRODUCTION

Due to the unbundling of the Nigerian Power Sector; it has in turn availed numerous investment opportunities which has been proven to be advantageous to investors in near long run. These opportunities cut across the three main areas of the sector; Generation, transmission and Distribution. NDPHC has taken a giant leap towards investment in generation and a little in the other sectors.

4.2 CHALLENGES

Power sector reforms in a developing economy such as Nigeria pose great challenges not only to the government that initiated the programme but also to the populace who are the consumer of energy and to the new born GENCOS and DISCOS which parades itself as a better alternative to the moribund PHCN. These challenges can be broadly classified into four areas:

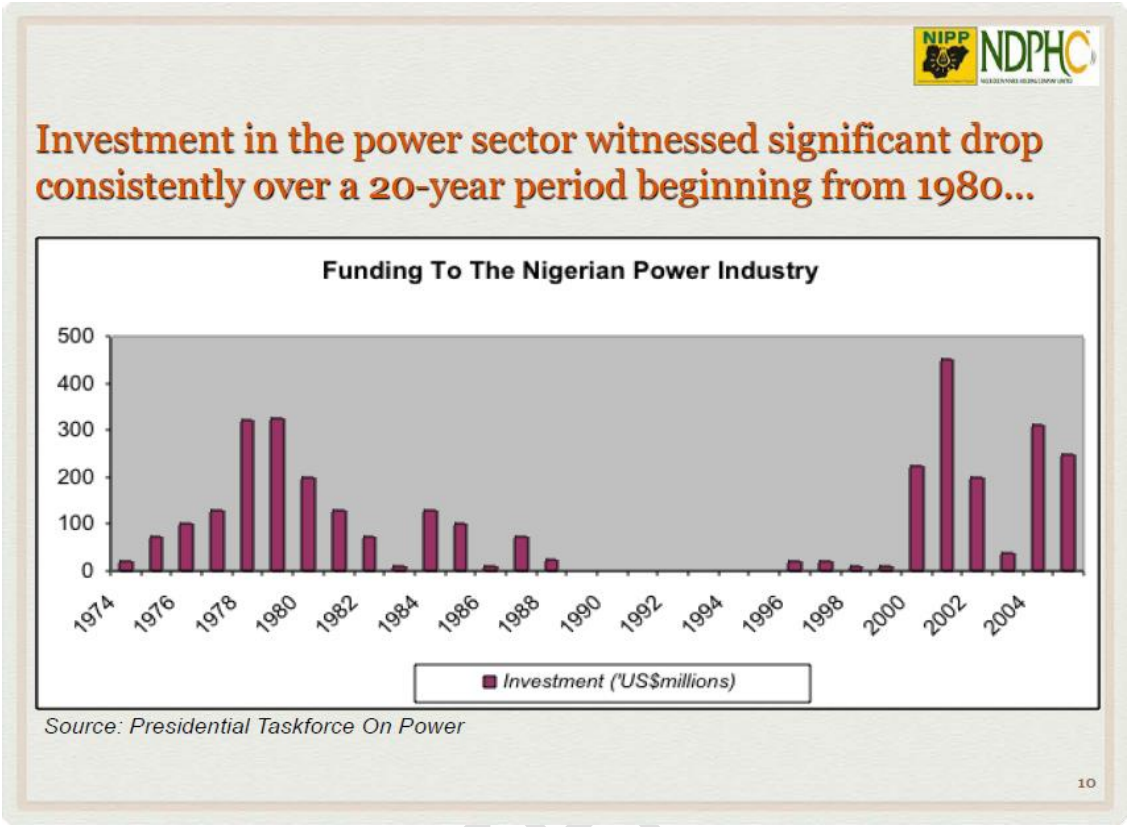
- Economic and Social
- Technical
- Political and
- Environmental

4.2.1 ECONOMIC AND SOCIAL CHALLENGES (FUNDING)

It is no longer debatable that the primary aim of the power sector reform by the federal government is to enhance the efficiency of the nation's power industry as well as make energy affordable and available to consumers. This means generating more power to the national grid and re-activating most of the 'dead' units in the nation's power stations.

In order to satisfy the demand of electricity by consumers, new power stations must be constructed, by the GENCOS and IPPs. Construction of new power stations and comprehensive maintenance of dysfunctional existing units are capital intensive. There is always a price to pay for constant power supply in our homes. This will definitely translate to more money being given out to the utility companies by end users since the primary concern will be to make profit. This is evident from the research conducted by Hall (2000) regarding a privatisation programme and the United Kingdom.

FIG 2: GRAPH SHOWING FUNDING TO POWER SECTOR FROM 1974-2004



4.2.2 TECHNICAL (INADEQUATE SKILLED MANPOWER)

It is not just enough to generate power adequately without recourse to the strength of the existing transmission line capabilities as well as how the power could be used for the overall interest of both the licensed companies and the consumers. There is need for emphasis on the need for transmission lines and substation re-enforcement and construction of additional transmission lines in order to ease evacuation of energy especially in areas where the IPPs cluster as result of proximity to energy sources (Inugonum, 2005). Of most concern again is the manpower to handle and maintain these machines effectively.

4.2.3 POLITICAL ISSUES AND CORRUPTION

There is need to create and ensure level playing fields for all stakeholders in the emerging power sector reforms if the desired objectives are to be achieved. By the reform programme, it is expected that the power sector will open itself to key players within and outside the country. This means that the IPPs should expect condusive political atmosphere before they can agree to invest their money. The majority of the IPPs would like to construct their plants within the Niger-Delta area where most sources of energy and fuel needed to run their plants are guaranteed. We hope government be more rational enough as not to repeat the same act that led to the citation of a refinery in Kaduna; thousands of miles away from source of raw materials- Tribal & Insensitive corruption. Of interest again is the hostile environment in the Niger-Delta predicated by armed ethnic militia and youth restiveness should be brought to a halt to create enabling environment to power investors. This brings to fore the need to sustain the nation's democratic structures with the view of ensuring government policy stability. By so doing, the envisaged comprehensive national energy policy that will take care of conservation, storage, consumption, construction and distribution be sustained.

4.2.4 ENVIRONMENTAL FACTORS

The nature of power plants to be built in a given locality is dependent on the nature of the environment. For instance, a city which already has a cement industry and chemical industry may frown at hosting thermal power plants because of a high level of Carbon monoxide (CO) emissions. In order to guard against this scenario, the government must create the Environmental Inspection Agency (EIA) to monitor and regulate the extent of damage caused by pollution to the environment and the inhabitants. Again, the IPPs may be confronted by high compensation fees, and the right of ways in their quest to erect a power plant in any given city. These high compensation fees may run into millions and can/have invariably pose(d) as a deterrent to potential IPPs.

Numerous challenges equally have been inherent with this struggling sector and as such investors are keenly advised to find ways around it. Federal government is also not relenting in putting measures to curb some of these challenges which include:

4.2.5 INADEQUATE GAS INFRASTRUCTURE, SUPPLY AND PRICING FRAMEWORK:

This is the major problem currently facing the sector. Although Nigeria is known for its crude oil production, the country is believed in energy circles to be "a gas province with only a pool of oil". Nigeria's natural gas reserves is put at more than 5 trillion cubic meters, which makes it the country with the 9th largest gas reserves in the world and largest in Africa. However in terms of production for market, Nigeria only produced 42 billion cubic meters in 2012, the 25th largest in the world. The Nigerian National Petroleum Corporation estimates that over 40% of the gas produced in Nigeria do not end up in the market but are flared. This is because a lot of the major oil and gas producers have been reluctant to invest in gas production and processing facilities and as such generating companies lack gas to fire the power plants.

TABLE 5: OTHER MAJOR CHALLENGES IN THE KEY SECTORS:

Generation Challenges	Transmission Challenges	Distribution Challenges
Gas supply difficulties	Evacuation capacity	Commercially viable tariff still lacking
Evacuation capacity	High transmission losses and overloaded transformers.	High level of customer resistance to tariff hikes
Credibility of off-taker not proven	Infrastructure limitations	Very few strong and financially viable DISCOs
Technical losses still high	Monopoly over transmission activities	Government subsidy regime still in place
Payment guarantees required	Vandalisation of equipments	High technical losses

TABLE 6 : SUMMARY OF MOST RECENT ACTS OF VANDALISATION

S/N	Location of Vandalisation	Nature of Vandalisation	Cost of Repair (₦)
1	Ikeja West-Ayede 330KV line	Towers No. 425 collapsed due to vandalisation	20,611,815.00
2	Sapele-Aladja 330KV line	Towers 75 collapsed due to fire from pipeline vandalisation	10,296,300.00

3	Delta – Benin	Towers 57 collapsed due to fire from pipeline vandalisation	Estimated cost 5,000,000.00
4	Jos –Bauchi 132KV line	Towers No. 133-137, 166-170, 177-179, 221-225 and 333-337 vandalised	Estimated cost 14,500,000.00
5	Gombe – Bauchi 132KV line	Towers 474 – 477 were vandalized	Estimated cost 3,500,000.00

4.3 OPPORTUNITIES

The last section has enumerated the enormous challenges involved in government power sector reforms. Here, the opportunities derivable from such laudable steps in terms of efficiency and reliability of services, investment opportunities, employment opportunities, transfer of technical manpower and encouragement of research will be discussed.

4.3.1 INVESTMENT OPPORTUNITIES

Power sector reform has the ability to massively expand personal share ownership in Nigeria. It is believed that over 800 000 shareholders can be created after liberasation and deregulation of PHCN. This is a welcome development which enables capital formation and economic growth (Wikipedia, 2004). It can reduce the reliance of public enterprises on the government for finance. Unbundling will make the successive companies easily raise funds through the capital market once the necessary investor confidence has been developed; thus changing their growth and expansion of their business outfit. Also new power facilities by the private sector will inject new capital into the economy. The federal government power sector reform will create an environment for investment and a healthy co-operative industrial outfit. Indeed, what is happening in the communication sector is a clear cut evidence of what liberalization can do.

4.3.2 EMPLOYMENT OPPORTUNITIES

The power sector reform will in the long run create reasonable employment opportunities for Nigerians. This is because the companies that are expected to participate will look for both skilled and unskilled labour in the task of executing their businesses (Benbow, 2003). It is expected that when reforms are fully implemented, many graduate engineers and technologists roaming the streets in search of unavailable jobs will heave a sign of relief as most will be absorbed by the emerging independent power producers

4.3.3 TRANSFER OF TECHNICAL MANPOWER

Subsidiary companies that will compete in the power sector, which some of them are foreign companies; have to come with their expatriated. These companies in a bid to set up their operational structure will impact knowledge and skill in areas of power system planning and protection, voltage collapse and stability, cogeneration.etc to Nigerians through their foreign expatriated. This area of technology transfer, if well tapped by Nigerians will go a long way in bridging the gap between the developed and developing nations in terms of technology advancement.

4.3.4 ENCOURAGEMENT OF RESEARCH

Liberalization brings about competition and allows management of privatized companies' full freedom to realize their optimum potentials. In order for any company to take a lead over the other, its products msut be second to none. Such excellence in quality of products could only be achieved through research. With the emerged reform, other sources of energy such as wind, solar and biomass are expected to be explored. For instance in the UK, prior to the liberalization of the the electricity sector, coal and gas turbines were used. With privatisation, research was conducted in combined heat and power plants, with the eventual success in research, generation companies rose from 10 to 32 while supply companies rose from 16 to 34 in 1990 because of new innovations in the field. (Wikipedia, 2004)

REFORMS AND PROJECTIONS

5.1 INTRODUCTION

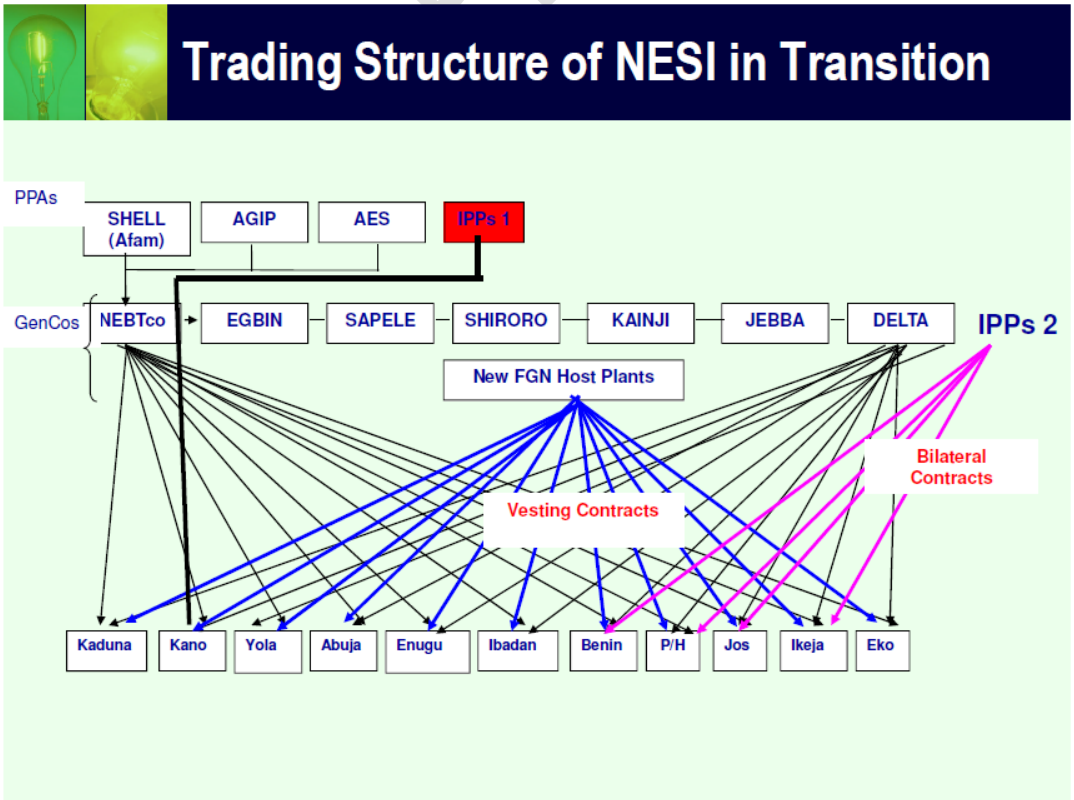
The power sector reform acts is aimed at putting an end to the inadequate power generation, transmission and distribution in Nigeria by putting in place appropriate industry and market structure and effective regulation to make electricity available, sufficient and efficient to consumers. It is such that will eliminate government's involvement in utility management, ensure transparent and responsible management and promote private sector participation for management and technical operations;

The overwhelming objective of the electric power policy statement is to ensure that Nigeria has an electricity supply industry (ESI) that can meet the needs of its citizens in the 21st century

Nigeria (ESI) must be such that is able:

- To meet all current and prospective economically justifiable demands for electricity throughout the country.
- To modernize and expand its coverage; and
- To support national economic and social development, including relations with neighbouring countries.

FIG 3: TRADING STRUCTURE OF NESI IN TRANSITION



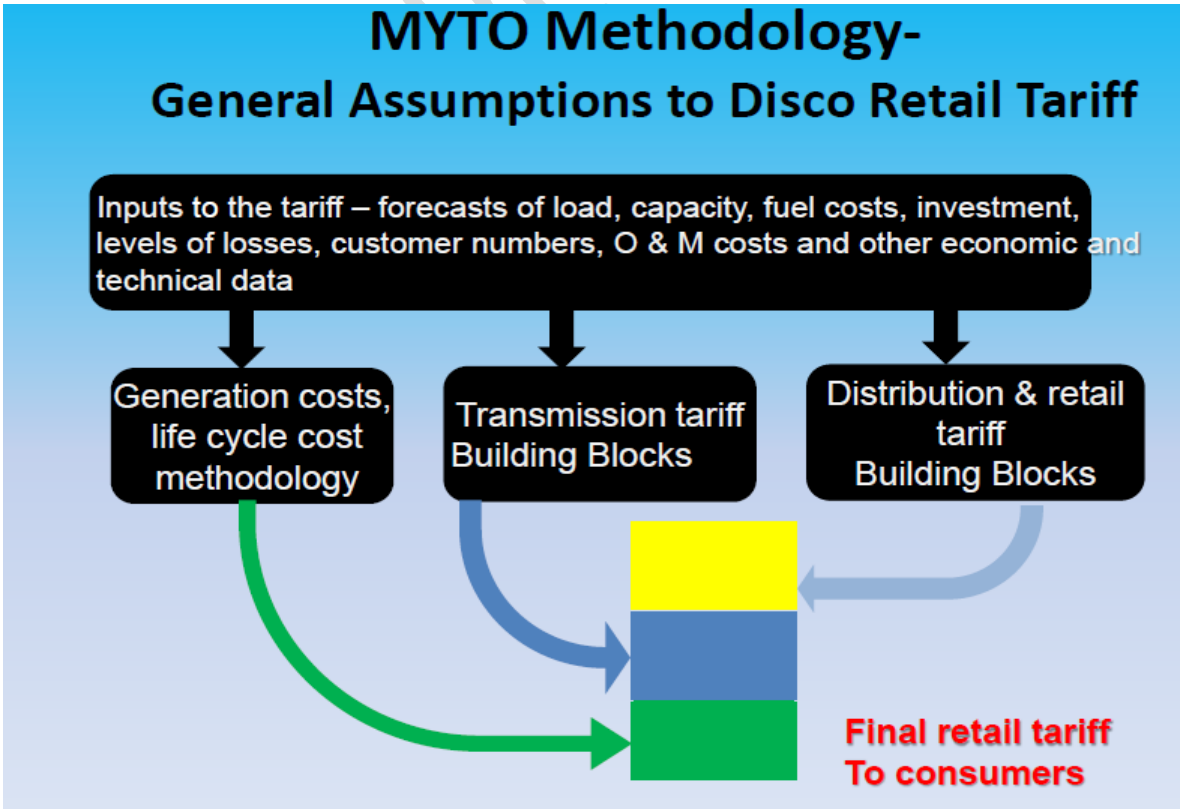
5.2 MULTI YEAR TARIFF ORDER (MYTO)

MYTO proffers the electricity consumers rights and the tariff methodology that establishes the electricity tariffs paid by all the Nigerian residents. MYTO is a unified way to determine total electricity industry revenue requirement, gives long-term view of industry tariffs that allows for the long gestation and investment recovery periods that are a key feature of the NESI and equally enables recovery of costs and allows reasonable profits, i.e/ the revenue requirement.

MYTO sets tariffs for the three electricity sectors based on certain principles and assumptions namely:

1. Cost recovery/financial viability
2. Signals for investments
3. Certainty and stability
4. Efficient use of the network
5. Allocation of risk

FIG 4: MYTO METHODOLOGY



MYTO also set conditions precedent to Generation, Distribution and Transmission companies and equally the conditions for price increase by these three sectors, but the scope of this work has limited this research.

5.3 BENEFITS OF MYTO TO CONSUMERS

- Attainment of certain degree of metering as a condition precedent for the implementation of MYTO by the Discos.
- Existing customers that have not paid for meters do not need to pay as the cost of the meters have been included in MYTO.
- New customers will only pay standard connection fee with no additional charges for the meter.
- Lifeline Customers (R1) will enjoy special benefit of paying no fixed charge on their electricity.

TABLE 7: CLASSES OF TARIFF & DESCRIPTIONS

S/No	Customer Classification	Description	Remarks
1,	Residential		A consumer who uses his premises exclusively as a residence- house, flat or multi-storeyed house where people reside
	R1	`Life-Line (50kWh)	
	R2	(1 and 3 phase)	
	R3	LV Maximum Demand	
	R4	HV Maximum Demand (11/33KV)	
2.	Commercial		A consumer who uses his premises for any purpose other than exclusively as a residence or as a factory for manufacturing goods
	C1	Single and 3-phase	
	C2	LV Maximum Demand	
	C3	HV Maximum Demand (11/33KV)	
3.	Industrial		A consumer who uses his premises for manufacturing goods including welding and iron monger
	D1	Single and 3-phase	
	D2	LV Maximum Demand	
	D3	HV Maximum Demand (11/33KV)	
4.	Special		Customers such as agriculture (agro-allied enterprises involving processing are excluded), water boards, religious houses, Government and teaching hospitals, Government research institutes and educational establishments
	A1	Single and 3-phase	
	A2	LV Maximum Demand	
	A3	HV Maximum Demand (11/33KV)	
5.	Street Lightning		
	S1	Single and 3-phase	

5.4 ENERGY DEMAND AND SUPPLY PROJECTIONS

The energy demand projections were computed by MAED (Model for the Analysis of Energy Demand) and MESSAGE (Model for the Energy Supply Strategy Alternatives and their General Environment Impact) for both demand and supply respectively

5.4.1 ENERGY DEMAND PROJECTION

The energy demand projections were computed using MAED with the key drivers of energy demand namely demography, socio-economy and technology. The application of MAED requires detailed information on demography, economy, energy intensities and energy efficiencies. This information is first assembled for a base year which is used as the reference year for perceiving the evolution of the energy system in the future. Selection of the base year is made on the basis of availability of data, assessment that the data are representative of the economic and energy situation of the country. MAED allows the breakdown of the country's final energy consumption into various sectors and within a sector into individual categories of end-uses in a consistent manner. The breakdown helps in the identification of the social, economic and technical factors influencing each category of final energy demand. In modeling the Nigeria's energy case, four economic scenarios were developed and used as follow:

- Reference Scenario – 7% GDP Growth
- High Growth Scenario – 10 % GDP Growth
- Optimistic Scenario 1 – 11.5% GDP Growth; and
- Optimistic Scenario II – 13% GDP Growth (based on Presidential pronouncement for the desire to be among the first 20 economies by 2020)

TABLE 8: ELECTRICITY DEMAND PROJECTIONS PER SCENARIO (MW)

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

This means that the in 13% GDP growth rate (for e.g); the demand projections rose from 5,746MW in the base year of 2005 to 297,900MW in the year 2030 which translates to construction of 11,686MW every year to meet the demand. The corresponding cumulative investment (investment & operations) cost for the 25-year period is US$ 484.62 billion, which

means investing US$ 80.77 billion every five years within the period. In conducting the studies, all the available energy resources in the country were considered in order to broaden the nation's energy supply mix and enhance its energy security.

5.4.2 ENERGY SUPPLY PROJECTION

The total energy supply were computed using MESSAGE and utilizes the projected energy demand as an input to produce a supply strategy. MESSAGE is an energy supply model, which representing energy conversion and utilization processes of the energy system (or its part) and their environmental impacts for an exogenously given demand of final energy. It is used for development of medium-term strategies, the planning horizon being in the order of 30 years. The time scope is limited due to uncertainties associated with future technological development. The energy system dynamics are modeled by a multi-period approach. MESSAGE takes into account demand variations of various final energy forms during the day, week and year as well as different technological and political constraints of energy supply. For the computation of Nigeria's Energy Supply, the same scenario that was used in MAED are used. The result for the electricity supply projections is shown in the table below:

TABLE 9: ENERGY SUPPLY PROJECTIONS PER SCENARIO (MW)

SCENARIO	2005	2010	2015	2020	2025	2030
REFERENCE (7%)	6440	15668	28,356	50817	77450	136879
HIGH GROWTH (10%)	6440	15861	30531	54275	107217	192079
OPTIMISTIC I (11.5%)	6440	15998	31,235	71964	177371	276229

It is obvious from the projections made that Nigeria is seriously lacking behind and needs more commitment and involvement to even make half of the calculated energy supply projections.

ROLE OF THE ELECTRICITY INDUSTRY IN ATTAINING NIGERIA'S VISION 20:2020

The importance of the power sector towards this vision cannot be overemphasized. No form of development can thrive under inadequate power supply and as such, a lot of efforts have to be put in attainment of Nigeria's vision 20:2020 unless it will just a mirage that is not ever going to happen.

To keep this vision alive; there should be:

- Expeditious implementation and execution of the electric power reform program
- Increase available capacity from 4200mw to about 30, 000MW (by year 2020)
- Increase transmission capacity from 5,838MVA to 15000 MVA
- Increase distribution capacity from 8,425MVA to 30,000MVA
- Operators and other stakeholders in the telecom industry to comply with all requirements to ensure listing as priority customers in view of direct impact of poor electricity supply on quality of service and increased network deployment.
- Adequate training of skilled manpower in the key areas of generation, transmission and distribution to foster the liberalization process.

If these measures could be could put in place, many other sectors like education, Agriculture, Health, Tourism, Transportation etc can then thrive well collectively. It implies that electricity is the bedrock of a nation's development and Nigeria has to get it right this time to attain the vision 20:2020. We hope the power reforms in the country will bring about the same competition as being witnessed in the telecommunication sector.

6.1 IMPROVED, EFFICIENT AND RELIABLE SERVICES

It is generally hoped that proper implementation of the reform programme will promote efficiency and growth in the power sector and lead to improved electricity services that is a key factor to drive the economy in the realization of vision 20:2020.

LIST OF ABBREVIATIONS

NERC:	Nigerian Electricity Regulatory Commission
PHCN:	Power Holding Company of Nigeria
NESCO:	National Electricity Supply Company

ECN:	Electricity Corporation of Nigeria
NDA:	Niger Dams Authority
NEPA:	National Electric Power Authority
NDPHC:	Niger-Delta Power Holding Company
IPP:	Independent Power Producers
NIPP:	National Integrated Power Projects
ESI:	Electricity Supply Industry
NESI:	Nigeria Electricity Supply Industry
GENCOS:	Generating Companies
DISCOS:	Distribution Companies
MYTO:	Multi Year Tariff Order
NBET:	Nigerian Bulk Electricity Trading
PWD:	Public Works Department
TCN:	Transmission Company of Nigeria
MAED:	Model for Analysis of Energy Demand
MESSAGE:	Model for Energy Supply Strategy Alternatives and their General Environmental impact.

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APPENDIX I

Abuja Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	Fixed Charge, N / Month			
Residential R1	-	-	-	-
Residential R2	500	702	986	1,384
Residential R3	37,527	52,696	73,997	103,908
Residential R4	113,358	136,030	191,016	268,228
Commercial C1	500	702	986	1,384
Commercial C2	34,020	47,772	67,082	94,197
Commercial C3	102,767	123,321	173,169	243,168
Industrial 1	10,000	10,000	14,042	19,718
Industrial D2	101,113	101,113	141,985	199,378
Industrial D3	102,767	123,321	173,169	243,168
Special 1	500	702	986	1,384
Special 2	35,938	43,125	60,557	85,035
Special 3	45,313	54,375	76,354	107,218
Street Lighting S1	500	600	843	1,183

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Abuja Disco- Energy Charge

	2012	2013	2014	2015
Tariff Code	Energy Charge, N / kWh			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	11.74	12.62	13.25	13.91
Residential R3	22.62	22.62	23.75	24.94
Residential R4	22.62	22.62	23.75	24.94
Commercial C1	16.56	16.56	17.39	18.26
Commercial C2	21.03	21.03	22.08	23.18
Commercial C3	21.03	21.03	22.08	23.18
Industrial 1	16.97	16.97	17.81	18.70
Industrial D2	22.04	22.04	23.14	24.30
Industrial D3	22.04	22.04	23.14	24.30
Special 1	16.24	16.24	17.05	17.90
Special 2	16.24	16.24	17.05	17.90
Special 3	16.24	16.24	17.05	17.90
Street Lighting S1	12.47	13.41	14.08	14.78

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APPENDIX II

Benin Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	Fixed Charge, N / Month			
Residential R1	-	-	-	-
Residential R2	500	750	1,500	1,800
Residential R3	25,018	37,527	49,143	64,355
Residential R4	101,631	133,091	174,289	228,239
Commercial C1	500	1,000	1,310	1,715
Commercial C2	22,680	34,020	44,551	58,341
Commercial C3	141,748	141,748	185,625	243,085
Industrial 1	500	1,000	1,310	1,715
Industrial D2	139,466	153,413	200,901	263,089
Industrial D3	141,748	155,923	204,188	267,394
Special 1	500	1,000	1,310	1,715
Special 2	34,375	37,813	49,517	64,845
Special 3	40,625	44,688	58,520	76,635
Street Lighting S1	500	1,000	1,310	1,715

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Benin Disco – Energy Charge

	2012	2013	2014	2015
Tariff Code	Energy Charge, N / kWh			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	11.37	11.37	11.94	12.54
Residential R3	20.28	20.28	21.29	22.36
Residential R4	20.28	20.28	21.29	22.36
Commercial C1	15.84	15.84	16.63	17.46
Commercial C2	18.85	18.85	19.79	20.78
Commercial C3	18.85	18.85	19.79	20.78
Industrial 1	15.21	15.21	15.97	16.77
Industrial D2	19.76	19.76	20.75	21.79
Industrial D3	19.76	19.76	20.75	21.79
Special 1	14.56	14.56	15.29	16.05
Special 2	14.56	14.56	15.29	16.05
Special 3	14.56	14.56	15.29	16.05
Street Lighting S1	15.00	15.00	15.75	16.54

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APPENDIX III

Enugu Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	Fixed Charge, N / Month			
Residential R1	-	-	-	-
Residential R2	500	650	874	1,176
Residential R3	18,787	24,424	32,847	44,175
Residential R4	117,416	117,416	157,910	212,369
Commercial C1	500	650	874	1,176
Commercial C2	17,032	22,141	29,777	40,046
Commercial C3	106,446	106,446	143,157	192,528
Industrial 1	1,000	1,300	1,748	2,351
Industrial D2	104,733	104,733	140,852	189,428
Industrial D3	106,446	106,446	143,157	192,528
Special 1	500	650	874	1,176
Special 2	37,500	37,500	50,433	67,826
Special 3	46,935	46,935	63,121	84,890
Street Lighting S1	500	650	874	1,176

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Enugu Disco – Energy Charge

Ibadan Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	Fixed Charge, N / Month			
Residential R1	-	-	-	-
Residential R2	500	500	625	781
Residential R3	18,764	18,764	23,453	29,314
Residential R4	117,267	117,267	146,573	183,202
Commercial C1	500	500	625	781
Commercial C2	17,010	17,010	21,261	26,574
Commercial C3	106,311	106,311	132,879	166,086
Industrial 1	500	500	625	781
Industrial D2	104,600	104,600	130,740	163,412
Industrial D3	106,311	106,311	132,879	166,086
Special 1	500	500	625	781
Special 2	33,594	33,594	41,989	52,482
Special 3	46,875	46,875	58,589	73,231
Street Lighting S1	500	500	625	781

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APPENDIX IV

Ibadan Disco – Energy Charge

Jos Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	Fixed Charge, N / Month			
Residential R1	-	-	-	-
Residential R2	500	775	1,163	1,744
Residential R3	18,764	29,083	43,625	65,438
Residential R4	117,267	181,764	272,646	408,969
Commercial C1	500	775	1,163	1,744
Commercial C2	17,010	26,366	39,548	59,322
Commercial C3	106,311	164,782	247,173	370,760
Industrial 1	900	1,395	2,093	3,139
Industrial D2	104,600	162,129	243,194	364,791
Industrial D3	106,311	164,782	247,174	370,760
Special 1	900	1,395	2,093	3,139
Special 2	40,625	62,969	94,453	141,680
Special 3	46,875	72,656	108,984	163,477
Street Lighting S1	900	1,395	2,093	3,139

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APPENDIX V

Jos Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	Energy Charge, N / kWh			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	12.99	13.63	14.32	15.03
Residential R3	23.40	24.57	25.80	27.09
Residential R4	23.40	24.57	25.80	27.09
Commercial C1	17.00	17.85	18.74	19.68
Commercial C2	21.75	22.84	23.98	25.18
Commercial C3	21.75	22.84	23.98	25.18
Industrial 1	17.00	17.84	18.74	19.68
Industrial D2	22.80	23.94	25.14	26.39
Industrial D3	22.80	23.94	25.14	26.39
Special 1	16.80	17.64	18.52	19.45
Special 2	16.80	17.64	18.52	19.45
Special 3	16.80	17.64	18.52	19.45
Street Lighting S1	17.00	17.00	17.85	18.74

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APPENDIX VI

Kaduna Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	Fixed Charge, N / Month			
Residential R1	-	-	-	-
Residential R2	500	800	1,280	2,048
Residential R3	25,018	40,029	64,046	102,474
Residential R4	156,356	250,170	400,271	640,434
Commercial C1	500	800	1,280	2,048
Commercial C2	22,680	36,288	58,061	92,897
Commercial C3	141,748	226,797	362,875	580,600
Industrial 1	1,000	1,600	2,560	4,096
Industrial D2	139,466	223,146	357,033	571,253
Industrial D3	141,748	226,797	362,875	580,600
Special 1	500	800	1,280	2,048
Special 2	46,728	74,766	119,625	191,400
Special 3	62,500	100,000	160,000	256,000
Street Lighting S1	500	800	1,280	2,048

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Kaduna Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	Energy Charge, N / kWh			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	12.69	13.96	15.36	16.90
Residential R3	23.33	25.66	28.23	31.05
Residential R4	23.33	25.66	28.23	31.05
Commercial C1	16.00	17.60	19.36	21.30
Commercial C2	21.68	23.85	26.24	28.86
Commercial C3	21.68	23.85	26.24	28.86
Industrial 1	17.50	19.24	21.17	23.29
Industrial D2	22.73	25.00	27.50	30.25
Industrial D3	22.73	25.00	27.50	30.25
Special 1	16.75	18.42	20.26	22.29
Special 2	16.75	18.42	20.26	22.29
Special 3	16.75	18.42	20.26	22.29
Street Lighting S1	14.19	15.61	17.17	18.89

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APPENDIX VII

Kano Disco – Fixed Charge

Tariff Code	2012	2013	2014	2015
	Fixed Charge, N / Month			
Residential R1	-	-	-	-
Residential R2	500	667	889	1,186
Residential R3	22,516	30,031	40,055	53,424
Residential R4	117,267	156,407	208,612	278,241
Commercial C1	500	667	889	1,186
Commercial C2	20,412	27,225	36,312	48,432
Commercial C3	106,311	141,795	189,122	252,245
Industrial 1	650	867	1,156	1,542
Industrial D2	104,600	139,512	186,077	248,184
Industrial D3	106,311	141,795	189,122	252,245
Special 1	500	667	889	1,186
Special 2	46,875	62,521	83,388	111,221
Special 3	62,500	83,361	111,184	148,294
Street Lighting S1	650	867	1,156	1,542

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Kano Disco – Energy charge

Tariff Code	2012	2013	2014	2015
	Energy Charge, N / kWh			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	12.78	13.42	14.09	14.80
Residential R3	23.40	24.57	25.80	27.09
Residential R4	23.40	24.57	25.80	27.09
Commercial C1	15.84	16.63	17.46	18.34
Commercial C2	21.75	22.84	23.98	25.18
Commercial C3	21.75	22.84	23.98	25.18
Industrial 1	17.55	18.43	19.35	20.32
Industrial D2	22.80	23.94	25.14	26.39
Industrial D3	22.80	23.94	25.14	26.39
Special 1	16.80	17.64	18.52	19.45
Special 2	16.80	17.64	18.52	19.45
Special 3	16.80	17.64	18.52	19.45
Street Lighting S1	12.90	13.55	14.22	14.93

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APPENDIX VIII

Eko Disco -Fixed Charge

Eko Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	Energy Charge, N / kWh			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	12.87	12.87	12.87	12.87
Residential R3	23.71	23.71	23.71	23.71
Residential R4	23.71	23.71	23.71	23.71
Commercial C1	15.84	15.84	15.84	15.84
Commercial C2	22.04	22.04	22.04	22.04
Commercial C3	22.04	22.04	22.04	22.04
Industrial 1	17.78	17.78	17.78	17.55
Industrial D2	23.10	22.10	23.10	23.10
Industrial D3	23.10	23.10	23.10	23.10
Special 1	17.02	16.02	17.02	17.02
Special 2	17.02	17.02	17.02	17.02
Special 3	17.02	17.02	17.02	17.02
Street Lighting S1	13.07	13.07	13.07	13.07

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APPENDIX IX

Ikeja Disco - Fixed Charge

Ikeja Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	Energy Charge, N / kWh			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	12.45	12.83	13.21	13.61
Residential R3	21.84	22.50	23.17	23.87
Residential R4	21.84	22.50	23.17	23.87
Commercial C1	16.56	17.06	17.57	18.10
Commercial C2	20.30	20.91	21.54	22.18
Commercial C3	20.30	20.91	21.54	22.18
Industrial 1	16.38	16.87	17.38	17.90
Industrial D2	21.28	21.92	22.58	23.25
Industrial D3	21.28	21.92	22.58	23.25
Special 1	15.68	16.15	16.63	17.13
Special 2	15.68	16.15	16.63	17.13
Special 3	15.68	16.15	16.63	17.13
Street Lighting S1	12.04	12.40	12.77	13.16

APPENDIX X

P/Harcourt - Fixed Charge

Tariff Code	2012	2013	2014	2015
	Fixed Charge, N / Month			
Residential R1	-	-	-	-
Residential R2	500	700	1,050	1,575
Residential R3	25,018	35,025	52,538	78,807
Residential R4	117,267	164,174	246,261	369,391
Commercial C1	500	700	1050	1, 575
Commercial C2	22,680	31,752	47,628	71,442
Commercial C3	106,311	148,835	223,253	334,880
Industrial 1	700	980	1470	2,205
Industrial D2	104,600	146,439	219,659	329,488
Industrial D3	106,311	148,835	223,253	334,880
Special 1	700	980	1,470	2,205
Special 2	46,875	65,625	98,438	147,656
Special 3	62,500	87,500	131,250	196,875
Street Lighting S1	700	980	1,470	2,205

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P/Harcourt Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	Energy Charge, N / kWh			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	12.82	13.21	13.60	14.01
Residential R3	23.40	24.10	24.83	25.57
Residential R4	23.40	24.10	24.83	25.57
Commercial C1	17.20	17.72	18.25	18.79
Commercial C2	21.75	22.40	23.07	23.77
Commercial C3	21.75	22.40	23.07	23.77
Industrial 1	23.40	24.10	24.83	25.57
Industrial D2	22.80	23.48	24.19	24.91
Industrial D3	22.80	23.48	24.19	24.91
Special 1	16.80	17.30	17.82	18.36
Special 2	16.80	17.30	17.82	18.36
Special 3	22.40	23.07	23.76	24.48
Street Lighting S1	17.20	17.72	18.25	18.79

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APPENDIX XI

Yola Disco -Fixed Charge

Tariff Code	2012	2013	2014	2015
	Fixed Charge, N / Month			
Residential R1	-	-	-	-
Residential R2	500	750	1,250	1,960
Residential R3	16,137	24,205	40,355	63,244
Residential R4	100,850	152,274	252,206	395,259
Commercial C1	500	750	1,250	1,960
Commercial C2	14,629	21,943	36,583	57,334
Commercial C3	91,427	137,141	228,643	358,331
Industrial 1	500	750	1,250	1,960
Industrial D2	89,956	134,933	224,962	352,562
Industrial D3	91,427	137,141	228,643	358,331
Special 1	500	750	1,250	1,960
Special 2	34,375	44,688	74,503	116,762
Special 3	40,313	60,469	100,814	157,996
Street Lighting S1	500	750	1,250	1,960

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Yola Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	Energy Charge, N / kWh			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	11.32	12.17	12.78	13.42
Residential R3	20.28	21.63	22.71	23.85
Residential R4	20.28	21.63	22.71	23.85
Commercial C1	15.84	17.03	17.88	18.77
Commercial C2	18.71	20.11	21.11	22.17
Commercial C3	18.71	20.11	21.11	22.17
Industrial 1	15.09	16.22	17.04	17.89
Industrial D2	19.61	21.08	22.13	23.24
Industrial D3	19.61	21.08	22.13	23.24
Special 1	14.45	15.53	16.31	17.12
Special 2	14.45	15.53	16.31	17.12
Special 3	14.45	15.53	16.31	17.12
Street Lighting S1	11.09	11.93	12.52	13.15