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Review of the Nigerian Power Sector

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The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

A constant power supply is a key indicator of a developed economy. Any nation with unreliable energy supply hampers its development and risks losing potential investors. Nigeria, a country with over 160 million people, has experienced frequent and persistent power outages over the past 33 years since the establishment of the National Electric Power Authority (NEPA), the agency responsible for electricity generation, transmission, and distribution. Currently, the federal government is implementing power sector reforms aimed at improving this unfavorable situation and reducing the monopoly control over the country's power industry. This paper examines the overall power sector and its reforms, evaluates the opportunities and challenges, and advocates for the introduction and effective management of National Integrated Power Projects (NIPPs) and Independent Power Producers (IPPs) as positive steps forward.

Keywords: Power sector; economy; federal government; national integrated power projects (NIPPs); federal capital territory (FCT).

LIST OF ABBREVIATIONS

NERC: Nigerian Electricity Regulatory Commission

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

1. INTRODUCTION

Nigeria is a vast country covering 356,667 square miles (923,768 square kilometers), with approximately 98.6% being land mass. The nation is divided into six geopolitical zones, which are further subdivided into 36 states and the Federal Capital Territory (FCT). The country's landscape varies greatly, ranging from flat open savannahs in the north to dense rainforests in the south, with numerous rivers, lakes, and mountains scattered throughout. These physical and political characteristics pose challenges to effectively providing power to all areas of the country.

To ensure Nigeria joins the ranks of industrialized nations, three critical activities must be effectively achieved:

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

Given the dynamic nature of development and population growth, these three activities must be approached in a dynamic, creative, and logical manner. Adequate power supply is essential for any nation's development, and electricity generation, transmission, and distribution are capital-intensive activities requiring significant resources in terms of funding and capacity. In Nigeria's current situation, where funds are increasingly scarce, creative and innovative

solutions are necessary to address the power supply challenges. The administration of President Umaru Musa Yar'adua set forth a mission to industrialize Nigeria by 2020, which is now about six years away [1-6].

This research provides a brief history of the efforts to supply power to the nation, along with an overview of the status of energy resources, energy demand and supply, power generation, transmission and distribution, and power sector reforms. It also discusses the opportunities and major challenges in the sector and examines the role of power in achieving the Vision 2020 goals.

1.1 History and Overview

To discuss the Nigerian power sector realistically and practically, it's essential to review its history. The production of electricity in Nigeria began in 1896 in Lagos, fifteen years after its introduction in England (Niger Power Review, 1985). At that time, the total capacity of the generators used was 60KW, indicating that the maximum demand was less than 60KW [7-10].

In 1946, the Nigerian Government Electricity Undertaking was established under the Public Works Department (PWD) to manage electricity supply in Lagos State. In 1950, the legislative council established a central body, the Electricity Corporation of Nigeria (ECN), to oversee electricity supply and development. Additionally, the Nigerian Electricity Supply Company (NESCO) was licensed to produce electricity in certain areas.

Another significant body was the Niger Dams Authority (NDA), established by an act of parliament. The NDA was responsible for constructing and maintaining dams on the River Niger and other locations, generating electricity through hydro power, improving navigation, and promoting fisheries and irrigation (5). The electricity generated by the NDA was sold to the ECN for distribution at utility voltages.

In April 1972, the operations of ECN and NDA were merged to form the National Electric Power Authority (NEPA). The merger aimed to consolidate the production and distribution of electricity under one organization, which would assume financial responsibilities. The integration was expected to enhance the efficient use of human, financial, and other resources within the electricity supply industry (Niger Power Review, 1989).

Despite NEPA's annual expansion to meet growing demand, most Nigerians still lack access to reliable electricity [6]. To address this issue, the federal government has initiated significant power sector reforms to revitalize NEPA, making it more efficient, effective, and responsive to public needs.

In March 2005, President Olusegun Obasanjo signed the Power Sector Reform Bill into law, allowing private companies to participate in electricity generation, transmission, and distribution. The government subsequently restructured the Power Holding Company of Nigeria (PHCN) into eleven distribution companies, six generating companies, and a transmission company, all of which were privatized. The privatization process faced challenges, including opposition from unions.

After being sworn in on May 29th, 2007, President Umaru Musa Yar'Adua promptly recognized the urgent need to address issues in the power sector [11-14]. He focused on tackling these problems swiftly and efficiently, bypassing the usual bureaucratic delays, while still ensuring compliance with Due Process. His goals for the power sector included:

- Achieving a minimum generation and transmission capacity of 20,000MW by 2020
- Reducing transmission and distribution power outages by at least 75%
- Minimizing technical losses in transmission and distribution

- Increasing revenue collection in PHCN by 50%
- Improving customer service delivery in PHCN's distribution and marketing sections
- Enhancing health, safety, and environmental measures in electricity generation, transmission, and distribution

To boost foreign participation in the electric power sector, the Nigerian government commissioned independent power projects (IPPs) to generate electricity for sale to PHCN. In April 2005, Agip's 450-MW plant began operations in Kwale, Delta State, funded by a \$480 million investment from NNPC and its joint venture partners ConocoPhillips and Agip.

Other IPPs under construction include the 276-MW Siemens station in Afam, Exxon Mobil's 388-MW plant in Bonny, ABB's 450-MW plant in Abuja, and Eskom's 388-MW plant in Enugu. Additionally, some state governments, such as Rivers State, have partnered with major oil companies like Shell to expand power generation, such as the 700-MW expansion at the 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 energy generation targets. China's EXIM Bank, Su Zhong, and Sino Hydro have committed to funding the Mambilla (3,900-MW) and Zungeru (950-MW) hydroelectric projects.

Additionally, NNPC, in partnership with Chevron, plans to construct a 780-MW gas-fired thermal plant in Ijede, Lagos State. The project will be developed in three phases, with each of the first two phases expected to generate 256 MW. Sadly, President Umaru Musa Yar'Adua's administration was interrupted by his untimely death due to ill health.

1.2 Current State of the Sector

Currently, the Nigerian electricity supply industry (NESI) operates 23 grid-connected generating plants, with a total installed capacity of 10,396 MW and an available capacity of 6,056 MW. Most of this generation is thermal based, with an installed capacity of 8,457 MW (81% of the total) and an available capacity of 4,996 MW (83% of the total). Hydropower, generated by three major plants, accounts for 1,938.4 MW of the total installed capacity and an available capacity of

1,060 MW. As of June 2014, only about 4,000 MW of the generated power is being efficiently transmitted.

The national grid consists of 4,889.2 km of 330kV transmission lines, 6,319.33 km of 132kV transmission lines, transformer capacity of 6,098 MVA at 330/132kV, and transformer capacity of 8,090 MVA at 132/33kV.

1.2.1 Generation

The total installed capacity of the current generating plants is approximately 10,396 MW, but the available installed capacity is less than 4,000 MW as of July 2014. Seven of the fourteen generation stations are over 20 years old, leading to low average daily power generation. Consequently, the nation experiences significant load shedding.

While the planned generation capacity projects promise a brighter future, the current state of power generation in Nigeria faces several challenges:

i. Inadequate generation capacity; ii. Delayed and insufficient maintenance of facilities; iii. Lack of adequate funding for power stations, among others.

1.2.2 Transmission

The transmission system in Nigeria does not extend to all parts of the country. Currently, it can transmit a maximum of about 4,000 MW and is technically weak, making it highly sensitive to major disturbances and challenges.

1.2.3 Distribution & marketing

In many areas of Nigeria, the distribution network is inadequate, voltage levels are unstable, and billing is inaccurate. As the department that interacts directly with the public, it is crucial to ensure sufficient network coverage and provide high-quality power supply, along with efficient marketing and customer service. Some of the major issues identified include:

- i. Insufficient and inadequate network coverage
- ii. Overloaded transformers and defective feeder pillars
- iii. Substandard distribution lines
- iv. Inaccurate billing systems

- v. Unethical practices by staff and poor customer relations
- vi. Lack of adequate logistical resources, such as tools and service vehicles
- vii. Outdated communication equipment
- viii. Low employee morale and lack of proper trainings.

2. STRUCTURE, DEREGULATION AND LIBERALISATION OF THE ELECTRICITY INDUSTRY

The concept of privatization, sometimes used interchangeably with liberalization, has multiple dimensions. It can refer to the process where government shares in enterprises are sold to private investors. This means that the ownership of these enterprises is transferred to individuals, with the government stepping aside to serve as a regulatory body. Therefore, privatization does not necessarily imply the outright sale of government property. Instead, it partially removes the government from ownership roles while maintaining its regulatory functions to prevent market abuses.

To address the issues in the struggling power sector, President Goodluck Ebele Jonathan established the Nigerian Electricity Regulatory Commission (NERC) as a supervisory body for the Electric Power Sector reforms, which had been delayed by previous administrations. The Electric Power Sector Reform Act of 2005 granted NERC the authority to enforce mandatory reliability standards in the power sector and to impose penalties on companies that manipulate electricity markets. As part of its responsibilities, NERC has several key goals as outlined under the EPSR Act of 2005

2.1 Roles of NERC

- Regulates the generation, transmission, distribution, and marketing of electricity within and with Nigeria.
- Licenses and inspects private and corporate electric power projects with a capacity of 10MW and above; projects with capacities of 1-10MW are issued Captive Licenses.
- Ensures the reliability of generation plants, the high voltage transmission system, and the zonal distribution system.
- Ensures the occupational health and safety of individuals involved in the electricity sector.
- Monitors and investigates energy markets.

- Enforces compliance with NERC rules in the energy markets using civil penalties and other measures against violators.
- Administers regulations on accounting, financial reporting, and the conduct of regulated companies.

2.2 Structure of NERC

The Nigerian Electricity Regulatory Commission (NERC) is overseen by a Board of Commissioners with fixed terms, led by a Chairman. The Nigerian President nominates one Commissioner from each geopolitical zone for a term of 4 years, which can be renewed once. The Chairman/CEO serves a term of 5 years, also renewable once. These nominees are screened by the Senate of the Federal Republic. The Board of Commissioners issues orders on electricity matters in Nigeria, makes regulatory decisions, grants final licenses to investors and operators, and resolves industrial disputes through its Alternative Dispute Resolution (ADR) mechanism in open hearings. NERC is organized 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
- Renewable Energy/Research and Development Division

The Legal Support and Licensing Division is primarily responsible for:

- Managing the processing of license applications, including issuing, amending, renewing, suspending, or canceling licenses.
- Advising the Commission on legal matters and providing legal input in drafting licenses, regulations, contracts, and other documents.
- Facilitating the creation of Dispute Resolution Panels/Committees that handle formal mediation, arbitration, and dispute resolution.
- Representing the Commission in legal matters and disputes, including appearing before other judicial bodies.

2.3 Licensing Framework of NERC

Under the EPSR Act, NERC has the authority to license all industry participants involved in the following activities:

- Electricity generation exceeding 1MW
- Electricity distribution exceeding 100KW
- Electricity transmission
- System operation
- Trading
- Electrical installation/wiring

The Act stipulates that it is an offense, punishable by imprisonment or a fine, for any person to engage in these activities without a license.

The entities involved in the Nigerian electricity market are commonly known as market participants. To operate as a market participant, an entity must obtain the appropriate license from NERC. A summary of the applicable licenses along the electricity value chain includes:

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

This paper does not delve further into the specifics of these licenses.

2.4 Legal and Regulatory Framework for Nigerian Power Sector

The main regulatory agencies involved are:

- Federal Ministry of Power
- Nigerian Electricity Regulatory Commission
- Energy Commission of Nigeria
- Rural Electrification Agency
- Presidential Task Force on Power

Each of these agencies has distinct responsibilities, which are beyond the scope of this research to cover in detail.

2.5 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

2.6 Existing Power Plants, IPPs and NIPPs

The privatization of the Nigerian power sector is considered one of the most ambitious privatization initiatives in the global power sector over the past decade, with a transaction cost of approximately \$3.0 billion. Over this period, the Federal Government successfully completed the privatization process. While the government retains ownership of the transmission assets (managed under concession), the generation and distribution sectors have been fully privatized. The following sections provide more insight into the various power sub-sectors, detailing current capacity, trends, and key statistics to enhance understanding of the sector. The Nigerian power sector comprises three major subsectors: generation, transmission, and distribution.

3. GENERATION COMPANIES

There are currently 23 grid-connected generating plants operating in the Nigerian electricity supply industry (NESI), with a total installed capacity of 10,396.0 MW and an available capacity of 6,056

MW. Most of the generation is thermal-based, accounting for an installed capacity of 8,457 MW (81% of the total) and an available capacity of 4,996 MW (83% of the total). Hydropower from three major plants contributes 1,938.4 MW to the total installed capacity, with an available capacity of 1,060 MW. As of July 2014, only about 4,000 MW is being efficiently transmitted. A key issue has been the shortage of gas to fire the plants (4).

3.1 Independent Power Producers (IPPS)

Independent Power Producers (IPPs) are power plants owned and operated by the private sector. Even before the privatization process, there were IPPs in Nigeria. Recently, the Nigerian Electricity Regulatory Commission (NERC) has issued over 70 licenses to new IPPs to enhance the country's power supply. Some of the existing IPPs include Shell's Afam VI (642 MW), Agip's Okpai (480 MW), and AES barges (270 MW).

3.2 National Integrated Power Projects

The National Integrated Power Projects (NIPP) is a crucial component of the Federal Government's strategy to address power shortages in Nigeria. Launched in 2004, it was designed as a fast-track, publicly funded initiative aimed at significantly increasing the country's

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

Table 2. Ten 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

electricity generation capacity. The project also includes the development of transmission and distribution infrastructure, as well as natural gas supply systems necessary to deliver this additional capacity to consumers nationwide. There are 10 NIPPs with a combined capacity of 5,455 MW that are scheduled for completion (for ongoing projects) and eventual privatization. Several more projects are in the pipeline. The NIPPs include:

The federal government has allocated N50 billion in escrow accounts at three Nigerian banks as a buffer against potential losses that GENCOS (Generation Companies) may incur during power transmission. Withdrawals from these accounts are only permitted if specific conditions are met. The Nigerian Bulk Electricity Trading (NBET) will oversee the management of these accounts.

3.3 Transmission Company

The Transmission Company of Nigeria (TCN) is a successor entity to the former PHCN, established following the unbundling of the power sector. It is currently managed by Manitoba Hydro International (Canada), a management contractor. Manitoba's role is to overhaul TCN to ensure technical and financial adequacy and to provide stable power transmission without system failures. Presently, the Nigerian Electricity Transmission system has approximately 5,523.8 km of 330KV lines and 6,801.49 km of 132KV lines.

The TCN comprises two main departments: the System Operator and the Market Operator. The Market Operations (MO) department within TCN is responsible for managing the wholesale electricity market, promoting efficiency, and fostering competition where possible. The

System Operator focuses on system planning, administration, and maintaining grid discipline:

- Implementing and enforcing the grid code, drafting, and implementing operating procedures as necessary for the proper functioning of the system operator-controlled grid and system planning.
- Implementing and overseeing open access to the system operator-controlled grid.

The Market Operator's responsibilities include market administration and the implementation of market rules.

3.4 Distribution Companies (Discos)

There are 11 electricity distribution companies (Discos) in Nigeria. The map below shows the coverage areas of these 11 companies. The fixed charges and energy charges for these Discos are detailed in the Appendix of this document.

4. OPPORTUNITIES AND CHALLENGES OF THE NIGERIAN POWER SECTOR

4.1 Introduction

The unbundling of the Nigerian Power Sector has created numerous investment opportunities, which have proven to be advantageous to investors in the near long term. These opportunities span the three main areas of the sector: generation, transmission, and distribution. The NDPHC has made significant strides in investing primarily in generation, with some investments also made in the other sectors.

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%

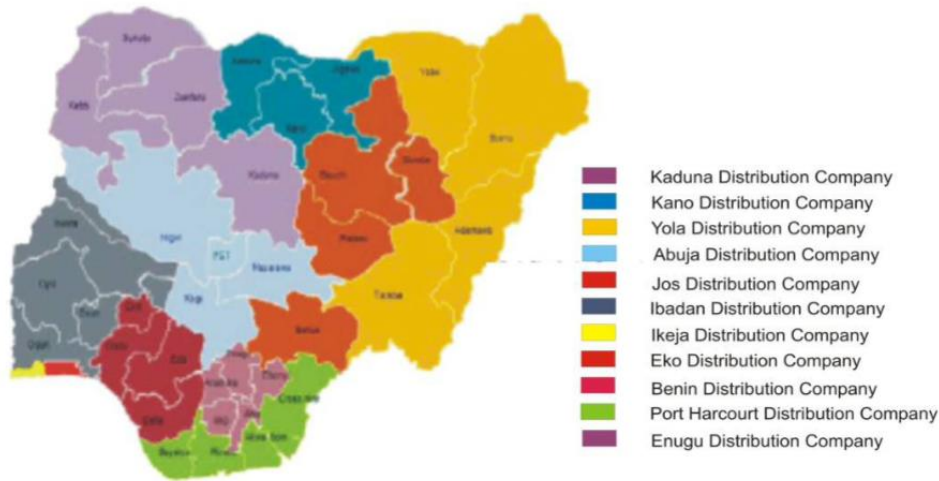


Fig. 1. Map of Coverage Area of GENCOS

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 Nasarawa
AES Nigeria Barge Limited	270 MW Generation on-grid		
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	Ihovbor, 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

Name	License Type	Site Location	Capacity
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
Name	License Type	Site Location	Capacity
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
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
Energys 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

Name	License Type	Site Location	Capacity
			covered by PHCN in Ogun State
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 Director Kaduna Electricity Distribution Company Plc Nagwamatse Building Ahmadu Bello Way Kaduna Tel: 062242213	B/Kebbi, Doka, Gusau, Mak
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

Name	License Type	Site Location	Capacity
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
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	Genration On-	Ajaokuta, Kogi State	500MW

Name	License Type	Site Location	Capacity
Limited	grid		
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
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

4.2 Challenges

Power sector reforms in a developing economy like Nigeria present significant challenges not only to the government that initiated the program but also to the citizens who consume energy and to the newly established GENCOS and DISCOS, which position themselves as an improved alternative to the defunct PHCN. These challenges can be broadly categorized into four areas:

- Economic and Social
- Technical
- Political
- Environmental

4.2.1 Economic and social challenges (funding)

There is no longer any debate that the primary goal of the federal government's power sector reform is to improve the efficiency of the nation's power industry and make energy more affordable

and accessible to consumers. This involves increasing the amount of power generated for the national grid and reactivating many of the non-functional units in the country's power stations.

To meet consumer demand for electricity, new power stations must be constructed by GENCOS and IPPs. Building new power stations and conducting comprehensive maintenance on dysfunctional units are capital-intensive endeavors. Ensuring a reliable power supply in our homes comes at a cost, which will likely result in higher payments from end users to utility companies, as these companies aim to make a profit.

4.2.2 Technical (Inadequate skilled manpower)

It is not sufficient to simply generate adequate power without considering the capacity of existing transmission lines and how the power can be utilized in the best interest of both licensed companies and consumers. Emphasis

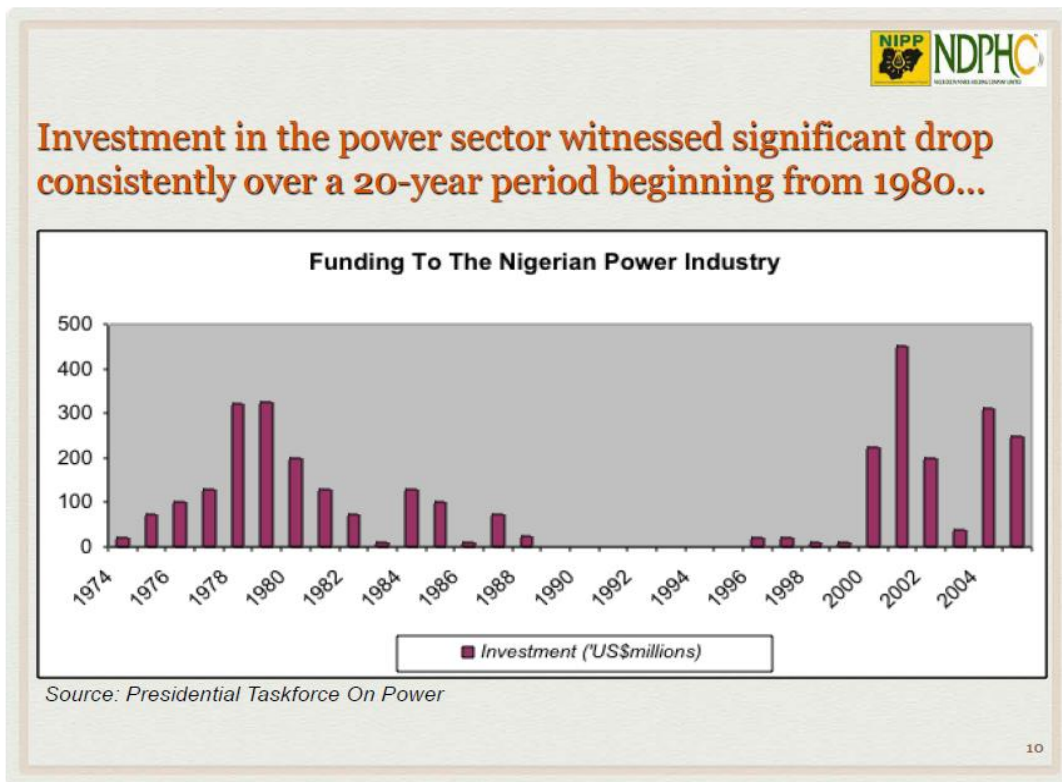


Fig. 2. Graph Showing Funding to Power Sector From 1974-2004

must be placed on reinforcing transmission lines and substations and constructing additional transmission lines to facilitate the efficient evacuation of energy, particularly in areas where IPPs are concentrated due to their proximity to energy sources. Another critical concern is having the skilled manpower needed to effectively handle and maintain these systems.

4.2.3 Political issues and corruption

It is essential to create and maintain a level playing field for all stakeholders in the emerging power sector reforms to achieve the desired objectives. The reform program aims to open the power sector to key players both domestically and internationally. This means that Independent Power Producers (IPPs) will require a conducive political environment to feel secure about investing their money.

Most IPPs prefer to construct their plants in the Niger-Delta region, where the energy and fuel sources needed to operate their plants are readily available. It is crucial that the government avoids repeating past mistakes, such as locating a refinery in Kaduna, far from its raw material sources, which was influenced by tribal and corrupt practices.

Additionally, the hostile environment in the Niger-Delta, characterized by armed ethnic militias and youth unrest, must be addressed to create a conducive environment for power investors. This underscores the importance of sustaining the country's democratic structures to ensure stability in government policies. By doing so, a comprehensive national energy policy focused on conservation, storage, consumption, construction, and distribution can be effectively maintained.

4.2.4 Environmental factors

The type of power plants to be constructed in a specific area depends on the environmental conditions of that locality. For example, a city with existing cement and chemical industries might oppose the addition of thermal power plants due to the high levels of carbon monoxide (CO) emissions. To prevent such situations, the government should establish an Environmental Inspection Agency (EIA) to monitor and regulate the environmental impact and pollution levels affecting both the environment and residents. Additionally, Independent Power Producers (IPPs) may face challenges related to high compensation fees and securing the right of

ways when attempting to build a power plant in a particular city. These high compensation fees, which can amount to millions, can deter potential IPPs from pursuing such projects.

The struggling power sector faces numerous challenges, and investors are advised to find ways to navigate them. The federal government is also actively implementing measures to address these issues, some of these challenges includes:

4.2.5 Inadequate gas infrastructure, supply and pricing framework

This is the primary issue currently plaguing the sector. Although Nigeria is renowned for its crude oil production, it is often considered a gas-rich country with only a modest oil reserve. Nigeria's natural gas reserves are estimated at over 5 trillion cubic meters, ranking it as the country with the 9th largest gas reserves globally and the largest in Africa. However, in terms of market production, Nigeria produced only 42 billion cubic meters in 2012, making it the 25th largest producer in the world. The Nigerian National Petroleum Corporation estimates that over 40% of the gas produced in Nigeria is flared rather than utilized. This is largely because many major oil and gas producers have been hesitant to invest in gas production and processing facilities, resulting in a lack of gas for generating companies to fuel power plants.

4.3 Opportunities

The previous section outlined the significant challenges associated with the government's power sector reforms. This section will discuss the opportunities that can arise from these commendable efforts, including improvements in service efficiency and reliability, investment prospects, job creation, transfer of technical expertise, and encouragement of research and development.

4.3.1 Investment opportunities

Power sector reform has the potential to greatly increase personal share ownership in Nigeria. It is estimated that more than 800,000 shareholders could emerge following the liberalization and deregulation of PHCN. This is a positive development that promotes capital formation and economic growth, reducing public enterprises' dependence on government funding. Unbundling will enable the resulting companies to raise funds more easily through the capital market, provided investor confidence is established, thus facilitating their growth and business expansion. Additionally, new power facilities developed by the private sector will bring fresh capital into the economy. The federal government's power sector reform will foster a conducive environment for investment and a cooperative industrial landscape. The successes in the communication sector clearly demonstrate the benefits of liberalization.

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 equipment	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 vandalism	20,611,815.00
2	Sapele-Aladja 330KV line	Towers 75 collapsed due to fire from pipeline vandalism	10,296,300.00
3	Delta – Benin	Towers 57 collapsed due to fire from pipeline vandalism	Estimated cost 5,000,000.00

S/N	Location of Vandalisation	Nature of Vandalisation	Cost of Repair (N)
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

4.3.2 Employment opportunities

In the long run, power sector reform will generate significant employment opportunities for Nigerians. The companies involved in this sector will require both skilled and unskilled labor to operate their businesses. Once the reforms are fully implemented, many graduate engineers and technologists currently struggling to find jobs will find relief, as many of them will be employed by the new independent power producers.

4.3.3 Transfer of technical manpower

Subsidiary companies entering the power sector, some of which are foreign, will bring their expatriates. As these companies establish their operations, they will transfer knowledge and skills to Nigerians in areas such as power system planning and protection, voltage collapse and stability, and cogeneration, among others. This technology transfer, if effectively utilized by Nigerians, will significantly help bridge the technological gap between developed and developing nations.

4.3.4 Encouragement of research

Liberalization introduces competition and grants the management of privatized companies the freedom to fully realize their potential. To stay ahead of competitors, companies must offer superior products, which can only be achieved through research and innovation. With the reforms, other energy sources such as wind, solar, and biomass are expected to be explored. For example, in the UK, before the liberalization of the electricity sector, coal and gas turbines were primarily used. After privatization, research into combined heat and power plants led to significant advancements, increasing the number of generation companies from 10 to 32 and supply companies from 16 to 34 by 1990 due to new innovations in the industry.

5. REFORMS AND PROJECTIONS

5.1 Introduction

The power sector reform acts aim to address the issues of inadequate power generation,

transmission, and distribution in Nigeria by establishing the appropriate industry and market structures and implementing effective regulation. These reforms are designed to make electricity available, sufficient, and efficient for consumers. The goal is to eliminate government involvement in utility management, ensure transparent and responsible management, and encourage private sector participation in both management and technical operations.

The primary objective of the electric power policy statement is to ensure that Nigeria develops an electricity supply industry (ESI) capable of meeting the needs of its citizens in the 21st century.

Nigeria's Electricity Supply Industry (NESI) must:

- Meet all current and future economically justifiable demands for electricity across the country.
- Modernize and expand its coverage.
- Support national economic and social development, including fostering relations with neighboring countries.

5.1 Multi Year Tariff Order (MYTO)

MYTO defines the rights of electricity consumers and the tariff methodology that sets the electricity rates paid by all Nigerian residents. It provides a standardized approach to determining the total revenue requirement for the electricity industry, offering a long-term perspective on industry tariffs. This approach accommodates the lengthy gestation and investment recovery periods characteristic of the Nigerian Electricity Supply Industry (NESI). It also ensures cost recovery and allows for reasonable profits.

MYTO also establishes the prerequisites for Generation, Distribution, and Transmission companies, as well as the conditions under which these sectors can increase prices. However, this research will not delve into these aspects.

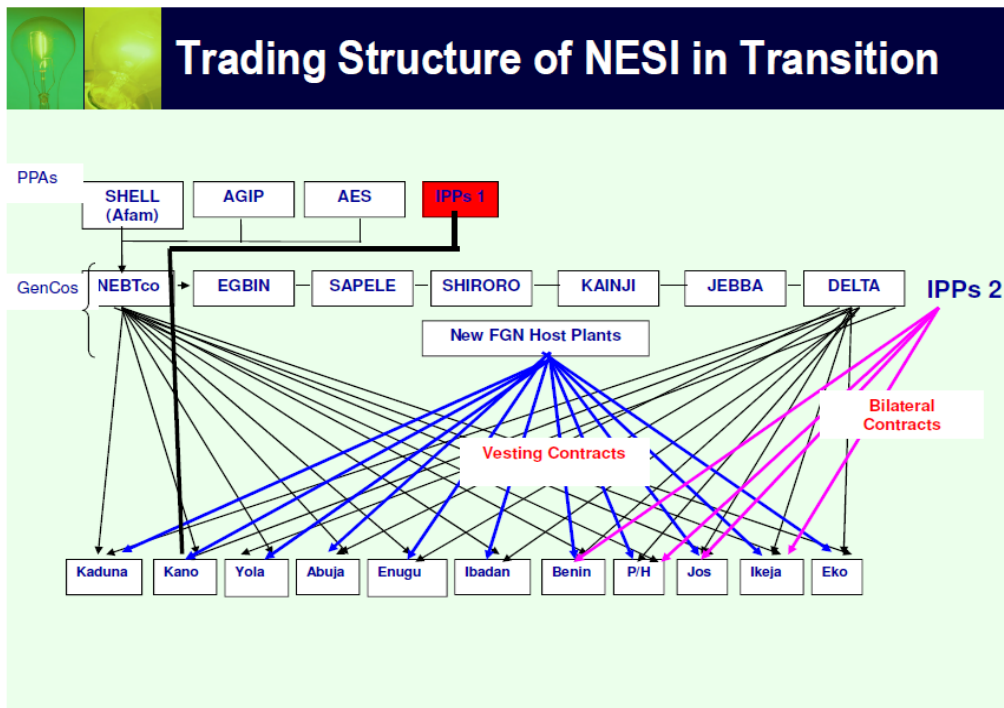


Fig. 3. Trading Structure of Nesi in Transition

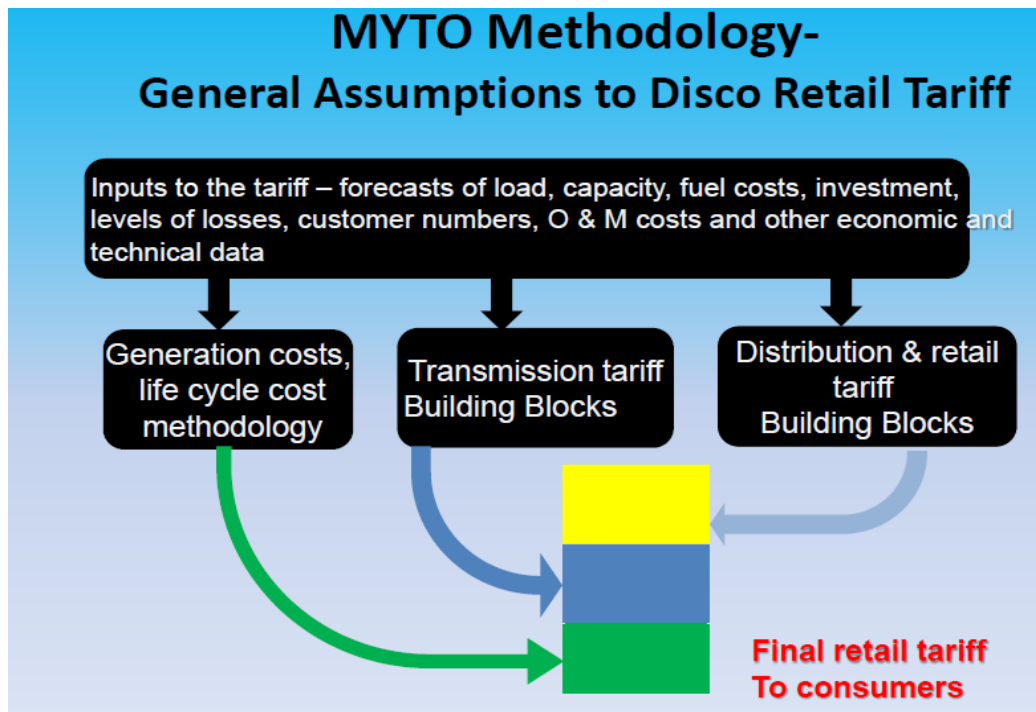


Fig 4. Myto Methodology

5.2 Benefits of Myto to Consumers

- Achieving a specific level of metering is required before MYTO can be implemented by the Discos.

- Current customers who have not yet paid for meters will not need to do so, as the cost of the meters is included in MYTO.

- New customers will only be required to pay a standard connection fee, with no extra charge for the meter.
- Lifeline Customers (R1) will benefit from not having to pay a fixed charge on their electricity.

5.3 Energy Demand and Supply Projections

The energy demand projections were calculated using MAED (Model for the Analysis of Energy Demand) for demand forecasting and MESSAGE (Model for the Energy Supply Strategy Alternatives and their General Environment Impact) for supply analysis.

5.3.1 Energy demand projection

The energy demand projections were generated using MAED, which incorporates key drivers of energy demand such as demographics, socioeconomics, and technology. To apply MAED, detailed data on demographics, economic conditions, energy intensities, and energy efficiencies is gathered for a base year, which serves as a reference point for forecasting future energy system developments. The choice

of the base year is based on data availability and its representativeness of the country's economic and energy situation. MAED facilitates a detailed breakdown of the country's final energy consumption across various sectors and, within each sector, into specific end-use categories. This breakdown helps in identifying the social, economic, and technical factors influencing each category of final energy demand. For modeling Nigeria's energy scenario, four economic scenarios were developed and applied as follows:

- 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)

The projections clearly indicate that Nigeria is significantly behind and requires greater commitment and involvement to achieve even half of the projected energy supply targets.

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	
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	
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	

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

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

The significance of the power sector in achieving this vision cannot be overstated. Development cannot progress under inadequate power supply, so substantial efforts are needed to realize Nigeria's Vision 20:2020. Without this, the vision risks becoming an unattainable illusion.

To keep this vision on track, the following actions should be taken:

- Swift implementation and execution of the electric power reform program.
- Increase available capacity from 4,200 MW to approximately 30,000 MW by 2020.
- Raise transmission capacity from 5,838 MVA to 15,000 MVA.
- Expand distribution capacity from 8,425 MVA to 30,000 MVA.
- Ensure compliance from operators and stakeholders in the telecom industry to become priority customers, recognizing the direct impact of inadequate electricity supply on service quality and network deployment.
- Provide adequate training for skilled personnel in generation, transmission, and distribution to support the liberalization process.

If these measures are implemented, it will enable various sectors such as education, agriculture, health, tourism, and transportation to thrive collectively. This underscores that electricity is the foundation of a nation's development. For Nigeria to achieve Vision 20:2020, getting the power sector right is crucial. We anticipate that the power reforms will foster competition similar to that seen in the telecommunications sector.

7. CONCLUSION

It is widely hoped that effective implementation of the reform program will enhance efficiency and growth in the power sector, resulting in better electricity services. This improvement is crucial

for driving the economy toward achieving Vision 20:2020.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Appendix I

Abuja Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	<u>Fixed Charge, N / Month</u>			
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

Tariff Code	2012	2013	2014	2015
	<u>Energy Charge, N / kWh</u>			
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
	<u>Fixed Charge, N / Month</u>			
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

Tariff Code	2012	2013	2014	2015
	<u>Energy Charge, N / kWh</u>			
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
	<u>Fixed Charge, N / Month</u>			
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				
Tariff Code	2012	2013	2014	2015
	<u>Energy Charge, N / kWh</u>			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	12.89	14.82	15.57	16.34
Residential R3	23.43	23.43	24.60	25.83
Residential R4	23.43	23.43	24.60	25.83
Commercial C1	17.28	17.28	18.14	19.05
Commercial C2	21.78	21.78	22.87	24.01
Commercial C3	21.78	21.78	22.87	24.01
Industrial 1	17.57	17.57	18.45	19.37
Industrial D2	22.83	22.83	23.97	25.17
Industrial D3	22.83	22.83	23.97	25.17
Special 1	16.82	19.34	20.31	21.33
Special 2	16.82	19.34	20.31	21.33
Special 3	16.82	19.34	20.31	21.33
Street Lighting S1	12.90	14.84	15.58	16.36

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Appendix IV

Ibadan Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	<u>Fixed Charge, N / Month</u>			
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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Ibadan Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	<u>Energy Charge, N / kWh</u>			
Residential R1	4.00	4.00	4.00	4.00
Residential R2	12.30	12.91	13.56	14.23
Residential R3	23.40	24.57	25.80	27.09
Residential R4	23.40	24.57	25.80	27.09
Commercial C1	15.48	16.25	17.07	17.92
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 V

Jos Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	<u>Fixed Charge, N / Month</u>			
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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Jos Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	<u>Energy Charge, N / kWh</u>			
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

Appendix VI

Kaduna Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	<u>Energy Charge, N / kWh</u>			
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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Kaduna Disco - Fixed Charge

Tariff Code	2012	2013	2014	2015
	<u>Fixed Charge, N / Month</u>			
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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Appendix VII

Kano Disco – Energy charge

Tariff Code	2012	2013	2014	2015
	<u>Energy Charge, N / kWh</u>			
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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Kano Disco – Fixed Charge

Tariff Code	2012	2013	2014	2015
	<u>Fixed Charge, N / Month</u>			
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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Appendix VIII

Eko Disco -Fixed Charge

Tariff Code	2012	2013	2014	2015
	<u>Fixed Charge, N / Month</u>			
Residential R1	-	-	-	-
Residential R2	500	750	1,125	1,688
Residential R3	21,265	31,898	47,847	52,632
Residential R4	118,831	136,655	150,321	165,353
Commercial C1	500	750	1,125	1,688
Commercial C2	19,278	22,170	25,495	29,819
Commercial C3	107,728	118,501	130,351	143,387
Industrial 1	603	905	1,357	1,628
Industrial D2	105,994	116,594	129,300	142,330
Industrial D3	107,728	118,501	130,351	143,387
Special 1	500	750	975	1,463
Special 2	47,500	52,250	57,475	63,223
Special 3	53,125	58,438	64,281	70,709
Street Lighting S1	500	750	1,125	1,688

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Eko Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	<u>Energy Charge, N / kWh</u>			
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

Tariff Code	2012	2013	2014	2015
	<u>Fixed Charge, N / Month</u>			
Residential R1	-	-	-	-
Residential R2	500	750	895	1,067
Residential R3	17,513	26,269	31,332	37,371
Residential R4	109,449	164,174	195,818	233,561
Commercial C1	500	750	895	1,067
Commercial C2	15,876	23,814	28,404	33,879
Commercial C3	99,224	148,835	177,523	211,740
Industrial 1	500	1,000	1,193	1,423
Industrial D2	97,626	195,252	232,887	277,775
Industrial D3	99,224	198,447	236,697	282,320
Special 1	500	750	895	1,067
Special 2	35,938	43,125	51,437	61,352
Special 3	43,750	65,625	78,274	93,361
Street Lighting S1	500	650	775	925

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Ikeja Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
	<u>Energy Charge, N / kWh</u>			
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 Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
<u>Energy Charge, N / kWh</u>				
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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P/Harcourt Disco – Energy Charge

Tariff Code	2012	2013	2014	2015
<u>Energy Charge, N / kWh</u>				
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
	<u>Fixed Charge, N / Month</u>			
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
	<u>Energy Charge, N / kWh</u>			
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

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