

**A COUNTRY REPORT SUBMITTED TO JICA KNOWLEDGE CO-  
CREATION PROGRAM (GROUP & REGION FOCUS)  
ENERGY POLICY (A)  
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# CHAPTER ONE

## NIGERIA

- 1.1 COUNTRY BACKGROUND
- Located in the west coast of Africa, precisely, West Africa, Nigeria is bordered in the North by Niger Republic (1497km) and Chad (87km), in the East by Cameroun (1690km), in the West by Benin Republic (773km) and in the South by the Atlantic Ocean. Nigeria's coastline is at least 853km in length. Situated between latitude 4o and 14oN, and longitude 2o and 15oE, Nigeria has a total land mass of 923,768 km<sup>2</sup> of which 1.4% is water. Nigeria comprises of 36 States and the Federal Capital Territory, where the capital Abuja is located. It is officially a democratic secular country with English as the official language. While several languages thrive in Nigeria, the three major languages are Hausa, Igbo and Yoruba.
- Nigeria gained independence from Great Britain on October 1, 1960 and was declared a republic exactly three years after. It presently practices the Presidential system with Muhammadu Buhari as the Head of Government. The President's power is checked by a Senate and a House of Representatives, which are combined in a bi-cameral body called the National Assembly. This is the legislative arm of government.

# FIGURE 1: Political Map of Nigeria



## 1.2 SOCIO-ECONOMIC

- From the population census of Y2006, Nigeria's population stood at 140,431,790 but estimates in Y2015 gave a figure of 182,202,000 indicating a population density of about 190 persons per km<sup>2</sup>. Much of the population is concentrated in the northern state of Kano and along the coastal lines of the country. Nigeria has one of the world's highest urbanization rates (est. 5.3% per year). The estimated net migration rate in Y2008 was 0.25 migrants per 1,000 persons.

S/N	DEMOGRAPHIC PARAMETER	Y2005	Y2010 (Est.)
1.	Total Population (million)	137.49	163.4
2.	Population Growth Rate (%)	3.16	3.52
3.	Urban Population (million)	55.00	75.19
4.	Urban Population share (%)	40	46
5.	Potential Labour Force (million)	92.94	110.82
6.	Actual Labour Force (million)	74.35	88.86
7.	Number of persons per Household	5.8	5.6

## 1.3 ECONOMIC SECTOR

- Nigeria is a middle income, mixed economy and emerging market with expanding financial service, communications, technology and entertainment sectors. It is ranked as the 21st largest economy in the world in terms of nominal GDP, and the 20th largest in terms of purchasing power parity (PPP). The GDP of the country as recorded in Y2015 is USD492.986 billion (nominal) and USD1.105 trillion (PPP) indicating a GDP per capita of USD2,758 (nominal) and USD6,184 (PPP). It is the largest economy in Africa; its re-emergent, though currently underperforming manufacturing sector is the third largest on the continent, and produces a large proportion of the goods and services for the West African sub-region. Nigeria recently changed its economic analysis to account for rapidly growing contributors to its GDP. These include the Telecommunications, Banking and the Film/music industry.
- *Figure 2* shows the key economic sectors in Nigeria and their percentage contribution to GDP in Y2010 and Y2011. In Y2011, the largest sectoral contributors were Agriculture (40.24%) followed by Wholesale & Retail (19.38%) and Crude oil & Natural Gas (14.71%). The three sectors contributed 70% to Nigeria's GDP in Y2011.

## 1.4 POVERTY RATE

Whereas the economy grew at an average of about 6.2% annually between 2002 and 2011, there is a general disconnect between Nigeria's economic growth and human development. Nigeria is ranked 156th out of 187 national economies worldwide (UNDP-HDR 2011). In 1988, the poverty level was 27.2% rising to 65.6% in 1999, an annual increase of 8.83%. In 2004, out of the estimated population of over 130 million, 54.4% lived below poverty line. The situation worsened in 2011 when 69.1% of the population or approximately 100million people lived in abject poverty. (NBS, 2011).

TABLE 2: Poverty Rate(Source: NBS, 2011)

S/ N	YEAR	RURAL %	URBAN %	NATIONAL %
1.	1980	28.3	17.2	27.2
2.	1985	51.4	37.8	46.3
3.	1992	46.0	37.5	42.7
4.	1996	69.3	58.2	65.6
5.	2004	63.3	43.2	54.4
6.	2011	80.1	50	69.1

## 1.5 ENERGY AND THE ECONOMY

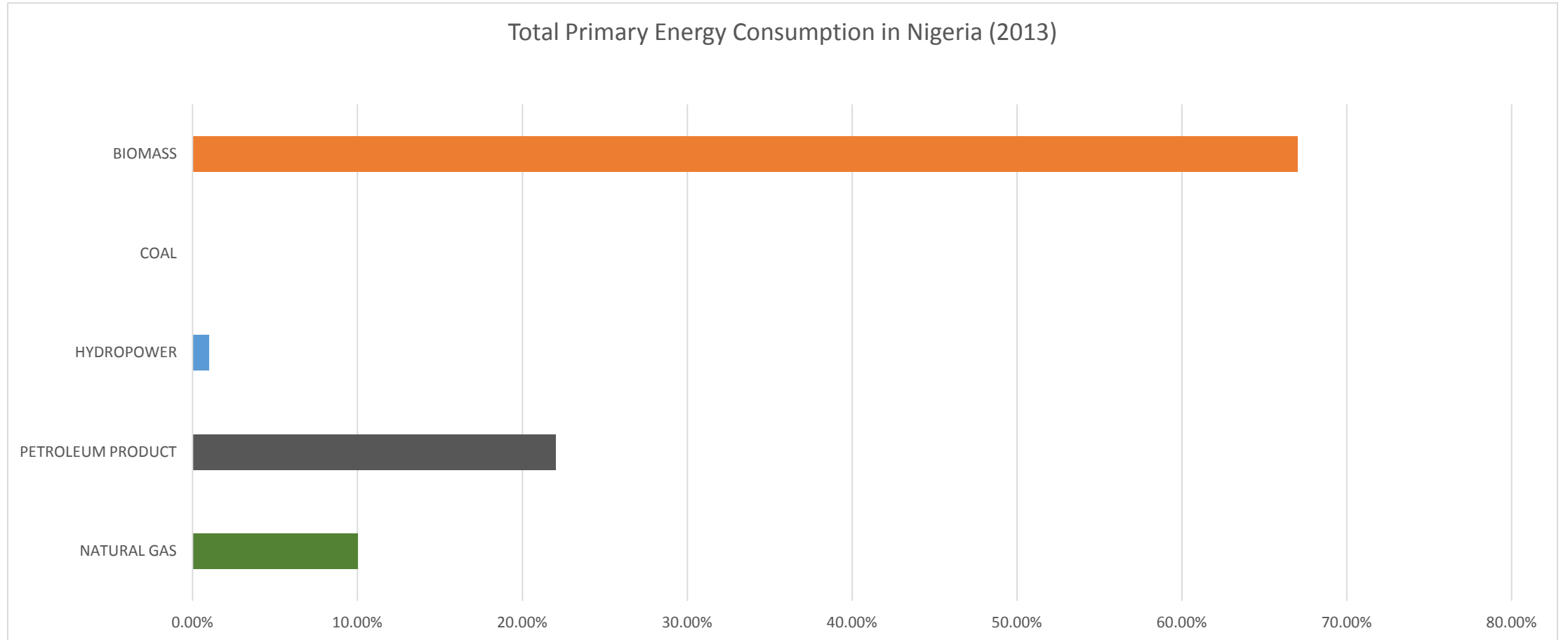
- Nigeria has vast primary energy resources ranging from light hydrocarbons to heavy hydrocarbons and also renewable resources like water, sun, wind, biomass and fuel wood. Table 3 highlights these potentials.
- Prior to the 1960s, non-commercial energy sources like fuel wood, charcoal, agricultural wastes and residues and solar radiation were the primary energy sources in the country. Commercially, coal was used as the energy source for power generation. The structure of energy supply in Nigeria changed with the discovery of oil and since the late 1960s, the Nigerian economy has been solely dependent on crude oil for sustenance. By 2005, out of a total primary energy consumption of 62.5Mtoe, natural gas accounted for 59.75%, followed by non-commercials (21.49%), petroleum products (17.73%) and hydro (1.03%) while coal has declined to an insignificant level. (See Figure 3)



**TABLE 3: Primary Energy Resources in Nigeria – Dec.,2010 (Source: ECN)**

S/N	RESOURCE TYPE	RESERVES (NATURAL UNITS)	PRODUCTION/CONSUMPTION
1.	Crude Oil	36.22 Billion barrels	0.73 Billion barrels/yr
2.	Natural Gas	187 Trillion SCF	2.4 TSCF/yr
3.	Coal and Lignite	2.175 Billion tonnes	Negligible
4.	Tar Sands	31 Billion barrels of equivalent	Negligible
5.	Large Hydropower	11,500 MW	1,900 MW
6.	Small Hydropower	3, 500 MW	30MW
7.	Solar radiation	3.5 – 7.0 kWh/m <sup>2</sup> /day	2MW
8.	Wind	2-4 m/s at 10m height	Negligible
9.	Biomass		1.2 Million Tonnes per Year
	a. Fuel Wood	11 Million hectares of Forest and Woodland	
	b. Animal Waste	211 Million Assorted animals	
	c. Energy Crops and Agric Residue	72 Hectares of Agric Land	
10.	Nuclear	Not Yet Quantified	

### Figure 3: Total Primary Energy Consumption in Nigeria (Y2013) {Source: ECN}



## 2.1

# THE ENERGY SITUATION

- Energy is central to sustainable development. It affects all aspects of development – social, economic, environmental and even cultural. The energy sector plays a strategic role in the Nigerian economy as it is a major factor in the reduction of poverty, improvement of productivity and enhancement of the general quality of lives of Nigerians. While on one hand, the energy sector contributes to a stable growth of the Nigerian economy and the realization of social and political objectives of the nation, on the other hand, the modernization and expansion of energy supply system to meet future energy demand require a large amount of human and financial resources. It is also noteworthy that the impact of energy supply can be used as an instrument of foreign policy in the promotion of international cooperation and development.
- Consequently, and in order to ensure optimal, adequate, reliable and secure supply of energy and its effective utilization, a comprehensive Energy Policy was put in place to serve as a blue print for the sustainable development, supply and utilization of energy resources within the economy and for the use of such resources in international trade and cooperation.
- Existing policies in the energy sector have been those of separate energy sub-sectors (electricity, oil & gas and solid minerals). There were also energy related policies developed in sub-sectors whose activities are strongly dependent on those in the energy sector. These include agriculture, the environment, science & technology and transportation, among others. These policies however only reflected the individual sub-sectoral perspectives. The new energy policy has therefore integrated these sub-sectoral issues and put them in proper perspectives in order to avoid policy conflicts and ensure a sustainable development of the Nigerian economy if well implemented.

## 2.2

## ENERGY SECURITY

- The discovery of hydrocarbon and over-dependence of this resources by the past governments in Nigeria has slowed down the development of alternative fuels. Diversification to achieve a wider energy supply mix will ensure greater energy security for the nation.
- Special attention needs to be paid to the diversification of energy supply mix in the rural areas as there already exists an imbalance in supply/demand of fuel wood in some parts of the country; a situation that threatens energy security in these areas. Inhabitants of rural communities depend largely on traditional fuels like charcoal, fuel wood, animal and plant wastes/residues.

## 2.3

## PRIVATE SECTOR PARTICIPATION

- Government has been largely responsible for the ownership and operation of energy sector systems and institutions. Investments in these areas which are normally huge had been sourced from public funds, An exception to this however is the upstream petroleum sub-sector, part of the downstream sector and to a smaller extent the power sector.
- However, in the face of increasing demands on government for the funding of other critical areas of the economy, the Nigerian government has not been able to provide the requisite funds for the energy sector. Although efficient and transparent management of the sector over the years have also been major challenges to its growth. These have resulted in collapse and deterioration of established facilities and infrastructure while new ones were not put in place even with the growing demand for energy supply. These have resulted in energy insecurity, inadequate and unreliable energy supply and massive loss of productivity of the Nigerian economy.
- In recent times, increased private sector participation in the energy sector is opening up the sector for improved infrastructure and a better future for the Nigerian economy if properly managed. The greater proportion of investments required will be foreign capital mainly because of technological advancement while indigenous private sector participation is also encouraged.

## 2.4

## INSTITUTIONAL FRAMEWORK

- A necessary condition for the optimal development of the energy sector is the effective coordination of the various energy sub-sectors because of their inter-relationships along with other energy related activities of the non-energy sectors of the economy. In this wise, appropriate coordination and cooperation by relevant government institutions in order to increase the efficiency and effectiveness of energy delivery in Nigeria and developing capacities to cope present and future challenges in the sector is very critical. Linkages should also be created between the federal government and the local and state governments to ensure that plans and programmes as highlighted in the energy policy are well executed.

## 3.0 THE NATIONAL ENERGY POLICY

### 3.1 THE NEED FOR A POLICY

- In 1999, the Federal Government of Nigeria took a bold step to get the Nigerian economy to be private sector driven. The strong nexus between energy and socio-economic development was the basis of the approval in Y2003, of the National Energy Policy which is hinged on a private sector led initiative in line with the national economic policy. The overall thrust of this policy is the optimal utilization of the nation's energy resources for sustainable development.
- The major objectives of the national energy policy include the following:
  - i. To ensure the development of the nation's energy resources, with diversified energy resources options for the achievement of national energy security and an efficient energy delivery system with an optimal energy resource mix.
  - ii. To guarantee adequate, reliable and sustainable supply of energy at appropriate costs and in an environmentally friendly manner to the various sectors of the economy for national development.
  - iii. To guarantee increased contribution of energy productive activities to national income.
  - iv. To guarantee an efficient and cost effective consumption pattern of energy resources.

- v. To promote increased investments and development of the energy sector industries with substantial private sector participation.
- vi. To accelerate the process of acquisition and diffusion of technology and managerial expertise in the energy sector industries for stability and self-reliance.
- vii. To ensure a comprehensive, integrated and well informed energy sector plans and programmes for effective development.
- viii. To foster international cooperation in energy trade and projects development in both the African region and the world at large.
- ix. To successfully use the nation's abundant energy resources to promote international cooperation.



## 3.2

# ENERGY SOURCES

### 3.2.1 CRUDE OIL

POLICY	OBJECTIVE	STRATEGY
<p>The nation shall engage extensively in exploration and production of crude oil and associated liquid petroleum</p> <p>Emphasis shall be placed on internal self-sufficiency in processing and export of petroleum products</p> <p>The nation shall encourage the adoption of environmentally friendly oil exploration, exploitation, handling and storage</p>	<ul style="list-style-type: none"> <li>• To increase the reserve to production ratio</li> <li>• To derive more economic benefits from the nation's crude oil resources</li> <li>• To ensure that refining to consumption ratio is greater than unity so as to ensure domestic self-reliance in the production of petroleum products for domestic consumption</li> <li>• To adequately protect the country from the vulnerability of oil price fluctuations</li> <li>• To ensure adequate and reliable supply and distribution of petroleum products to meet the demand of the domestic market</li> </ul>	<ul style="list-style-type: none"> <li>• Investing in and intensifying hydrocarbon exploration and production</li> <li>• Reviewing existing laws and regulations to create the enabling environment for increased private sector participation in the petroleum industry especially in the downstream sub-sector</li> <li>• Maximizing and expanding the refining capacity in the country to cater fully for local consumption and exports of petroleum products</li> <li>• Ensuring adequate geographical coverage of oil refining and petroleum products distribution</li> <li>• Expanding and promoting research and development activities in the country</li> <li>• Ensuring the use of locally available materials such as bentonite and barytes</li> <li>• Emphasizing the processing of crude oil for export to withstand the adverse effect of crude oil price fluctuations</li> </ul>

<p>The nation shall completely deregulate and privatize the petroleum industry.</p> <p>The nation shall encourage indigenous and foreign companies to fully participate in both upstream and downstream activities of the petroleum industry</p> <p>The nation shall aggressively pursue R &amp;D and human capacity development to derive maximum benefits from its oil resources</p>	<ul style="list-style-type: none"> <li>• To promote efficient management and operations of the petroleum industry in line global best practices</li> <li>• To accelerate the process of technology acquisition and diffusion in the petroleum industry</li> <li>• To enhance indigenous capability in the interest of national security</li> <li>• To attract increased private sector (indigenous and foreign) capital inflow to the petroleum industry</li> </ul>	<ul style="list-style-type: none"> <li>• Improving the living standards of people in oil producing communities through the provision of socio-economic infrastructure</li> <li>• Providing appropriate fiscal incentives to attract investments and ensure reasonable returns</li> <li>• Encouraging local engineering design and fabrication of equipment and spares in Nigeria</li> <li>• Ensuring the availability of adequate strategic reserves of storage capacity for refined products for at least 90 days of forward consumption</li> <li>• Taking appropriate measures to ensure that Nigerians are put into key decision making positions in the petroleum industry</li> </ul>
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## 3.2.2 NATURAL GAS

POLICY	OBJECTIVE	STRATEGY
<p>The nation's gas resources shall be harnessed and optimally integrated into the national economy, energy mix and industrial processes</p> <p>The nation shall put in place necessary infrastructure and incentives to encourage indigenous and foreign companies to invest in the sector</p> <p>The nation shall engage extensively in gas exploration and development with a view to increasing the reserve base to the highest level possible</p>	<ul style="list-style-type: none"> <li>• To eliminate the flaring of associated gas by 2008</li> <li>• To determine the gas reserves available to the nation</li> <li>• To expand the utilization of natural gas as industrial and domestic fuel, as well as for power generation</li> <li>• To increase the use of natural gas as industrial feedstock for petrochemical, pharmaceutical and fertilizer plants, etc.</li> <li>• To use gas to diversify the foreign exchange earning base of the nation</li> <li>• To encourage indigenous entrepreneurial capabilities in the gas industry including the development of end-use devices</li> </ul>	<ul style="list-style-type: none"> <li>• Encouraging the oil producing companies to gather and utilize associated gas in order to eliminate gas flaring by 2008</li> <li>• Imposing appropriate and effective penalties to discourage gas flaring</li> <li>• Encouraging the establishment of the necessary infrastructure for the effective gathering, transmission and distribution of gas nationwide</li> <li>• Providing incentives to encourage industrial and domestic consumers to use gas or to convert to gas</li> <li>• Providing incentives to encourage the introduction and use of LPG appliances in areas not accessible to natural gas so as to encourage the consumer's preference for gas</li> <li>• Establishing suitable infrastructure for the export of natural gas</li> <li>• Expanding and promoting gas related R &amp; D outfits in the country</li> </ul>

The nation shall put in place necessary infrastructure and incentives to ensure adequate geographical coverage of the gas transmission and distribution network

- To accelerate the process of technology acquisition and diffusion in the gas industry

- Formulating suitable urban and regional planning regulations needed for the effective distribution of natural gas and its utilization by domestic and industrial consumers
- Providing necessary incentives to indigenous and foreign entrepreneurs to facilitate their participation in the gas industry
- Ensuring that the price of natural gas is cost effective while giving due attention to the effect on local consumption
- Embarking on deliberate exploration for gas deposits in all parts of the country

### 3.2.3 TAR SANDS

POLICY	OBJECTIVE	STRATEGY
<p>The nation shall encourage tar sands exploration and exploitation</p> <p>The exploitation of tar sands shall be private sector driven while indigenous participation shall be actively promoted</p> <p>The nation shall encourage the adoption of environmentally friendly approach for the exploration and exploitation of tar sands</p>	<ul style="list-style-type: none"> <li>• To extract heavy oil from tar sands for refineries</li> <li>• To conserve foreign exchange used in importing heavy crude oil and also produce heavy crude for export</li> <li>• To acquire the technology for developing and harnessing the tar sands</li> <li>• To ensure adequate financing, efficient operation and management of the sub-sector</li> <li>• To encourage the local content input in the sub-sector from the early stages of its development</li> <li>• To minimize adverse environmental impacts associated with tar sands exploration</li> </ul>	<ul style="list-style-type: none"> <li>• Undertaking exploration and exploitation activities for tar sands deposits in the country</li> <li>• Establishing an appropriate regulatory institution for the tar sands sub-sector</li> <li>• Putting in place necessary regulations and guidelines for the exploitation of tar sands</li> <li>• Establishing infrastructural facilities for the acquisition of the technology for harnessing tar sands</li> <li>• Intensifying R &amp;D in the production of lubricants and other heavy oil products from tar sands</li> <li>• Establishing heavy oil upgrading facilities near the tar sands deposits</li> <li>• De-emphasizing the importation of heavy crude oil as a way of encouraging the utilization of heavy oils from tar sands</li> <li>• Providing appropriate incentives to facilitate investment in the exploration and exploitation of tar sands</li> <li>• Providing an appropriate financing facility to support indigenous investments in tar sands development</li> </ul>

## 3.2.4 COAL

POLICY	OBJECTIVE	STRATEGY
<p>The nation shall pursue vigorously a comprehensive programme of resuscitation of the coal industry</p> <p>Extensive exploration activities to maintain a high level of coal reserves shall be carried out</p> <p>Private sector as well as indigenous participation in the coal industry shall be actively promoted</p> <p>The exploitation and utilization of the coal reserves shall be done in line with global best practices</p> <p>The nation shall explore the techno-economic feasibility of new coal technology such as coal gasification and coal to liquid conversion</p> <p>The nation shall ensure adequate supply of coal to meet the energy requirements of the country in a cost effective and sustainable manner</p>	<ul style="list-style-type: none"> <li>• To promote production of coal for export and domestic needs</li> <li>• To promote effective utilization of coal for complementing the nation's energy needs and as industrial feed stock</li> <li>• To attract increased investments and promote indigenous participation in the coal industry</li> <li>• To utilize coal in the form of coal briquetted</li> <li>• To minimize environmental pollution arising from the utilization of coal</li> <li>• To increase the contribution of coal by 30% to the national energy mix by 2020</li> <li>• To support increased environmental monitoring, including air quality monitoring for existing and/or proposed mines and power stations in the country</li> <li>• To establish an emissions performance standard that will guide the construction of coal-fired power station in the country</li> </ul>	<ul style="list-style-type: none"> <li>• Intensifying the drive for coal exploration and production activities</li> <li>• Providing adequate incentives to indigenous and foreign entrepreneurs so as to attract investments in coal exploration and production</li> <li>• Providing adequate for large scale production of coal stoves at affordable prices</li> <li>• Providing adequate incentives to indigenous and foreign entrepreneurs for the establishment of coal based industries</li> <li>• Developing adequate infrastructure for handling and transportation of coal within and out of the country</li> <li>• Organizing awareness programmes for the use of smokeless coal briquettes as an alternative to fuel wood</li> <li>• Encouraging R&amp;D in the production, processing and utilization of coal</li> <li>• Introducing clean coal technologies into coal utilization</li> <li>• Re-introducing the use of coal for power generation</li> </ul>

## 3.2.5 NUCLEAR

POLICY	OBJECTIVE	STRATEGY
<p>The nation shall promote the development of nuclear energy and undertake all activities related to peaceful uses of nuclear energy in its entire ramification</p>	<ul style="list-style-type: none"> <li>To promote nuclear energy as an important electricity component in the nation's energy mix</li> </ul>	<ul style="list-style-type: none"> <li>Strengthening the institutional framework for the operational and regulatory aspects of the nuclear industry</li> </ul>
<p>The nation shall pay adequate attention to safety, security and safeguard issues in the pursuit and operation of its nuclear programmes</p>	<ul style="list-style-type: none"> <li>To promote the development and application of nuclear science and technology in industry, agriculture, medicine and water resources management as well as other socio-economic aspects</li> </ul>	<ul style="list-style-type: none"> <li>Developing all necessary legal/legislative frameworks necessary for the smooth operation of nuclear facilities</li> </ul>
<p>The nation shall strengthen all institutional and legal/legislative frameworks and ensures they are operational</p>	<ul style="list-style-type: none"> <li>To pursue with commitment, the exploration of nuclear mineral resources in the country</li> </ul>	<ul style="list-style-type: none"> <li>Developing national capacity in all areas related to the use of nuclear energy and attaining self-sufficiency in human capacity development</li> </ul>
<p>The nation shall encourage and fund the development of the requisite manpower and provide the enabling environment for the acquisition of competencies and skills to develop the nuclear industry</p>	<ul style="list-style-type: none"> <li>To design and implement the strategy for the integration of nuclear energy into Nigeria's programme as contained in the approved nuclear power road map</li> </ul>	<ul style="list-style-type: none"> <li>Carrying out research into all areas of peaceful use of nuclear energy</li> </ul>
<p>The nation shall support research and infrastructural development necessary to enable rapid domestication and encourage intellectual property right</p>	<ul style="list-style-type: none"> <li>To institute the necessary nuclear safety, security and safeguards in the exploitation of nuclear energy and handling of radioactive materials</li> </ul>	<ul style="list-style-type: none"> <li>Ensuring that adequate sites are made available for the construction of nuclear facilities</li> </ul>
<p>The nation shall cooperate with International Atomic Energy Agency (IAEA) and other international organizations involved in the peaceful use of nuclear energy</p>	<ul style="list-style-type: none"> <li>To promote the development of appropriate framework necessary to attain self-sufficiency in nuclear matters in the long term and also ensure environmental protection and minimizing adverse effects of nuclear activities</li> </ul>	<ul style="list-style-type: none"> <li>Instituting adequate measures to ensure safety, security and safeguards</li> </ul>
<p>The nation shall ensure that storage and disposal of nuclear waste is done in an environmentally friendly and sustainable manner</p>	<ul style="list-style-type: none"> <li>To ensure that all nuclear facilities are operated in a transparent manner and in line with global best practice</li> </ul>	<ul style="list-style-type: none"> <li>Making arrangements with institutions or individuals in Nigeria for the conduct of research into all aspects of nuclear energy</li> </ul>
		<ul style="list-style-type: none"> <li>Creating incentives for career progression in nuclear research, nuclear industry or areas of associated spin-off benefits</li> </ul>
		<ul style="list-style-type: none"> <li>Developing appropriate framework and mechanism necessary for environmental protection and management of radioactive wastes</li> </ul>
		<ul style="list-style-type: none"> <li>Developing appropriate mechanism that will ensure adequate compensation for victims of nuclear accidents</li> </ul>
		<ul style="list-style-type: none"> <li>Undertaking public enlightenment campaigns on the applications and benefits of the various nuclear application programmes and how safety, security and safeguard issues are addressed</li> </ul>
		<ul style="list-style-type: none"> <li>Collaborating with IAEA, other development partners and friendly countries to develop nuclear energy for peaceful benefits</li> </ul>
		<ul style="list-style-type: none"> <li>Prospecting for and mining radioactive minerals</li> </ul>
		<ul style="list-style-type: none"> <li>Establishing appropriate mechanisms for local participation in the supply of nuclear energy equipment</li> </ul>
		<ul style="list-style-type: none"> <li>Constructing and maintaining nuclear facilities for the purpose of generating electricity and for other peaceful uses</li> </ul>
		<ul style="list-style-type: none"> <li>Producing, acquiring, treating, storing, transporting and disposing of any radioactive substance</li> </ul>

## 3.2.6 HYDROPOWER

POLICY	OBJECTIVE	STRATEGY
<p>The nation shall fully harness the hydropower potential in the country for electricity generation</p> <p>The nation shall pay particular attention to the development of the small, mini and micro hydropower schemes for the growth of the rural economy</p> <p>The nation shall exploit hydropower resources in an environmentally sustainable manner</p> <p>The nation shall actively promote private sector and indigenous participation in hydropower development</p> <p>The nation shall support R&amp;D on local adoption of hydropower plant technologies</p>	<ul style="list-style-type: none"> <li>• To increase the contribution of hydropower to the total electricity supply mix</li> <li>• To extend electricity to rural and remote areas through the use of small, mini and micro hydropower schemes</li> <li>• To pursue hydropower production in an environmentally friendly and sustainable manner that minimizes the adverse impacts on the environment, ecosystem and population</li> <li>• To attract private sector investments into the hydropower sub-sector</li> <li>• To develop local manufacturing capabilities for hydropower technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Promoting and supporting R&amp;D activities on hydropower exploitation for increased indigenous participation in the planning, design and construction of hydropower facilities</li> <li>• Establishing more hydro-meteorological stations across river basins</li> <li>• Generating and updating data on all rivers, identifying possible locations for hydropower projects and facilitating detailed survey of the potential SHP sites</li> <li>• Organizing sensitization workshops, seminars and enlightenment programmes on the roles of SHP in rural development</li> <li>• Introducing tax reduction, soft loans, grants. Bilateral concessional funding to encourage private investments and public-private partnerships in the development of hydropower projects</li> <li>• Putting in place a framework for power purchase agreement between owners of SHP, the grid and users</li> <li>• Exploiting the multi-functional use of hydropower infrastructure (e.g flood control, water supply, recreation, electricity generation, etc.)</li> <li>• Ensuring that State Rural Electricity Boards incorporate small scale hydropower projects to support socio-economic development programmes in the states</li> <li>• Supporting cutting-edge R&amp;D of mitigation techniques and technologies to reduce or eliminate adverse impacts of hydropower development and operation on the ecosystem</li> <li>• Establishing local training institutions to produce skilled manpower in hydropower technology</li> <li>• Integrating capacity building in the procurement of hydropower projects to encourage technology transfer to indigenous personnel</li> <li>• Encouraging the establishment of indigenous manufacturing industries for hydropower equipment and accessories</li> </ul>



## 3.2.7 SOLAR

POLICY	OBJECTIVE	STRATEGY
<p>The nation shall aggressively pursue the integration of solar energy into the nation's energy mix based on the established potentials and available technologies</p> <p>The nation shall keep abreast of worldwide developments in solar energy technology and utilization to adopt global best practices</p> <p>The nation shall utilize solar energy resources where it is more cost effective and advantageous</p> <p>The nation shall support the establishment of local manufacturing industries for solar energy conversion technologies and applications</p>	<ul style="list-style-type: none"> <li>• To develop the nation's capability and capacity in the utilization of solar energy</li> <li>• To use solar energy as the main energy option in the rural and peri-urban areas with higher solar energy potential</li> <li>• To develop the market for solar energy technologies and services</li> <li>• To develop local manufacture capabilities for solar energy conversion technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Intensifying R&amp;D in solar energy technology and applications</li> <li>• Intensifying human and institutional capacity building in solar energy technologies and applications</li> <li>• Providing adequate incentives to suppliers of solar energy products and services</li> <li>• Providing adequate incentives to local manufacturers for the production of solar energy systems and accessories</li> <li>• Introducing measures to fast-track the local solar energy industry</li> <li>• Setting up extension programmes to popularize solar energy technology and solutions to the rural and peri-urban communities</li> <li>• Providing fiscal incentives for the installation of solar energy systems</li> <li>• Pursuing aggressive mass campaign and advocacy on the use of renewable energy as alternative energy source</li> <li>• Setting up and maintaining a comprehensive information system on available solar energy resources and technologies</li> <li>• Developing and enforcing standards for solar energy technologies, products, services and processes</li> <li>• Putting in place measures to leverage funding from international agencies and countries that promote the use of solar energy</li> </ul>

## 3.2.8 WIND

POLICY	OBJECTIVE	STRATEGY
<p>The nation shall commercially develop its wind energy resource and integrate this with other energy resources into a balanced energy mix</p> <p>The nation shall take necessary measures to ensure that this form of energy is harnessed at sustainable costs to both suppliers and consumers in the rural areas</p> <p>The nation shall apply global best practices in the exploitation of wind energy resources</p>	<ul style="list-style-type: none"> <li>• To develop wind energy as an alternative energy resource</li> <li>• To develop local capability in wind energy technology</li> <li>• To use wind energy for provision of power to rural areas and remote communities far removed from the national grid</li> <li>• To apply wind energy technology in areas where it is technically and economically feasible</li> </ul>	<ul style="list-style-type: none"> <li>• Encouraging R&amp;D in wind energy utilization</li> <li>• Developing skilled manpower for provision of basic engineering infrastructure for the local production of components and spare parts of wind power systems</li> <li>• Intensifying work in wind data acquisition and development of wind maps</li> <li>• Training of skilled local craftsmen to ensure the operation and maintenance of wind energy systems</li> <li>• Providing appropriate incentives to producers, developers and consumers of wind power systems</li> <li>• Developing extension programmes to facilitate the general use of wind energy technology</li> <li>• Developing local capacity through the establishment of local manufacturing of wind energy systems</li> </ul>

## 3.2.8 HYDROGEN

POLICY	OBJECTIVE	STRATEGY
<b>The nation shall integrate hydrogen as an energy source in the energy mix of the country</b>	<ul style="list-style-type: none"><li>• To keep abreast of international trends in hydrogen production and application</li><li>• To develop local production capacity for hydrogen</li><li>• To ensure hydrogen utilization as a preferred energy source, where possible, on account of its high environmental friendliness</li></ul>	<ul style="list-style-type: none"><li>• Encouraging R&amp;D in hydrogen energy related technologies</li><li>• Developing domestic capacity in hydrogen production and application technologies</li><li>• Providing incentives to popularize the use of hydrogen as an energy source</li></ul>

### 3.2.9 OTHER RENEWABLES (GEOOTHERMALS, OCEAN, TIDAL, WAVE, ETC.)

S/N	POLICY	OBJECTIVE	STRATEGY
1.	The nation shall maintain an interest in other emerging sources of renewable energy	<ul style="list-style-type: none"> <li>• To develop a database on the potentials of these emerging energy resources</li> <li>• To keep abreast of international trends in energy technology development</li> <li>• To ensure incorporation of any new proven cost-effective energy resource into the energy mix</li> </ul>	<ul style="list-style-type: none"> <li>• Gathering and disseminating information on the development of these emerging technologies</li> <li>• Encouraging R&amp;D in the technologies of the exploitation of these emerging energy resources</li> <li>• Prioritizing the level of need, level of technological development and viability of emerging renewable energy resources.</li> </ul>

## 3.2.10 BIOMASS

POLICY	OBJECTIVE	STRATEGY
<p>The nation shall effectively harness non-fuel wood biomass energy resources and integrate them with other energy resources</p> <p>The nation shall promote the use of efficient biomass conversion technologies</p> <p>The nation shall improve measures required to support initiatives aimed at reducing forest thinning and to enhance collection and use of forest residue</p> <p>The nation shall enhance the demand side measures that support the use of biomass for the production of renewable energy</p> <p>The nation shall set a limit on the amount of biomass used for energy to ensure that the overall demand can be accommodated alongside other demands for land</p> <p>The nation shall undertake a comprehensive mapping of agro-ecological suitability for energy crops for the purpose of obtaining a regional view of production potentials and contribute to decision making on support for handling and/or processing facilities</p> <p>The nation shall incorporate waste-to-energy strategy in its overall waste management framework</p>	<ul style="list-style-type: none"> <li>• To promote biomass as an alternative energy resource especially in the rural areas</li> <li>• To promote efficient use of agricultural residues, animal and human wastes as energy sources</li> <li>• To reduce health hazards arising from combustion of biomass fuel</li> <li>• To focus biomass utilization close to production for community heating schemes and domestic heating, particularly off the national grid</li> </ul>	<ul style="list-style-type: none"> <li>• Developing extension programmes to facilitate the general use of new biomass energy technologies</li> <li>• Promoting R&amp;D in biomass energy technology</li> <li>• Establishing pilot projects for the production of biomass energy conversion devices and systems</li> <li>• Providing adequate incentives to local entrepreneurs for the production of biomass energy conversion systems</li> <li>• Training of skilled manpower for the maintenance of biomass energy conversion systems</li> <li>• Developing skilled manpower and providing basic engineering infrastructure for the local production of components and spare parts for biomass systems</li> <li>• Promoting electricity and heat generation from biomass waste</li> <li>• Mainstreaming waste-to-energy strategy in the overall waste management framework</li> </ul>

### 3.3 ELECTRICITY

Availability of electricity is key to socio-economic development of Nigeria. Its supply is however still inadequate in the country. In Nigeria, commercial electricity is generated primarily from gas turbines, hydro-stations and steam plants. The installed capacity for electricity generating plant in Nigeria, which is 98% owned by the Federal Government increased by a factor of 6 over the period 1968 to 1991 and stood at 5881.6MW until 2006 when it rose to 6000MW. Functionability of these generating plants however had a total installed capacity of about 4,680MW which is about 70% of the total installed capacity. About 72% of the total generation capacity comes from conventional thermal sources (mostly gas fired plants) with the remaining coming from large hydroelectricity. This implies that renewable sources still play almost a negligible role in the nation's power generation.

Over the years, access to the national grid by across the country has been inadequate as only few towns were fully connected. In bridging this gap and ensuring electricity for all, especially those residing in the rural areas, the Federal Government established a Rural Electrification Agency (REA) under the on-going reform in the power sector of the country. This reform is aimed at ensuring that electricity supply can meet the demands of Nigerians in 21st century while also modernizing and expanding the network in order to support socio-economic development. This reform gave birth to the development of a competitive electricity market,

the establishment of National Electricity Regulation Commission (NERC) and unbundling of the power sector, which has several generation and distribution companies. These include:

- Ten new gas plants
- Ten new NIPP gas plants in the Niger Delta
- Two new Hydro Plants (Zungeru and Mambila)

25-year Power Development Plan reported an electricity demand projection for a 10% annual growth of the GDP was given as 16,000MW, 30,000MW and 192,000MW for the years 2010, 2015 and 2030 respectively. Achieving these require an energy mix of Coal (11%), Hydro (7%), Natural Gas (70%), Nuclear (2%) and Renewables (10%).

Electricity supply in Nigeria involves transmission and distribution and achieving this requires infrastructure as highlighted below and overleaf:

TABLE 14: Electricity Transmission Network in Nigeria (2005) {Source: ECN}

S/N	LINE	LENGTH (Km)	SUB-STATIONS	CAPACITY (MVA)
1.	330KV	5000	23 (330/132kV)	6,000 (4,600 @0.8 utilization factor)
2.	132KV	600	91(132/33kV)	7,800 (5,800 @ 0.75 utilization factor)



**TABLE 15: Electricity Distribution Grid in Nigeria (2005) {Source: ECN}**

LINE	LENGTH (Km)	SUB-STATIONS	CAPACITY (MVA)
<b>33kV</b>	23,753	679 (33/11kV)	6,000 (4,600 @0.8 utilization factor)
<b>11kV</b>	19,226	20,543 (33/0.415kV, 11/0.415kV)	7,800 (5,800 @ 0.75 utilization factor)

Additionally, 1,790 Distribution transformers and 680 Injection Transformers exist.

Characterised by obsolete equipment, overloaded transformers, inefficient dispatch of electricity and uncoordinated system planning, the Transmission Reinforcement Programme as proposed a massive upgrade of electricity transmission infrastructure in Nigeria. Table 16 overleaf gives a policy on the electricity sub-sector.

POLICY	OBJECTIVE	STRATEGY
<p>The nation shall make steady and reliable electric power available at all times, at economic rates for industrial, economic and social activities of the country</p>	<ul style="list-style-type: none"> <li>To provide electricity to all State capitals, local governments as well as other towns by the year 2020.</li> </ul>	<ul style="list-style-type: none"> <li>Strengthening the institutional framework for the operational and regulatory aspects of the electricity sub-sector</li> </ul>
<p>The nation shall continue to engage intensively in the development of the electricity sub-sector and ensure availability of local capacities along the value chain</p>	<ul style="list-style-type: none"> <li>To stimulate industrialization in the rural areas in order to reduce rural to urban migration</li> </ul>	<ul style="list-style-type: none"> <li>Establishing a viable cost reflective tariff that will encourage the electricity sector</li> <li>Rehabilitating existing power plants in order to derive optimum power from the installed capacity</li> <li>Completing on-going projects designed to enable Nigerian Electricity Supply Industry satisfy the national demand</li> </ul>
<p>The nation shall continue to promote private sector participation in the sector while ensuring broad based participation of Nigerian investors</p>	<ul style="list-style-type: none"> <li>To provide reliable and stable electricity supply to all Nigerians, especially for industrial growth</li> </ul>	<ul style="list-style-type: none"> <li>Reinforcing the transmission network and supporting the development of the distribution network expansion necessary to allow consumers enjoy steady and reliable electricity supply</li> <li>Encourage R&amp;D in the generation, transmission and distribution of electricity</li> </ul>
<p>The nation shall pursue measures to diversify energy sources for electricity generation</p>	<ul style="list-style-type: none"> <li>To broaden the energy options for generating electricity</li> </ul>	<ul style="list-style-type: none"> <li>Regulating import duties to be paid on generation, transmission and distribution materials/equipment used in the in the whole electricity value chain to encourage investment and local production of power components</li> </ul>
<p>The nation shall encourage the State and Local Governments to provide access to the rural areas through off-grid and other rural electrification programmes</p>	<ul style="list-style-type: none"> <li>To attract adequate investment capital for the development of the sub-sector</li> </ul>	<ul style="list-style-type: none"> <li>Encouraging onshore training facilities as a primary source of human capital capacity development in the sector</li> </ul>
<p>The nation shall continue to engage intensively in the development of the sub-sector alignment along the electricity supply chain</p>	<ul style="list-style-type: none"> <li>To maximize access by Nigerians to investment opportunities in the sub-sector</li> </ul>	<ul style="list-style-type: none"> <li>Ensuring participation and involvement of indigenous Engineers and research groups in the execution of on-going and future projects right from feasibility studies with the aim of establishing local capacity in the long term</li> </ul>
<p>The nation shall ensure a sustainable supply of gas for electricity generation</p>	<ul style="list-style-type: none"> <li>To ensure electric power security</li> </ul>	<ul style="list-style-type: none"> <li>Developing a bankable feasibility studies for development of renewable, coal, nuclear and large hydropower for power generation</li> </ul>
	<ul style="list-style-type: none"> <li>To make reliable electricity available to 75% of the population by Y2020 and 100% by Y2030</li> </ul>	<ul style="list-style-type: none"> <li>Creating environment such as Feed - in –Tariff and Model PPP that will encourage power system development in renewable, coal, nuclear and large hydropower sources for power generation</li> <li>Intensifying national effort in training, R&amp;D in using nuclear, solar, wind and other renewable resources for electricity generation</li> </ul>
	<ul style="list-style-type: none"> <li>To provide enabling environment for the local manufacture of electrical components within the country</li> </ul>	<ul style="list-style-type: none"> <li>Taking effective measures to ensure security of electricity supply components within the value chain</li> <li>Providing appropriate incentives and support to entrepreneurs to ensure adequate returns on investment</li> </ul>
		<ul style="list-style-type: none"> <li>Providing enabling environment and encouraging financial institutions to support indigenous investments in the electricity sub-sector</li> <li>Encouraging off-grid generation and supply of power in remote or isolated areas</li> <li>Operating the Rural Electrification Fund to facilitate electrification in the rural areas</li> </ul>
		<ul style="list-style-type: none"> <li>Establishing a reduced tariff regime for low income and especially physically challenged electricity consumers and a mechanism for funding the subsidy within the cost reflective tariff structure</li> </ul>
		<ul style="list-style-type: none"> <li>Carrying out as necessary, the National Electricity Demand Study to cover 20 – 25 years and to be updated every 5years</li> <li>Ensuring a balanced electricity supply mix</li> </ul>
		<ul style="list-style-type: none"> <li>Establishing commercial bankable agreement within the value chain</li> <li>Establishing and strengthening basic engineering infrastructure for the local manufacture of power systems components</li> </ul>

## 3.4

# ENERGY UTILIZATION

Energy utilization in Nigeria has been grossly inadequate owing to its erratic and epileptic supply for various applications in the socio-economic activities of the nation. Energy utilization is predominantly from sources earlier highlighted and they find applications in the following sectors:

- Agriculture
- Transportation
- Manufacturing
- Households
- Commerce

The traditional fuels like fuel wood, charcoal, etc. are utilized largely for cooking and water heating in rural and sub-urban households with small quantities used in the in the services sector also for cooking while some cottage industries like bakeries also find use for them. In order to increase energy utilization in the country, the following measures are being adapted:

- developing a database on energy supply, demand and consumption for all sectors of the economy
- putting in place a legal/institutional framework that mandates all relevant organisations to supply energy supply, demand and consumption annually to Energy Commission of Nigeria
- Promoting energy conservation and efficiency
- Encouraging industry, agriculture and transport sectors to switch over to more appropriate and environmentally friendly energy sources
- Promoting human capacity building to fill gaps created by dearth of skilled manpower
- Establishing a national 90-day strategic reserve of petroleum products in each of the six geopolitical zones in the country.

## 3.5 ENERGY EFFICIENCY AND CONSERVATION

Energy efficiency is the goal to reduce the amount of energy required to provide products and services. Reducing energy use reduces energy costs and may result in financial cost savings to consumers. In Nigeria, the limited is wasted through the use of aged obsolete and inefficient appliances as well as wasteful lifestyles if Nigerians on energy use. Consequently, the cost of energy savings become high especially in the four major demand sectors, namely; household, transportation, industry and public sector services. This is as a result of inadequate human capacity, lack of public awareness/sensitization, lack of uncoordinated research and absence of energy efficiency testing laboratories. Other factors include absence of Minimum Energy Performance Standards for appliances, lack of comprehensive energy efficiency roadmap, cost of energy efficient appliances and products, low institutional capacity and lack of funding.

Energy efficiency and conservation best practices have many benefits which could reduce the imbalance between energy supply and demand and thus measures have provided through the National Energy Policy to guarantee an efficient and cost effective consumption of energy resources. It will also ensure the importation and manufacture of the most energy efficient equipment and machinery as well as promoting public awareness on the benefits on improved energy efficiency and conservation in Nigeria.

## 4.0 ENERGY DEMAND AND SUPPLY

There exists a great imbalance between energy supply and demand in Nigeria. Continued losses of energy through electricity transmission and other unstable use of energy in industrial and domestic activities will continue to challenge energy delivery. It therefore implies that new infrastructure need to be developed while old and obsolete ones are revamped and upgraded while generation can be increased through the deployment of other sources in the energy mix.

Nigeria has envisioned to grow its economy at a rate of 11% to 13% by the year 2020, energy demand and supply studies conducted by ECN under various growth scenarios and taking into consideration the economic vision, demography, available energy resources and modern development path have indicated that huge amount of energy is required in the form of electricity, fuel and heat to meet this vision.

In being optimistic and using Y2009 as the base year, three growth scenarios were considered as highlighted in the tables below and overleaf:

# TABLE 17 : Total Energy Demand by Sector (Source: ECN)

Scenario/ Sector	Year						Growth rate,%	Share, %					
	2009	2010	2015	2020	2025	2030		2009 - 2030	2009	2010	2015	2020	2025
<i>Reference Growth (7%)</i>	36.0 2	37.1 2	61.43	94.2 9	138. 84	190. 99	8.27	100	100	100	100	100	100
<b>Industry</b>	1.15	0.47	23.34	46.7 2	73.8	105. 52	24.01	3. 20	1.30	3.80	49.6	53.2	55.3
<b>Transport</b>	7.65	9.26	11.6	15.5	21.1	28.5	6.46	21. 2	24.9	18.9	16.5	15.2	14.9
<b>Household</b>	24.0 9	24.6 8	23.4	27.2 8	36.4 6	46.2 9	3.16	66. 90	66. 50	38. 10	28.9	26.3	24.2
<b>Services</b>	3.13	2.71	3.055	4.76	7.46	10.6 7	6.01	8. 70	7.30	5.0	5.0	5.3	5.6

Table 17(Contd.): Total Energy Demand by Sector (Source: ECN)

<i>High Growth Scenario (10%)</i>	36.02	37.56	75.25	124.2	200.9	346.9	11.39	100	100	100	100	100	100
<b>Industry</b>	1.15	1.73	30.46	62.21	115.30	233.12	28.78	3.2	4.6	40.5	50.1	57.4	67.2
<b>Transport</b>	7.65	7.36	11.04	16.49	24.02	34.88	7.49	21.2	19.6	14.7	13.3	11.9	10.0
<b>Household</b>	24.09	27.32	30.44	39.53	52.16	65.15	4.85	66.9	72.7	40.4	31.8	26.0	18.8
<b>Services</b>	3.13	1.15	3.305	5.93	9.49	13.75	7.30	8.7	3.1	4.4	4.8	4.7	4.0



Table 17(Contd.): Total Energy Demand by Sector (Source: ECN)

Optimistic Growth Scenario	36.02	40.66	77.15	143.75	278.46	541.4	13.78	100	100	100	100	100	100
Industry	1.15	6.92	34.97	81.66	190.01	420.74	32.45	3.2	17.0	45.3	56.8	68.2	77.7
Transport	7.65	5.56	11.11	16.51	24.71	37.63	7.88	21.2	13.7	14.4	11.5	8.9	7.0
Household	24.09	24.72	26.37	36.60	49.75	62.97	4.68	66.9	60.8	34.2	25.5	17.9	11.6
Services	3.13	3.46	4.70	8.98	13.99	20.08	9.25	8.7	8.5	6.1	6.2	5.0	3.7

## TABLE 18: Total Energy Demand for Petroleum Products (Projected) {Source: ECN}

Year	PMS(Million Litres)		DPK (Million Litres)		AGO (Million Litres)		FUEL OIL (Million Litres)		LPG (Million Litres)	
	7%	13%	7%	13%	7%	13%	7%	13%	7%	13%
<b>2009</b>	5096.94	5096.94	356.06	356.06	565.64	565.64	120.01	120.01	74.16	74.16
<b>2010</b>	6180.00	8890.00	464.00	902.00	791.68	1177.85	160.00	270.00	93.20	132.90
<b>2015</b>	14460.00	19510.00	3788.00	7039.00	2301.86	3651.10	1800.00	3380.00	1107.00	1870.20
<b>2020</b>	28170.37	35587.13	9038.71	22704.49	4176.76	6270.84	4632.07	9277.93	2862.50	5733.51
<b>2025</b>	39769.44	55459.38	15984.94	44285.43	6231.84	11408.42	7806.10	20797.42	4823.96	12852.25
<b>2030</b>	56457.15	88369.15	22064.93	77255.68	8902.43	21349.73	11374.64	45443.40	7029.22	22903.70

## 5.0 CHALLENGES FACED IN THE FORMULATION OF ENERGY POLICIES

### 5.1 CHALLENGES

In view of optimally utilizing the nation's viable energy resources for sustainable national development and for fostering regional and international cooperation the National Energy Policy was approved by the Federal Government of Nigeria in Y2003. This document, which had inputs from various stakeholders from the academia, public service, business world and development partners went through several reviews in order to address the energy challenges of Nigeria. However, various bottlenecks in its implementation has made the policy another piece of document occupying a space on the shelf. Such bottlenecks include the following:

- Lack of adequate and reliable data on energy use and related issues
- Lack of skilled human capital
- Inadequate institutional framework to enforce standards in the energy sector
- Inadequate funding
- Inefficiency in the use of foreign technologies
- Political will
- Wrongful allocation or deployment of resources

These are some of the factors militating against the implementation of the National Energy Policy in Nigeria

## 6.0 CAPACITY BUILDING

### 6.0 TRAINING NEEDS

In view of the enormity of the challenges of the energy sector and the need to enhance the socio-economic development of Nigeria, issues of human capacity development on energy development matters should be given necessary attention.

Lagos State Government, the economic, financial and commercial nerve center of Nigeria and ECOWAS has identified Power as key to sustainable economic and thus a state energy policy that would promote and develop sustainable strategies for energy planning, security and sufficiency for all sectors in Lagos State.

Consequently, as a representative of the Lagos State Government on the Energy Policy (A) program, I am interested in developing my capacity in the following key areas;

1. Energy Policy Development and Planning
2. Energy Auditing
3. Energy Demand Forecasting
4. Development of Renewable Energy sources with particular attention to solar systems and waste-to-energy systems