Energy Commission of Nigeria

Federal Ministry of Science, Technology and Innovation

FEDERAL REPUBLIC OF NIGERIA

NATIONAL ENERGY POLICY

Revised Edition

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ENERGY COMMISSION OF NIGERIA

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FOREWORD

An overall National Energy Policy (NEP) for any country is often sought after by investors, development partners and scholars for a guide on government's overall policy direction. The first National Energy Policy for Nigeria was midwifed by the Energy Commission of Nigeria and approved by the Federal Executive Council (FEC) in 2003; and was launched by Mr. President on 20th June, 2005. It was later reviewed in 2013, 2018 and 2021. The NEP emphasizes the optimum utilization of the nation's energy resources for sustainable national development with the active participation of the private sector.

Energy development and utilization is however dynamic. Since the National Energy Policy was approved in 2003, many changes have taken place in the national and international energy scenes necessitating its review. For instance, the much anticipated reforms in the Nigerian petroleum sector has been considered through the Petroleum Industry Act (PIA); many neighbouring and other African countries have discovered petroleum in commercial quantities; shale oil and shale gas are being explored in major oil and gas consuming countries. The electricity sector has achieved a significant level of liberalization, deregulation and privatization through the Electric Power Sector Reform Act (EPSR) of 2005. Moreover, greater attention is being given to the development of renewable energy and energy efficiency worldwide, for driving sustainable development in line with Climate Change Protocols.

It is therefore commendable that the Energy Commission of Nigeria, in the discharge of its statutory responsibility has reviewed the 2003 NEP document, in 2013, 2018 and 2021. This was done after due consultation with Ministries, Departments and Agencies (MDAs) of Government and other relevant stakeholders, whose functions relate to the field of energy development. The observations, contributions and recommendations by stakeholders have been incorporated into the current National Energy Policy.

The National Energy Policy, which emphasizes active participation of the private sector in the development of the energy sector in a sustainable manner, has thirteen chapters: Chapter 1: Introduction; Chapter 2: Petroleum Policy; Chapter 3: Coal and Tar Sand Policy; Chapter 4: Nuclear Policy; Chapter 5: Renewable Energy Policy; Chapter 6: Bio-Energy Policy; Chapter 7: Electricity Policy; Chapter 8: Energy Utilization Policy; Chapter 9: Energy Efficiency and Conservation Policy; Chapter 10: Environment and Climate Change Policy; Chapter 11: Policy on Other Energy Issues;

Chapter 12: Energy Financing Policy and Chapter 13: Planning and Implementation Policy. Each Chapter of the National Energy Policy contains policy statements, policy objectives and strategies as well as the short, medium and long-term implementation strategies.

This National Energy Policy provides the framework for sustainable energy development in Nigeria with the overall objective of providing clean, affordable, adequate and reliable energy with the active participation of the private sector.

Honourable Minister
Federal Ministry of Science, Technology & Innovation

ACRONYMS

AFREC	African Energy Commission
APPA	African Petroleum Producers Association
AU	African Union
AUDA	African Union Development Agency
bpd	barrels per day
CBN	Central Bank of Nigeria
CDM	Clean Development Mechanism
CFLs	Compact Fluorescent Lamps
CO_2	Carbon dioxide
DPK	Dual Purpose Kerosene
DSM	Demand Side Management
ECN	Energy Commission of Nigeria
ECOWAS	Economic Community of West African States
EDCs	Electricity Distribution Companies
ESCOs	Energy Services Companies
EPSRA	Electric Power Sector Reform Act
FEC	Federal Executive Council
GBDCS	Green Building Standard and Certification System
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHGs	Green House Gases
GWh	Gigawatt-hour
HHK	Household Kerosene
IAEA	International Atomic Energy Agency
IOCs	International Oil Companies
IP	Intellectual Property
IPDF	Infrastructure Project Development Facility
IPPs	Independent Power Producers
IRENA	International Renewable Energy Agency
KfW	German Development Finance Group
kg	Kilograms
km	Kilometres

km/h	Kilometres/hour
km^2	Square kilometres
kWh	Kilowatt-hour
LEDs	Light Emitting Diodes
LPG	Liquefied Petroleum Gas
m/s	metre per second
mbpd	million barrels per day
Mcfpd	million cubic feet per day
MDAs	Ministries, Departments, Agencies
MEPS	Minimum Energy Performance Standards
MJ	Megajoules
MJ/m^2-day	Megajoules per square meter per day
MW	Megawatts
~~₦~~	Nigerian Naira
N_2O	Nitrous oxide
NASENI	National Agency for Science and Engineering Infrastructure
NASS	National Assembly
NDC	Nationally Determined Contribution
NEP	National Energy Policy
NEMP	National Energy Master Plan
NEPA	National Electric Power Authority
NEPAD	New Partnership for Africa's Development
NERC	Nigerian Electricity Regulatory Commission
NIIMP	National Integrated Infrastructure Master Plan
NiMet	Nigerian Meterological Agency
NREEEP	National Renewable Energy and Energy Efficiency Policy
NMDPRA	Nigerian Midstream and Downstream Petroleum Regulatory Agency
NNPC	Nigerian National Petroleum Corporation
NNRA	Nigerian Nuclear Regulatory Agency
NUPRC	Nigerian Upstream Petroleum Regulatory Commission
OPEC	Organization of Petroleum Exporting Countries
PAYC	Pay As You Consume
PHCN	Power Holding Company of Nigeria
PIA	Petroleum Industry Act

PMS	Premium Motor Spirit (Petrol)
PPP	Public Private Partnership
PV	Photovoltaic
R & D	Research and Development
R, D & D	Research, Development and Demonstration
R, D & T	Research, Development and Training
RE	Renewable Energy
S&L	Standards and Labels
SDG	Sustainable Development Goal
SERC	Sokoto Energy Research Centre
SMEs	Small and Medium Scale Enterprises
tce	Tonnes of Coal Equivalent
TFEC	Total Final Energy Consumption
toe	Tonnes of Oil Equivalent
tscf	Trillion standard cubic feet
UN	United Nations
US$	United States Dollars
WEC	World Energy Council
YTD	Year-To-Date

CHAPTER 1

INTRODUCTION

Energy has a major impact on every aspect of our socio-economic lives. It plays a vital role in the economic, social and political development of our nation. Inadequate supply of energy restricts socio-economic activities, limits economic growth and adversely affects the quality of life. Improvements in standards of living are manifested in increased food production, increased industrial output, the provision of efficient transportation, adequate shelter, healthcare and other human services. These will require increased energy consumption. Thus, our future energy requirements will continue to grow with the increase in living standards, industrialization and a host of other socio-economic factors.

It is pertinent to note that the impact of energy goes beyond national boundaries. Energy supply can be used as an instrument of foreign policy in the promotion of international cooperation and development.

Need for a National Energy Policy

The level of energy utilization in an economy, coupled with the efficiency of conversion of energy resources to useful energy, is directly indicative of the level of development of the economy. In order to ensure optimal, adequate, reliable and secure supply of energy and its efficient utilization in the country, it is essential to put in place a co-ordinated, coherent and comprehensive energy policy. The policy will serve as a blueprint for the sustainable development, supply and utilization of energy resources within the economy, and for the use of such resources in international trade and co-operation.

There are sub-sectoral policies in the separate energy sub-sectors, namely: electricity, oil and gas and solid minerals. There are also energy related policies developed in economic sub-sectors, whose activities are strongly dependent on those in the energy sector. These include transportation, agriculture, science and technology, environment, among others. The sub-sectoral policies, however, reflect the individual sub-sectoral perspectives. It is necessary to have an integrated energy policy, which provides a guide for future energy related sub-sectoral policy developments, in order to avoid policy conflicts that may, otherwise, arise. An overall

national energy policy is also normally needed and requested by foreign investors, who wish to invest in the nation's economy.

The Energy Commission of Nigeria, in furtherance of its mandate, midwifed the production of a Draft National Energy Policy in 1993. This was later reviewed in 1996 by an Inter-ministerial Committee, under the Chairmanship of the Ministry of Science and Technology. The document was yet to be approved by the Federal Executive Council (FEC), when in 1999, some significant changes occurred in the orientation of the economy, especially as regards increased private sector participation. This necessitated another review of the 1996 document, which ended in 2003. The result of that review was approved by the FEC in 2003.

However, NEP was produced and approved twenty-one (21) years ago and updated in 2013, 2018 and 2021 due to changes that have taken place in the national and international energy scenes necessitating its review. For instance, the much anticipated reforms in the Nigerian petroleum sector has been considered through the Petroleum Industry Act (PIA) 2021, the discovery of crude oil in commercial quantities in the neighboring countries and the exploration of shale gas/oil in major oil and gas consuming countries. The electricity sector has achieved a significant level of deregulation, while privatization of the sector is almost completed. Moreover, greater attention is being given to the development of renewable energy and energy efficiency worldwide, for driving sustainable development. Also, national economic development is usually quantified by the Gross Domestic Product (GDP); however, Nigeria's GDP was rebased about ten (10) years since NEP was approved.

The review entailed the assessment of the existing NEP's overall performance; identification and analysis of gaps and inadequacies existing in the NEP; update of the information and data in the NEP; comparison of the NEP with energy-related sub-sectoral policies as well as with international best practices and global developments in energy matters.

Socio-Economic Background

The nation's overall economy, as measured by the real GDP, has grown by about 6.30% annually between 2000 and 2009, and 6.9% between 2011 to the first quarter of 2018. In recent years and after rebasing, the nominal GDP increased from ₦54.2 trillion in 2010 to ₦80.2 trillion in the year 2013. On a per capita basis, nominal GDP fluctuated between ₦85,014.60

and ₦151,076.20, with an average of ₦118,058.90, between 2011 and the year first quarter 2018.

Over the period of 2011 to first quarter 2018, the per capita nominal GDP has however, shown no significant change generally at an annual average rate of 17.86%. The population was estimated to be 140.42 million people as at 2006 Census, with a growth rate of about 3.20% and a rural population of over 60% of the total.

The structure of the economy has changed significantly since independence in 1960. Agriculture was the most important sector of the economy, whose contribution to the GDP was above 54%. The contribution of the agricultural sector to the real GDP remained over 40% between 2000 and 2009 with an average contribution of 41.10% within the period, but it has declined to 21.65% in 2018. Correspondingly, agricultural exports, which were the main sources of foreign exchange earnings, declined and the dollar value of food and live animals imports increased. On the other hand, industry (crude oil production, mining and quarrying and manufacturing) contribution to GDP increased from about 13% in 1960 to an all-time high of 30.50% in the year 2003 and then declined to about 20.60% in the year 2009 and has increased to 29.19% in 2018**.** A closer examination of industry contribution to total GDP at 1990 constant basic prices reveals that between 2000 and 2009, industry contributed an average of 27.50% with petroleum accounting for 23.40%, mining and quarrying 0.37% and manufacturing 3.90% and in 2018, the sectorial contribution of manufacturing is 9.91%, mining and quarrying 9.67% and oil 9.61% respectively.

Energy and the Economy

Nigeria is blessed with abundant primary energy resources. These include reserves of crude oil and natural gas, coal, tar sands and renewable energy resources such as hydro, fuelwood, solar, wind and biomass. However, since the late 1960s, the economy has been solely dependent on the exploitation of oil to meet its development expenditures. In 2000, oil revenue alone accounted for about 98.50% of exports and 83.50% of total government revenues**.** However, its contribution to GDP was only 32.50%. By year 2009, the contribution of petroleum to total exports remain high at 95.80%, while its contribution to GDP dropped to 16.10%. Between 2000 and 2009, petroleum accounted for 79.60% of total government gross revenue on average. However, its contribution has generally been declining over the period. The contribution of energy proxied by petroleum to GDP, has been declining from 15.50% in 2010 to 13.70% in 2013 and currently 7.24% as at 2021.

The total modern energy consumed in 2000 was 31.9 million tce at 1985 = 100 and 18.3 million tce in 2009 at 1990=100**.** This declined to 15.8 million tce at 1990=100 in 2012 and 57.2 million tce in 2016. The dominant source of modern energy is petroleum, accounting for 80% of commercial energy consumption between 2010 and 2018. Natural gas production, which is mostly in association with oil production, is appreciable. Its contribution to commercial energy consumption, on the other hand, had increased from 6% in 2009 to 15% in 2012. Natural gas and hydro are the dominant energy sources for grid connected electricity generation, with natural gas contributing about 80%. About 11% of the natural gas produced was flared by the end of 2018. Up to the early 1960s coal production was significant and dominated the commercial energy supply. It was also the predominant source of energy for rail transportation and electricity generation. However, partly due to fuel substitution to oil and gas, coal production and utilization dropped to an insignificant level.

With respect to the renewable energy resources, hydro power plants entered the Nigerian energy scene in the early 20th century. Presently, hydro is the second largest energy resource for electricity generation in the country, contributing about 20% of the total installed grid-connected electricity generating capacity.

Fuelwood is the dominant source of energy in the domestic sector. It is also used in other sectors of the economy such as cottage industries. The share of fuelwood and charcoal in total energy consumption is estimated at over 60%. This is largely due to inability of low income consumers to have access to substitutes such as kerosene, cooking gas and electricity. Over the years the fuelwood supply/demand imbalance in some parts of the country has adversely affected the economic well-being of the people. On the national level, increasing fuelwood consumption contributes to deforestation with consequent desertification and soil erosion.

Solar energy intensity is generally high in the country. Solar energy is widely used in the country for drying purposes. But it is normally lumped with the informal sector, which is not adequately captured in the national accounts. Nevertheless, there has been significant increase in the solar photovoltaic systems especially for lighting, water pumping and communications. Solar energy has great potential for the provision of power for rural development.

Energy Security

Over-dependence on oil has slowed down the development of alternative energy resources. Diversification to achieve a wider energy supply mix will ensure greater energy security for the nation. The domestic demand for petroleum products is growing rapidly. The development of alternative fuels from locally available energy resources should therefore be pursued vigorously.

The rural populace, whose needs are often basic, depend to a large extent on traditional sources of energy, mainly fuelwood, charcoal, plant residues and animal wastes. This class of fuels currently constitutes over 60% of total primary energy consumption in the country. Fuelwood supply/demand imbalance in some parts of the country is now a real threat to the energy security of the rural communities. Hence, special attention needs to be paid to the diversification of the energy supply mix in the rural areas.

Even when there exists adequate and diversified energy supply options in the country, the problem of unreliability of supply constitutes a huge drain on the national economy. This leads to energy insecurity and had constituted a major characteristic of the energy crisis experienced by the country over the last decades, especially with regards to the supply of electricity and petroleum products. Therefore, attention must be given to adequate production levels and reliable distribution networks for all fuel types to ensure steady economic growth.

Energy Sector Reform

Prior to the Electric Power Sector Reform (EPSR) Act 2005, with the exception of the upstream oil and gas sub-sectors, and to a smaller extent the electricity sub-sector**,** government had been large**l**y responsible for the ownership and operation of the energy sector industries. In particular, investment capital had been sourced from public funds, while the industries had relied on the sense of public interest, within management, as the motivation for responsible and transparent management of the industries.

The funds required for the maintenance and refurbishment of the energy supply infrastructure, and for the expansion of capacity, are enormous. In the face of increasing demands on government for investments in other areas of the economy such as transport, health, education and security, government had been unable to provide the funds needed by the energy sector. Efficient and transparent management of the industries had also not been achieved.

Consequently, established facilities had progressively deteriorated while new capacity had not been added, inspite of increasing demand. Furthermore, the funding and management deficiencies had given rise to inadequate and unreliable supply, especially of electricity and petroleum products, insecurity of the energy supply system and loss of productivity.

It is believed that increased private sector participation in the energy sector will attract new investments to the sector, while the profit motive will assist in solving much of the management problems experienced under public ownership. This restructuring of the sector involved both deregulation and privatization.

In consequence of the above, government has embarked on a reform of the power sector. The direction of the reform is towards private sector leadership of investments in, and operation of, the power sector industries. The privatization of the sector is near completion. The six successor generation companies to the government owned power utility, PHCN, have been fully privatized with all the thermal plants transferred to the private companies that succeeded in their bidding process, while the hydro-plants have been transferred to the concessionaires for long-term periods following successful bidding exercise. The eleven successor distribution companies have also been privatized but with a small percentage of their shares retained by government, while the successor transmission company is government owned.

The upstream oil and gas sector is fully deregulated. In the downstream sector, petroleum products distribution is also deregulated. However, the price of PMS is controlled by government through the Nigerian Midstream and Downstream Petroleum Regulatory Agency (NMDPRA). The Petroleum Industry Act (PIA) 2021, whose objectives include bringing all existing petroleum laws under one legislation has been enacted, establishing clear rules, procedures and institutions for the administration of the petroleum industry in Nigeria.

Institutional Framework

Given the vital role of energy in national development and its impact on every aspect of life, energy planning must be viewed as an integral part of national development planning such that energy development decisions are not taken based on isolated sectoral plans, but rather, closely linked and reconciled with those of the rest of the economy.

A necessary condition for the optimal development of the energy sector is the effective coordination of the various interrelated energy sub-sectors. It is also necessary to coordinate the energy related activities of the non-energy sectors of the economy. In this respect, revision of the NEP at the instance of the Energy Commission of Nigeria (ECN), the government organ for the strategic planning and coordination of national policies on energy, is a strategic development. This development must however be complemented by promoting cooperation in the implementation of the national energy policies and plans between the Energy Commission and relevant Ministries, Departments and Agencies (MDAs), Independent Power Producers (IPPs), Electricity Distribution Companies (EDCs), Petroleum Upstream, Midstream and Downstream Companies, other private energy companies, etc. It is important to realize that in order to increase the efficiency and effectiveness of energy delivery in the country, there is a need to develop the technological capabilities of these energy sector companies to cope with the challenges of future energy development.

There should also exist at state and local government levels, units responsible for energy matters. These would provide necessary links for the formulation of national energy policies, plans and programmes as well as for the execution of some of the programmes.

The successful implementation of the energy policy will require the active participation of the private sector. Therefore, the inputs of the organized private sector and the public are essential in the formulation of policy and implementation of strategies.

Policy Overview

The national energy policy recognizes the multi-dimensional nature of energy and therefore addresses diverse issues such as research and development, energy pricing and financing, legislation, energy efficiency, environment, etc. The overall thrust of the energy policy is the optimal utilization of the nation's energy resources in an environmentally sustainable manner for sustainable development with the active participation of the private sector.

Objectives of Energy Policy

The policy objectives and implementation strategies have been carefully defined with the fundamental guiding premises that energy is crucial to national development goals and that government has a prime role in creating the enabling environment for meeting the energy challenges facing the nation. Furthermore, the dependence on oil can be reduced through the

diversification of the nation's energy resources, aggressive research, development and demonstration (R D& D), human resources development, etc. Consequently, the overall energy policy objectives may be summarized as follows:

i. To ensure the development of the nation's energy resources, with diversified energy resources option, for the achievement of national energy security and an efficient energy delivery system with an optimal energy resource mix.

ii. To guarantee increased contribution of energy activities to national income.

iii. 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.

iv. To guarantee an efficient and cost effective consumption pattern of energy resources.

v. To accelerate the process of acquisition and diffusion of technology and managerial expertise in the energy sector.

vi. To promote indigenous participation in energy sector industries, for stability and self-reliance.

vii. To promote increased investments and development of the energy sector industries with private sector leadership.

viii. To ensure a comprehensive, integrated and well-informed energy sector plans and programmes for effective development.

ix. To foster international co-operation in energy trade and projects development in both the African region and the world at large.

x. To successfully use the nation's abundant energy resources to promote international co-operation.

xi. To promote research and development in, and adoption of, sustainable low carbon and clean energy technologies to mitigate environmental pollution and climate change.

xii. To promote gender sensitivity and special attention to rural energy needs.

xiii. To promote efficiency, conservation and carbon management best practices in the nation’s energy supply chain.

xiv. To ensure comprehensive and up-to-date availability of energy sector data and information.

xv. To ensure effective coordination of national energy planning, programmes and policy implementation.

CHAPTER 2

PETROLEUM POLICY

Crude Oil

Crude oil was discovered in commercial quantities in Nigeria in 1956 while oil production started in 1958. The nation had a proven reserve estimate of about 37 billion barrels of predominantly low sulphur light crude, as at December 2018. The crude oil reserve has remained stagnant at the 37 billion barrels for the past decade due to low exploration for new discoveries and investment. The annual oil production peaked at about 845 million barrels in 1979. There was a decline in production to 451 million barrels in 1983 after a major market collapse that began in 1981 and lasted till 1987. Thereafter, it rose again to 776 million barrels in 1998 and all time high of 912.5 mmbbls in 2005. However, the average production was about 1.896 mbpd from 2002 and 1.778 mbpd as at 2020.

Nigeria has four refineries with a total installed capacity of 445,000 barrels per day. However, capacity utilization is low. Consequently, annual consumption of petroleum products is not fully met by internal production and has to be supplemented by imports. Currently, efforts are being made to increase capacity through private sector participation, especially through conventional and modular refineries.

The nation is clearly over dependent on crude oil for its foreign exchange earnings, which currently contributes about 80%; hence, the economy is vulnerable to the unstable nature of the international oil market. Therefore, there is a need to promote the expansion of the processing sub-sector to allow for the export of value-added petroleum products. Furthermore, it is desirable to diversify the domestic energy mix away from ever-increasing consumption of petroleum products in order to avert any possible conflict between domestic and export requirements.

Oil will continue to play a major role in the nation's economy. At current proven reserve of and production rate, of Nigeria crude oil reserve will last for over five decades. Therefore, there is a strong need to increase the nation’s reserve base through expanded and sustained exploration efforts in the Niger Delta and other frontier sedimentary basins in Nigeria.

Policies

i. The nation shall engage extensively in exploration and production of crude oil and associated liquid petroleum.

ii. The nation shall place emphasis on internal self-sufficiency in processing and export of petroleum products.

iii. The nation shall encourage the participation of indigenous and foreign companies in both upstream and downstream activities of the oil industry.

iv. The nation shall encourage the adoption of environmentally-friendly oil exploration, exploitation, handling and storage methods.

v. The nation shall complete deregulation and privatization of the oil industry.

vi. The nation shall aggressively pursue research and development and human capacity development to derive maximum economic benefit from its oil resources.

Objectives

i. To increase the reserves and the production capacity.

ii. To derive maximum economic benefits from the nation's liquid petroleum resources.

iii. To ensure that refining to consumption ratio is greater than one (1), so as to ensure domestic self-reliance in the production of petroleum products for domestic consumption.

iv. To ensure adequate and reliable supply and distribution of petroleum products to meet the demand of the domestic market.

v. To accelerate the process of technology acquisition and diffusion in the oil industry.

vi. To enhance indigenous capability in the industry in the interest of national security.

vii. To promote the efficient management and environmentally-friendly operation in line with global best practices.

viii. To attract increased private sector capital inflow to the oil industry.

ix. To mainstream and/or integrate climate change considerations in both upstream and downstream activities of the oil industry.

x. To foster the use of best available practices/technology to minimize impacts of oil activity on the project communities/location most vulnerable to environmental/climate change threat.

xi. To minimize adverse environmental impacts of oil activities on the project communities and locations.

xii. To encourage the full participation of indigenous and foreign companies in both upstream and downstream activities of the oil industry.

Strategies

Short-Term

i. Investing in, and intensifying crude oil exploration and production in all Nigerian sedimentary basins and ensuring that acreages put up for bidding rounds are properly pre-estimated with minimal speculations.

ii. Investing in exploration, production and refining activities in other countries to promote national development and energy security.

iii. Maximizing and expanding the refining capacity in the country to cater fully for local consumption and export of petroleum products.

iv. Expanding and promoting research and development activities in the country, including improved access to available data for R & D institutions and universities.

v. Taking appropriate measures to ensure that Nigerians are adequately involved in all sections of the oil industry.

vi. Providing appropriate incentives to attract investments and ensure reasonable returns.

vii. Encouraging local engineering design and fabrication of equipment and spare parts in Nigeria.

viii. Ensuring the use of locally available materials, for oil exploration, production and processing including refining.

ix. Updating laws and regulations constantly to create the enabling environment for increased private sector participation in the oil industry, especially in the downstream sub-sector.

x. Improving the living standards of people in oil producing communities through the provision of socio-economic infrastructure.

Medium-Term

xi. Reviewing, improving and continuation of short-term strategies.

xii. Ensuring that acreages put up for bidding rounds are properly pre-estimated with minimal speculations.

xiii. Ensuring adequate geographical coverage of oil refining and petroleum products distribution network.

xiv. Ensuring the availability of adequate strategic reserves of storage capacity for refined products for at least 90 days of forward consumption.

Long-Term

xv. Reviewing, improving and continuation of medium-term strategies.

Natural Gas

Nigeria's proven natural gas reserves**,** estimated at about 203 trillion standard cubic feet (tscf) as at 2019**,** are known to be substantially larger than its oil resources. Nigeria has the largest gas reserves in Africa but only about 25% of these are being produced or are under development as at 2018. Gas discoveries in Nigeria are incidental to oil exploration and production activities. Gas flaring was progressively curtailed from about 50% in 2001 to 11% in 2017 and about 7% in 2020.

In view of the increasing domestic oil consumption, an economically optimal strategy to replace oil with gas and gas derivatives will enhance the availability of more oil for export. This will also promote the conservation of the oil reserves. Apart from the economic advantage, fuel substitution from oil to gas is more environmentally friendly because gas is a cleaner fuel than oil. In the area of electricity operation, Nigeria has about 13 gigawatts (GW) of installed capacity as at 2021, but mostly less than 5 GW is available in the grid due to inadequate gas supply. The Nigeria Government has a target to increase electricity generation to 30 GW in 2030. This represents a huge development opportunity for Nigeria's domestic gas consumption.

Given the current reserves and rate of exploitation, the Nigerian Natural Gas is expected to last 67 years. It is therefore, strategically important to undertake major investments in the gas sector in order to prepare adequately for gas as a substitute for oil both for domestic needs and foreign exchange earnings.

The continued flaring of natural gas has resulted in a substantial waste of energy resources, in addition to contributing to atmospheric pollution. It is therefore imperative to take effective measures to eliminate routine gas flaring.

Policies

i. The nation's gas resources shall be harnessed and optimally integrated into the national economy, energy mix and industrial processes.

ii. The nation shall intensify efforts in gas exploration and development.

iii. The nation shall put in place the necessary infrastructure and incentives for indigenous and foreign investors.

iv. The nation shall put in place necessary infrastructure and incentives for adequate geographical coverage of the gas transmission and distribution network.

v. The nation shall promote a competitive and efficient domestic market for natural gas and establish indigenous-based natural gas facilities.

vi. The nation shall aggressively pursue research and development and human capacity development to derive maximum economic benefit from its gas resources.

vii. The nation shall develop National Building Code to include Domestic gas piping and installation within residential buildings.

viii. The nation shall develop a corporate social responsibility Document for implementation by the Oil Companies (OCs) in order to end conflict and insecurity in the oil producing areas.

ix. The nation shall should advocate the incorporation of de-sulphurization unit in the existing refinery and also ensure that any new refinery to be built contains de-sulphurization unit to ensure low level of sulphur to an acceptable level of 50ppm as against the current 150ppm

Objectives

i. To determine the level of gas reserves available to the nation.

ii. To eliminate the flaring of associated gas as determined by the government.

iii. To expand the utilization of natural gas as industrial and domestic fuel, as well as for power generation.

iv. To increase the use of natural gas as industrial feedstock for petrochemical**,** pharmaceutical, fertilizer plants, etc.

v. To use gas to diversify the foreign exchange earnings base of the nation.

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

vii. To encourage indigenous entrepreneurial capability in the gas industry including the development of end-use devices.

viii. To ensure reliability of energy supply to all parts of the country.

ix. To support private sector participation in natural gas infrastructure for rapid development of energy intensive industries.

x. To promote efficient and reliable supply of natural gas.

xi. To mainstream and/or integrate climate change consideration in both upstream and downstream activities of the gas industry.

xii. To minimize adverse environmental impacts of gas activities on the project communities and locations.

Strategies

Short-Term

i. Embarking on deliberate exploration and development of gas reserves in all parts of the country.

ii. Encouraging the oil-producing companies to gather and utilize associated gas to eliminate flaring as determined by the government**.**

iii. Imposing appropriate and effective penalties to discourage gas flaring.

iv. Encouraging the establishment of the necessary infrastructure for the effective gathering, transmission and distribution of gas nationwide.

v. Providing incentives to encourage industrial and domestic consumers to use gas or to convert to gas.

vi. Providing incentives to encourage the penetration and use of LPG as alternative cooking fuel nationwide.

vii. Establishing suitable infrastructure for the export of natural gas.

viii. Expanding and promoting gas related research and development outfits in the country.

ix. Formulating suitable urban and regional planning regulations needed for the effective distribution of natural gas to, and its utilization by, domestic, commercial and industrial consumers.

x. Providing necessary incentives to indigenous and foreign entrepreneurs to facilitate their participation in the gas industry.

xi. Ensuring that the price of natural gas is cost-effective.

xii. Providing incentives for the use of LPG and CNG as automotive gas.

Medium-Term

xiii. Reviewing, improving and continuation of short-term strategies.

xiv. Developing gas reserves in all parts of the country.

xv. Implementing suitable urban and regional planning regulations needed for the effective distribution of natural gas to, and its utilization by, domestic, commercial and industrial consumers.

Long-Term

xvi. Reviewing, improving and continuation of medium-term strategies.

Shale Hydrocarbon Resources

Nigeria is endowed greatly in conventional petroleum, nonetheless, fossil fuel is a wasting asset, and hence any future discoveries of shale oil/gas should be welcome for reserves addition apart from expanding the national energy mix. Besides, since conventional petroleum is not presently found in most inland basins, any discovery of commercial quantities of the shale hydrocarbon resources in the associated states will no doubt boost their economy apart from its overall salutary effect on the nation, as a whole.

Oil shale is an organic-rich fine-grained sedimentary rock from which both liquid and gaseous hydrocarbons called shale oil and shale gas, respectively, can be produced. Shale oil and shale gas are unconventional petroleum and are substitutes for conventional crude oil and natural gas, respectively. However, extracting shale oil/gas from oil shale is more costly than the production of their conventional counterparts both financially and in terms of its environmental impact. Deposits of oil shale sedimentary rocks occur around the world, including deposits all around the country. Estimates of global deposits shale oil range from 2.8 to 3.3 trillion barrels.

Policies

i. The nation shall encourage co-ordinated baseline studies and research on shale hydrocarbon resources.

ii. The nation shall put in place the mechanism for development of appropriate legal, fiscal, environmental and other regulations for the guidance and operation of the shale gas/oil industry.

iii. The nation shall encourage indigenous and foreign companies to participate in exploration and exploitation of shale oil/gas.

Objectives

i. To encourage geological studies of Nigerian sedimentary basins for shale hydrocarbon resources.

ii. To increase the national oil and gas reserves base and production capacity.

iii. To expand the national energy mix.

iv. To put in place the appropriate regulatory framework for safe and orderly operation of shale gas/oil industry in accordance with global best practices.

v. To encourage technology acquisition and capacity development for local content value addition.

vi. To gather relevant information on shale gas/oil prospectivity in all sedimentary basins in the country.

Strategies

Short-Term

i. Encouraging and promoting research and development by both public and private institutions for focused studies and geological mapping of shale gas/oil–rich zones in all the sedimentary basins.

ii. Setting in motion appropriate legal and regulatory framework for creating enabling environment for exploration and exploitation of shale hydrocarbons in line with international best practices.

iii. Ensuring land reclamation and zero environmental degradation, including pollution of ground-water resources from chemicals or other materials utilized in shale oil/gas production at project communities and locations.

Medium-Term

iv. Reviewing, improving and continuation of short-term strategies.

v. Delimiting, charting and leasing prospective blocks of sedimentary basins for shale gas exploration and exploitation by indigenous and foreign entrepreneurs as well as the national oil petroleum corporation.

vi. Making adequate provision to improve the living standards of people in shale gas/oil producing areas through provision of appropriate socio-economic infrastructure and other amenities.

Long-Term

vii. Reviewing, improving and continuation of medium-term strategies.

viii. Leasing prospective blocks of sedimentary basins for shale gas exploration and exploitation to indigenous and foreign oil companies.

ix. Encouraging domestication of the technology for production, processing and utilization of shale hydrocarbon resources.

CHAPTER 3

COAL AND TAR SANDS/BITUMEN POLICY

Coal

Available data show that coal of sub-bituminous grade occurs in about 33 coal fields spread over 16 States of the Federation. The proven coal reserves so far in the country are about 650 million tonnes while the inferred reserves are about 2.75 billion tonnes, consisting approximately of 49% sub-bituminous, 39% bituminous and 12% lignitic coals.

Coal mining in Nigeria started in 1906 and recorded an output of 24,500 tonnes in 1916. Production rose to a peak of 905,000 tonnes between 1958 and 1959 with a contribution of over 70% to commercial energy consumption in the country. Following the discovery of crude oil in commercial quantities in 1958 and the conversion of railway engines from coal to diesel, production of coal fell from the beginning of the sixties to only 52,700 tonnes in 1983. This excludes the civil war years and the period of 1970 and 1971 during the reconstruction years, when there was little or no production. Production rose to about 14,390 tonnes in 2000. In 2001**,** coal contributed approximately 0.02% to commercial energy consumption in the country, as compared to 31.9% for oil, 61.9% for natural gas and 6.2% for hydropower.

Nigerian coal has been found suitable for boiler fuel, production of high calorific gas, domestic heating, briquettes, formed coke and the manufacture of a wide range of chemicals including waxes, resins, adhesives and dyes. Their characteristic properties (low sulphur and ash content as well as low thermoplastic properties), make these sub-bituminous coals ideal for coal-fired electric power plant. Some Nigerian coals can also be used to produce formed-coke of metallurgical quality. These potentials of coal need to be effectively harnessed into the country's energy delivery system and export commodity mix through the development of a vibrant coal industry.

From the onset of coal production in Nigeria, the Nigerian Coal Corporation was the only institution active in the coal industry. In 1990, the Federal Government approved the full commercialization of the Corporation. Joint venture arrangements with foreign partners for the exploitation of some of the coal deposits are ongoing. However, there is still the need for increased private sector, as well as indigenous, participation in the activities of the coal industry.

Policies

i. The nation shall pursue vigorously a comprehensive programme of resuscitation of the coal industry.

ii. The nation shall sustain extensive exploration activities to maintain a high level of coal reserves.

iii. The nation shall actively promote private sector as well as local content input in the coal industry.

iv. The nation's exploitation and utilization of coal shall be in line with global best practices.

v. The nation shall explore the techno-economic feasibility of new coal technologies such as coal gasification and coal liquefaction.

vi. The nation shall ensure adequate supply of coal to meet the energy requirements of the country in a cost effective and sustainable manner.

Objectives

i. To promote production of coal to meet domestic needs and for export.

ii. To promote effective utilization of coal to complement the nation's energy needs and as industrial feedstock.

iii. To attract increased investment into, and promote local content input, in the industry.

iv. To promote the utilization of coal in the form of coal briquettes.

v. To increase the contribution of coal by 30% to the national energy mix by 2030 in an environmentally sustainable manner.

Strategies

<u>Short-Term</u>

i. Intensifying the drive for coal exploration and production activities.

ii. Providing adequate incentives to indigenous and foreign entrepreneurs so as to attract investments in coal exploration and production.

iii. Organizing awareness programmes for the use of smokeless coal briquettes as an alternative to fuelwood.

iv. Providing adequate incentives for the large-scale production of coal stoves at affordable prices.

v. Encouraging research and development in the production, processing and utilization of coal.

vi. Minimizing environmental pollution arising from the utilization of coal.

vii. Supporting increased environmental monitoring, including air quality monitoring for existing and/or proposed mines and power stations in the country.

viii. Sustaining the existing emissions performance standard and prevent the construction of coal-fired power station in the country that fails to meet emissions performance standard.

Medium-Term

ix. Reviewing, improving and continuing short-term strategies.

x. Undertaking more detailed geological exploration for coal deposits in the country.

xi. Providing adequate incentives to indigenous and foreign entrepreneurs for the establishment of coal-based industries.

xii. Ensuring land reclamation and zero environmental degradation at project communities and locations.

xiii. Developing adequate infrastructure for handling and transporting coal within and out of the country.

xiv. Introducing clean coal technologies into coal utilization.

xv. Increasing the export capacity of coal.

Long-Term

xvi. Reviewing, improving and continuating medium-term strategies.

xvii. Re-introducing the use of coal for power generation.

Tar Sands/Bitumen

Nigeria is endowed with large quantities of tar sands/bitumen. Preliminary investigation has indicated a resource size of 31 billion barrels of oil equivalent. The heavy crude oil from the tar sands can be a major feedstock for the Kaduna Refinery, which at present relies on imported heavy oil with similar properties.

Bitumen, which is derived from tar sands, is used in road construction, electrical, chemical, petrochemical and other industries. If properly harnessed, the tar sand resource in the country would contribute immensely to the nation's economic resource base. In this regard, government has set up the Bitumen Blocs Committee to supervise the sale of identified bitumen blocs.

Policies

i. The nation shall promote tar sands/bitumen exploration and exploitation.

ii. The nation shall actively promote private sector as well as local content input through small scale ventures in the exploitation of the tar sands/bitumen resources.

iii. The nation shall encourage the adoption of environmentally friendly approach for exploration and exploitation of Tar sands.

Objectives

i. To extract heavy oil from the tar sands/bitumen for refineries.

ii. To conserve foreign exchange used in importing heavy crude oil and also produce heavy crude for export.

iii. To acquire the technology for developing and harnessing the tar sands/bitumen.

iv. To ensure adequate financing, efficient operation and management of the tar sands/bitumen.

v. To encourage local content input in the development of tar sands/bitumen right from its early stage.

vi. To minimize adverse environmental impacts associated with Tar Sands/Bitumen exploration.

Strategies

Short-Term

i. Sustaining the ongoing geological exploration activities for tar sands/bitumen deposits in the country.

ii. Providing appropriate incentives to facilitate investment in the exploration and exploitation of tar sands/bitumen resources.

iii. Establishing an appropriate regulatory framework for the tar sands/bitumen exploration and processing, including implementation of land reclamation and zero degradation activities at project communities and locations.

iv. Providing an appropriate financing facility to support indigenous investments in tar sands/bitumen development.

v. De-emphasizing the importation of heavy crude oil as a way of encouraging the utilization of heavy oils from domestic tar sands/bitumen.

Medium-Term

vi. Reviewing, improving and continuing short-term strategies.

vii. Establishing heavy oil upgrading facilities near the tar sands/bitumen deposits.

viii. Intensifying research and development in the production of lubricants and other heavy oil products from tar sands/bitumen.

ix. Establishing infrastructural facilities for acquiring the technology for harnessing tar sands/bitumen.

Long-Term

x. Reviewing, improving and continuing medium-term strategies.

CHAPTER 4

NUCLEAR ENERGY POLICY

Nuclear energy has found broad application in various socio-economic developments of nations and it is indeed one of the major sources of base load electricity generation in the world today. The technology for harnessing nuclear energy demands great responsibility and expertise. Therefore, it requires careful planning of manpower development, effective stakeholder involvement and availability and utilization of material resources.

Coordinated approach to research, training and development in the areas of nuclear science and technology in Nigeria started in 1976 when the Act establishing Nigeria Atomic Energy Commission was enacted, which gave rise to the establishment of two nuclear energy research centres in 1977. Another nuclear science and technology centre was also established in 1993 and new ones have recently been added**.** Consequently, trained personnel in this area are concentrated in these centres. However, there is need to continuously plan and accelerate the manpower development programme in view of the diverse peaceful applications of nuclear energy within the framework of safety and security concerns.

Crucial to any nuclear programme is the availability of nuclear minerals such as uranium and thorium. In 1947, pyrochlore containing uranium was found in appreciable quantities on the Jos- Plateau and its environs. By 1979, about 617,000 km^2 of land area had been covered by aerial radiometric surveys and another 90,000 km^2 had been covered by other surveys. Recently, a few other studies carried out indicate that these nuclear minerals are contained in the Benue Trough, North West and North East regions of the country. There is the need to extend investigations to other areas of the country suspected to have traces of any of the radioactive minerals.

Uranium ores are complex assemblages of minerals and therefore differ widely in details of composition and texture. The characterization of some of the known uranium ore minerals in the country has been carried out. There is however the need to develop the extraction processes for each of them, on the basis of which a commercially viable pilot plant could be established.

In addition to the generation of electricity, nuclear energy finds many other peaceful applications. In fact, it has been in use in the country for decades for various peaceful

applications in health care delivery system, petroleum industry, agriculture, food preservation, animal husbandry, water resources management**,** pest control, industry, materials analysis**,** and mineral exploration. All these applications will be enhanced by the adequate utilization of the nuclear research reactor, the nuclear accelerator, the industrial irradiator and other facilities. There is also the need to strengthen the existing institutional and regulatory frameworks.

Policies

i. The nation shall promote the development of nuclear energy, and undertake all activities related to peaceful uses of nuclear energy in its entire ramification.

ii. The nation shall pay adequate attention to safety, security and safeguard issues in the pursuit and operation of its nuclear programmes.

iii. The nation shall continuously strengthen all institutional frameworks (legal/legislative), and ensure their effective implementation.

iv. The nation shall continuously fund and encourage the development of the requisite manpower, and provide the enabling environment for the acquisition of competencies and skills needed for the design, construction and operation of the nation's nuclear facilities.

v. The nation shall encourage and support research and infrastructural development necessary to enable rapid domestication of nuclear technology and encourage intellectual property right.

vi. The nation shall facilitate and sustain cooperation with the International Atomic Energy Agency (IAEA) and other international stakeholders in the peaceful use of nuclear energy.

vii. The nation shall ensure that the safe management of nuclear waste is done in an environmentally friendly and sustainable manner taking cognizance of national and international obligations.

Objectives

i. To promote nuclear energy, as an important electricity component in the nation's energy mix.

ii. To promote the study and development of nuclear science and technology in educational institutions.

iii. To promote the development and application of nuclear science and technology in industry, agriculture, medicine and water resources management, as well as other relevant sectors.

iv. To pursue the exploration of nuclear mineral resources in the country.

v. To develop national capability in the deployment of nuclear energy to all areas of socio-economic development of Nigeria and ensure that spin-off benefits are derived within the shortest possible time for sustainable development.

vi. To design and implement the strategy for the integration of nuclear energy into Nigeria's programme of accelerated development as contained in the approved nuclear power roadmap.

vii. To institute the necessary nuclear safety, security and safeguards requirements and obligation in the exploitation of nuclear energy.

viii. To promote the development of appropriate framework necessary to ensure adequate environmental protection and minimize adverse environmental impacts associated with nuclear and other radioactive materials.

ix. To promote the development of appropriate framework necessary to attain self-reliance in nuclear matters in the long term.

x. To ensure that effective policy, legal and regulatory framework, infrastructure and other resources are made available for the provision of safe and sustainable management of spent fuel and radioactive waste.

xi. To enhance national commitment, speedy and sustainable development of nuclear science and technology in the country.

xii. To ensure that all nuclear facilities are operated in a safe, secure and transparent manner in line with international best practices.

xiii. To support all operational service delivery including research to the extent that localization of all industrial/service operations are achieved.

Strategies

Short-Term

i. Strengthening the institutional framework for the operational and regulatory aspects of the nuclear industry.

ii. Developing all necessary legal/legislative frameworks for the smooth operation of nuclear facilities**.**

iii. Developing national capacity in all areas related to the use of nuclear energy and attaining self-sufficiency in human capacity development.

iv. Carrying out research into all areas of peaceful uses of nuclear energy.

v. Ensuring that adequate, safe and secure sites are made available for the construction of nuclear facilities.

vi. Instituting adequate and sustainable measures to ensure effective safety, security and safeguards regimes.

vii. Collaboration with institutions or individuals in Nigeria for the conduct of research into all aspects of nuclear energy.

viii. Creating incentives for career development in nuclear research, nuclear industry or areas of associated spin-off benefits.

ix. Developing appropriate frameworks and mechanisms necessary for environmental protection and management of wastes and spent fuel.

x. Developing appropriate mechanism that will ensure adequate compensation and effective nuclear liability most especially for victims of nuclear accidents.

xi. Undertaking public awareness and enlightenment campaigns on the applications and benefits of the various nuclear application programmes, and how safety, security and safeguards issues are being addressed.

xii. Collaborating with the International Atomic Energy Agency (IAEA), other development partners and friendly countries to develop nuclear energy for peaceful benefits.

Medium-Term

xiii. Reviewing, improving and continuation of short-term strategies.

xiv. Prospecting for and mining radioactive minerals.

Long-Term

xv. Reviewing, improving and continuation of medium-term strategies.

xvi. Establishing appropriate mechanism for local participation in the supply of nuclear energy equipment.

xvii. Construction and maintaining nuclear facilities for the purpose of generating electricity and for other peaceful applications.

xviii. Producing, acquiring, treating, storing, transporting and disposing of any radioactive substances.

CHAPTER 5

RENEWABLE ENERGY POLICY

Renewable energy is energy derived from different sources that regenerates within a relatively short period of time through natural processes. The Nigerian renewable energy resources base is enormous and these include: solar, wind, hydro, biomass and other renewable energy sources (geothermal, tidal and ocean waves, etc).

In twenty years, Nigeria's population is expected to double and aggregate energy demand will triple. Conventional energy sources alone will not meet the challenges of an increasing population at affordable costs and in a flexible manner. To meet the rapidly growing demand for energy, and the challenges posed by climate change and the thrust towards industrialization there has to be a conscious effort to increasingly include renewable energy into the nation's energy mix. Renewable energy has the potential to create jobs, improve livelihoods and open up the market in rural areas. Increasing demand for rural water supply, lighting, health services and the needs of micro enterprises are already driving the market for PVs. This trend will continue to drive small hydro and wind power plants if the supporting legislative and regulatory structures are put in place.

For Nigeria, to achieve its goals of sustainable socio-economic development in line with SDG 7, it is crucial that Renewable Energy development in Nigeria be consistent with the approved National Renewable Energy and Energy Efficiency Policy (NREEEP) of 2015 and Federal Government's ambitious targets in the Electricity Vision 30:30:30 which seeks to generate 30GW in year 2030 with 30% from renewable energy sources.

Hydropower

Hydropower refers to the potential and kinetic energy of water transformed into mechanical and then electrical energy. Despite its high initial capital cost, hydropower provides one of the cheapest and cleanest sources of electricity. Hydropower is one of the major sources of base load electricity generation in Nigeria.

Nigeria is well endowed with large rivers and some few natural falls which are responsible for the high hydropower potential of the country. The Rivers Niger and Benue and their numerous tributaries constitute the core of the Nigerian river system, which offers a renewable source of

energy in the form of hydropower. Hydropower Schemes in Nigeria are generally classified as follows:

- Pico scheme: ≤ 5 kW
- Micro schemes: ≤ 500kW
- Mini schemes: 500kW < Mini ≤ 1 MW
- Small hydropower: 1MW < Small ≤ 30 MW
- Medium Hydropower 30 MW < Medium ≤ 100 MW
- Large hydropower: > 100 MW

The total exploitable large scale hydropower potential of Nigeria is estimated at over 24,000 MW, capable of producing about 86,400 GWh of electricity annually. Only about 13.50% of the nation's large hydropower potential has been developed. Some of the major hydropower stations are Kainji (760 MW), Jebba (540 MW) and Shiroro (600 MW), ongoing Zungeru (700 MW), Mambilla (3050 MW). The Small hydropower potential of Nigeria is estimated at 3,500MW of which only 110 MW which represents about 3% had been developed. There is the urgent need to develop Small Hydropower Plants for provision of electricity for the rural areas and remote settlements.

In Nigeria, hydropower generation capacity accounts for a significant part of the total grid electricity generation mix. Grid electricity production capacity from hydropower sources was 19.50% of total power generation capacity in Nigeria in 2012. However, as at 2018, the hydropower contribution to the national grid was about 20%.

Policies

i. The nation shall fully harness the hydropower potential in the country for electricity generation.

ii. The nation shall pay particular attention to the development of the small, mini and micro and pico hydropower schemes for the growth of the rural economy.

iii. The nation shall exploit hydropower resources in an environmentally sustainable manner.

iv. The nation shall actively promote private sector and indigenous participation in hydropower development.

v. The nation shall support Research and Development activities for local adaptation of hydropower plant technologies.

Objectives

i. To increase the contribution of hydropower to the total electricity supply mix.

ii. To extend electricity to rural and remote areas, through the use of small, mini and micro hydropower schemes to promote economic activities.

iii. To pursue hydropower production in an environmentally friendly and sustainable manner that minimizes the adverse impacts on the environment, ecosystem and population.

iv. To attract private sector investments into the hydropower sub- sector**.**

v. To develop local manufacturing capabilities for hydropower technologies.

vi. To encourage the development of standards on the locally manufactured SHP components.

vii. To encourage local and international collaboration as well as international best practices in hydropower development and utilization.

Strategies

Short-Term

i. Promoting and supporting research and development activities on hydropower exploitation for increased indigenous participation in the planning, design and construction of hydropower projects.

ii. Establishing more hydro-meteorological stations across river basins.

iii. Generating and updating data on all rivers, identifying possible locations for hydropower projects and facilitating detailed survey of the potential SHP sites.

iv. Organizing sensitization workshops, seminars and enlightenment programmes on the roles of SHP in rural development.

v. Introducing tax reductions, soft loans, grants, bilateral concessional funding to encourage private investments and public-private partnerships in the development of hydropower projects.

vi. Putting in place a framework for power purchase agreement between owners of SHP, the grid and users.

vii. Exploiting the multifunctional use of hydropower infrastructure (e.g. flood control, water supply, electricity generation, recreation, etc).

viii. Exploring the potential of hydrokinetic energy for selected rivers.

ix. Ensuring that State Rural Electricity Boards incorporate small-scale hydropower projects in their agricultural, industrial and economic development plans.

x. Supporting cutting-edge research and the development of mitigation techniques and technologies to reduce or eliminate adverse impact of hydropower development and operation on the ecosystem.

Medium-Term

xi. Reviewing, improving and continuing short-term strategies.

xii. Establishing local training institutions to produce skilled manpower in hydropower technology.

xiii. Integrating capacity building in the procurement of hydropower projects to encourage technology transfer to indigenous personnel.

xiv. Encouraging the private sector establishment of Indigenous Manufacturing Industries for hydropower equipment and accessories.

xv. Generation of energy through hydrokinetic system downstream of Jebba Hydropower scheme.

Long-Term

xvi. Reviewing, improving and continuation of medium-term strategies.

Solar

Solar energy is the energy that comes to the earth from the sun and is renewable from the continuing or repetitive current occurring in the natural environment. Solar radiation incident on the earth's surface varies in intensity with location**,** season, day of the month, time of the day, instantaneous cloud cover and other environmental factors. Nigeria lies within a high sunshine belt. Solar radiation is fairly well distributed within the country. The annual average of total solar radiation varies from about 12.6 MJ/m^2-day in the coastal latitudes to about 25.2 MJ/m^2-day in the far North. However, the incorporation of efficient storage devices in solar energy conversion systems will take care of this intermittent nature of the availability of solar radiation. Solar energy utilization is environmentally friendly; consequently when the availability and environmental costs of the utilization of other forms of energy are taken into account, the competitiveness of solar energy will be evident, particularly for low to medium power applications.

Solar radiation conversion technologies are generally either of the solar-thermal type (direct utilization of solar radiation) or of the photovoltaic (PV) type (conversion of solar radiation to electricity using semi-conductor devices). Areas of application of solar thermal technologies include: crop drying, house heating, air-conditioning, preservation of foods and drugs, power

generation, heating of process water for industries, hospitals etc, . On the other hand solar PV power may be utilized in low to medium power applications such as communication stations, television radio, water pumping, refrigeration etc. It may also be used for power supply to remote villages not connected to the national grid. It is also possible to generate PV power for feeding into the national grid.

Most solar-thermal technologies can be supported by the technical expertise existing within the country. However, the solar power infrastructure needs to be strengthened for effective utilization of the energy resource. PV system components require more sophisticated technologies for their manufacture, particularly with regards the PV cells. However, the National Agency for Science and Engineering Infrastructure (NASENI) and the Sokoto Energy Research Centre (SERC) have commenced the production of solar panels in the country.

The use of solar energy technologies in Nigeria is improving especially in the areas of street-lighting, water-pumping and rural electrification. However, substantial work need to be done in the development of solar technology equipment, standards for materials, design and equipment manufacture. United Nations target for 2030 is to double the Renewable energy share in the total final energy consumption (TFEC). The policies shall go in line with the Renewable Energy Master Plan to harmonize them.

Policies

i. The nation shall aggressively pursue the integration of solar energy into the nation's energy mix, which should be based on the established potentials and available technologies nationwide.

ii. The nation shall keep abreast of worldwide developments in solar energy technology and utilization to adopt global best practices.

iii. The nation shall utilize solar energy resources where it is more cost effective and advantageous.

iv. The nation shall support the establishment of local manufacturing industries for solar energy conversion technologies and applications.

v. The nation shall encourage individual and corporate bodies to generate solar power and feed into the grid.

vi. The nation shall encourage research and development in solar energy technology.

Objectives

i. To develop the nation's capability and capacity in the utilization of solar energy.

ii. To use solar energy as the main energy option in rural and peri-urban areas with higher solar energy potential.

iii. To develop the market for solar energy technologies and services.

iv. To develop local manufacture capabilities for solar energy conversion technologies.

v. To encourage individuals and corporate bodies to generate solar power and reduce total dependence on the national grid as well as feeding the excess generated power into the national grid.

vi. To encourage research and development in solar power.

Strategies

Short-Term

i. Intensifying research and development in solar energy technology and applications.

ii. Intensifying human and institutional capacity building in solar energy technologies and applications.

iii. Providing adequate incentives to suppliers of solar energy products and services.

iv. Providing adequate incentives to local manufacturers for the production of solar energy systems and accessories.

v. Introducing measures to fast-track the development of local solar energy industries.

vi. Setting up extension programmes to popularize solar energy technology and solutions especially to the rural and peri-urban communities.

vii. Providing fiscal incentives for the installation of solar energy systems.

viii. Pursuing aggressive mass campaign and advocacy on the use of RE as alternative energy sources.

ix. Developing and enforcing standards for solar energy technologies, products, services and processes.

x. Setting up and maintaining a comprehensive information system on available solar energy resources and technologies.

xi. Encourage the adoption of solar installations in existing infrastructures.

Medium-Term

xii. Reviewing, improving and continuation of short-term strategies.

xiii. Putting in place measures to leverage funding from international agencies and countries that promote the use of solar energy.

Long-Term

xiv. Reviewing, improving and continuation of medium-term strategies.

xv. Encourage design of new residential buildings to accommodate solar installations.

Wind

The Wind is a natural phenomenon related to the movement of air masses caused primarily by the differential solar heating of the earth's surface. Seasonal and locational variations in the energy received from the sun affect the strength and direction of the wind. The annual average wind speed at 10 m heights varies from about 2 m/s in the coastal areas to about 4 m/s in the far north**.** It is possible to convert wind energy to rotary mechanical energy and electrical energy for a variety of uses. Wind energy has been utilized for centuries for water pumping as well as for the milling of grains. For meaningful exploitation of wind energy, a necessary prerequisite is the optimization of the components of wind water pumping and wind electricity generation.

In view of the energy available in the wind, there is a need to embark on a wind energy development programme.

Policies

i. The nation shall commercially develop its wind energy resource and integrate this with other energy resources into a balanced energy mix.

ii. 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.

iii. The nation shall apply global best practices in the exploitation of wind energy resources.

iv. The nation shall encourage the utilization of wind energy for agricultural purposes.

Objectives

i. To develop wind energy as an alternative energy resource.

ii. To develop local capability in wind energy technology.

iii. To use wind energy for provision of power to rural areas and remote communities far removed from the national grid.

iv. To apply wind energy technology in areas where it is technically and economically feasible.

v. To encourage the utilization of wind energy for agricultural purpose.

Strategies

Short-Term

i. Encouraging research and development in wind energy utilization.

ii. Developing skilled manpower for provision of basic engineering infrastructure for the local production of components and spare parts of wind power systems.

iii. Training of skilled local craftsmen to ensure the operation and maintenance of wind energy systems.

iv. Intensifying work in wind data acquisition and development of wind maps.

v. Providing appropriate incentives to producers**,** developers and consumers of wind power systems.

vi. Developing extension programmes to facilitate the general use of wind energy technology.

Medium-Term

vii. Reviewing, improving and continuation of short-term strategies.

viii. Developing local capability through the establishment of local manufacturing in the area of wind energy technology.

ix. Development of wind data acquisition for wind farm development.

Long-Term

x. Reviewing, improving and continuation of medium-term strategies.

Hydrogen

Hydrogen is mostly found in water and organic compounds. Direct thermal, thermoelectric and electrolytic methods are so far employed in the separation of hydrogen from its carriers.

Hydrogen is an environmentally friendly combustible fuel. On combustion, it releases thermal energy and produces water as the only by-product. It is light and has good safety records during storage, transportation and utilization.

Hydrogen can be used in most thermal applications where fossil fuel is being used today. It is particularly used in fuel cells for the generation of electricity and in other thermal energy conversion systems where low weight-to-power ratio is critically required.

Policy

i. The nation shall integrate hydrogen as an energy source in the energy mix of the country.

Objectives

i. To keep abreast of international trends in hydrogen production and application.

ii. To develop local production capacity for hydrogen.

iii. To ensure hydrogen utilization as a preferred energy source, where possible, on account of its high environmental friendliness.

Strategies

Short-Term

i. Encouraging research and development in hydrogen energy related technologies.

ii. Embarking on intensive awareness and sensitization campaign

iii. Building indigenous capacity

Medium-Term

iv. Reviewing, improving and continuation of short-term strategy.

v. Targeting the use of hydrogen in transportation.

vi. Automation and standardization requirement to scale up hydrogen systems.

vii. Developing domestic capacity in hydrogen production and application technologies.

viii. Providing incentives to popularize the use of hydrogen as an energy source.

Long-Term

ix. Reviewing, improving and continuation of medium-term strategies.

Other Renewables

Other renewable energy resources, which are not in common usage worldwide, include ocean waves, tidal energy, ocean thermal gradients, and geothermal energy. There is still much more work to be done on these energy resources in Nigeria. They may in future make contributions to the energy mix of the country.

Among all these, ocean wave and geothermal energy sources have high potential. Nigeria is bounded by Atlantic coast line of about 853km, while geothermal potentials are available in Nasarawa, Jos and Bauchi. If these energy sources are harnessed, it will provide an additional energy into Nigeria energy mix.

Policy

i. The nation shall maintain an interest in other emerging sources of renewable energy.

Objectives

i. To develop a database on the potentials of these emerging energy resources.

ii. To keep abreast of international trends in energy technology development.

iii. To ensure incorporation of any new proven cost-effective energy resource into the energy mix.

Strategies

Short-Term

i. Gathering and disseminating information on the development of these emerging technologies.

ii. Encouraging research and development in the technologies of the exploitation of these emerging energy resources.

iii. Prioritizing the level of need, level of technological development and viability of emerging renewable energy resources.

Medium-Term

iv. Reviewing, improving and continuation of short-term strategies.

Long-Term

v. Reviewing, improving and continuation of medium-term strategies.

CHAPTER 6

BIO–ENERGY POLICY

Introduction

Bio-energy is energy from non-fossil type organic matter referred to as biomass.

Biomass

Biomass is a non-fossil material of biological origin. The biomass resources of Nigeria can be identified as wood, forage grasses and shrubs, animal wastes and wastes arising from forestry, agricultural, municipal and industrial activities, as well as aquatic biomass. The biomass energy resources of the nation have been estimated to be significant.

Fuelwood is solid plant biomass that is used for heating and cooking. Plant biomass can be used as fuel in thermal power plants or converted to produce solid briquettes, which can then be utilized as fuel for small-scale industries. Biogas digesters of various designs are capable of sustaining household, industrial and institutional energy needs. It has indeed been shown that the remaining biomass material after digestion is a better fertilizer than the original waste. The intensive application of this will reduce the existing heavy reliance on chemical fertilizers.

The abundant energy available from biomass can be meaningfully introduced into the nation's energy mix through the development of a comprehensive programme. The programme should encompass fully supported research, development, demonstration and manpower training components.

Policies

i. The nation shall effectively harness non-fuelwood biomass energy resources and integrate them with other energy resources.

ii. The nation shall promote the use of efficient biomass conversion technologies.

iii. The nation shall improve measures required to support a greater degree of efficient forest thinning and enhance the collection and use of forest residues.

iv. The nation shall enhance the demand side measures that support the use of biomass for the production of renewable energy.

v. The nation shall undertake the life cycle analysis of all biomass feedstock to determine their relative climate change benefits.

vi. 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.

vii. The nation shall incorporate waste-to-energy strategy in its overall waste management framework.

Objectives

i. To promote biomass as an alternative energy resource especially in the rural areas.

ii. To promote efficient use of agricultural residues, animal and human wastes as energy sources.

iii. To reduce health hazards arising from utilization of biomass.

iv. To focus biomass utilization close to production, for community heating schemes and domestic heating, particularly off the national grid network.

Strategies

Short-Term

i. Developing extension programmes to facilitate the general use of new biomass energy technologies.

ii. Promoting research and development in biomass energy technology.

iii. Establishing pilot projects for the production of biomass energy conversion devices and systems.

iv. Providing adequate incentives to local entrepreneurs for the production of biomass energy conversion systems.

v. Training of skilled manpower for the maintenance of biomass energy conversion systems.

vi. Developing skilled manpower and providing basic engineering infrastructure for the local production of components and spare parts for biomass systems.

vii. Promoting electricity and heat generation from biomass waste.

viii. Mainstreaming waste-to-energy strategy in the overall waste management framework.

ix. Promoting the production of biomass sources across the ecological zones of Nigeria for sustainable biomass technology production.

Medium-Term

x. Reviewing, improving and continuation of short-term strategies in line with best practices.

xi. Adopting measures to ensure that biomass is converted to energy in an efficient manner to maximize its benefit while at the same time to ensure that biomass is produced in a sustainable way.

Long-Term

xii. Reviewing, improving and continuation of medium-term strategies.

Fuelwood

Over 60% of Nigeria's population depends on fuelwood for cooking and other domestic uses**.** The consumption of fuelwood is worsened by the widespread use of inefficient cooking methods, the most common of which is still an open fire. This system has a very low thermal efficiency and the smoke is also hazardous to human health, especially to women and children who mostly do the cooking in homes.

The rate of consumption of fuelwood far exceeds the replenishing rate to such an extent that desert encroachment**,** soil erosion and loss of soil fertility are now serious problems in the country.

The largest sources of fuelwood at present are from open forests, communal woodlots and private farmlands. Supply from natural forest regeneration is continuously being diminished due to the additional activities such as the clearing of forests for development projects, agricultural and industrial activities. Since forests are essential for healthy environment and as a check on wind and water erosion and desertification, and also serve as energy sources, it is essential that they are cropped on a rational basis.

Policies

i. The nation shall promote the use of alternative energy sources to fuelwood.

ii. The nation shall promote improved efficiency in the use of fuelwood.

iii. The nation shall de-emphasize the use of wood as a fuel in the nation's energy mix.

iv. The nation shall intensify efforts to increase the percentage of land mass covered by forests in the country.

v. The nation shall ensure that harvested areas are regenerated.

vi. The nation shall promote the commercial growing of fuel wood.

vii. The nation shall promote energy conservation.

Objectives

i. To conserve the forest resources of the nation.

ii. To greatly reduce the percentage contribution of fuelwood consumption in the domestic, agricultural and industrial sectors of the economy.

iii. To mitigate the ecological problems of desert encroachment**,** soil erosion and deforestation.

iv. To facilitate the use of alternative energy resources to fuelwood.

v. To reduce health hazards arising from fuelwood combustion.

vi. To invest in community education/sensitization regarding benefit and disadvantages of using wood for energy.

vii. To ensure that forest greenhouse gas balance is maintained.

Strategies
Short-Term

i. Organizing systematic public enlightenment campaigns on the problems of desertification and soil erosion arising from deforestation.

ii. Disseminating the alternative technologies to fuelwood through extension programmes, pilot plants etc.

iii. Cultivating improved and fast growing tree species needed to accelerate the regeneration of forests.

iv. Improving on appropriate technologies for the utilization of alternative energy sources to fuelwood.

v. Improving appropriate efficient wood stoves in the short term.

vi. Encouraging the establishment of private and community woodlots for supply of fuelwood in the short term.

vii. Establishing micro-credit facilities for entrepreneurs, especially for women groups, for the establishment and operation of commercial fuelwood lots and the production of renewable energy devices and systems.

viii. Establishing the production of renewable energy devices and systems.

ix. Ensuring the availability and effective distribution of alternative energy sources to fuelwood at all times.

x. Establishing training programmes on the use, maintenance and fabrication of efficient woodstoves and other alternative technologies.

xi. Ensuring the existence of effective forestry laws to stop the willful felling of trees.

xii. Ensuring effective enforcement of the forestry laws.

xiii. Disseminating the alternative technologies to fuelwood through extension programmes and pilot plants etc.

Medium-Term

xii. Reviewing, improving and continuation of short-term strategies in line with best practices.

xiii. Advancing the development of alternative fuel wood technologies

xiv. Increasing the area covered by forest reserves.

xv. Improving an effective system of forest regeneration.

xvi. Developing an appropriate pricing structure to encourage substitution from fuelwood to alternative fuel types.

Long-Term

xvii. Reviewing, improving and continuation of medium-term strategies in line with best practices.

Biofuels

Biofuel refers to liquid fuels derived from biomass. Biofuel production is a major and unique way of integrating the agricultural sector of the economy with the energy sector. The benefits of biofuel include environmentally friendly fuel, additional tax revenue for the government from the economic activities of the sector, job creation, increased economic development and empowerment of the rural communities, improved farming techniques, increased agricultural research, increased crop demand, and reduction in overall Green House Gas (GHG) emissions.

The Federal Government of Nigeria in August 2005 directed the implementation of Automotive Biofuel Programme for Nigeria by the Nigeria National Petroleum Corporation. Based on current demand for gasoline in the country, at 10% blending ratio with biofuel ethanol, about 1.45 billion litres will be required for the country. This is expected to increase to about 5.65 billion litres by 2030. It is also estimated that market demand for biodiesel will be about 1.78 billion litres by 2030 as compared to baseline market possibility of about 460 million litres for a 20% blend for biodiesel. The biofuel production programme aspires to achieve 100% domestic production of biofuels consumed in the country in the long term.

Policies

i. The nation shall improve on the link between the agricultural sector and the energy sector.

ii. The nation shall promote the blending of biofuels as a component of fossil-based fuels in the country as required for all automotive use. The blend shall involve the process of upgrading fossil-based fuels.

iii. The nation shall promote investments in the biofuels industry.

iv. The nation shall grant biofuels pioneer status for an initial 10-year period with the possibility of additional 5-year extension.

v. The nation shall support the emergence of an industry in which substantial portion of feedstock used by biofuel plants will be produced by large – scale producers and out growers.

vi. The nation shall ensure that biofuel industry benefit from carbon credit.

Objectives

i. To gradually reduce the nation's dependence on fossil fuels while at the same time creating a commercially viable industry that can precipitate sustainable domestic job.

ii. To gradually reduce environmental pollution.

iii. To firmly establish a thriving biofuel industry utilizing agricultural products as a means of improving the quality of automotive fossil-based fuels in Nigeria.

iv. To promote job creation, rural and agricultural development, and technology acquisition and transfer.

v. To provide a framework capable of attracting foreign investment in the biofuels industry.

vi. To streamline the roles of various tiers of government in order to ensure an orderly development of the biofuels industry in Nigeria.

vii. To involve the oil and gas industry in the development of biofuels in Nigeria.

Strategies

Short-Term

i. Creating public awareness and consumer acceptance

ii. Encouraging integrated (plants and plantations) biofuels operators to set up agricultural service companies to support out-growers scheme.

iii. Mandating biofuel producers to establish public private partnership with biofuels feedstock out-growers.

iv. Facilitating easy market entry for intending biofuel operators through supportive regulations on biofuel activities.

v. Granting pioneer status-tax holiday to all registered businesses engaged in biofuels related activities.

vi. Granting 10-Year import duty waiver for biofuels equipment not produced locally.

vii. Exempting biofuel companies from taxations, withholding tax and capital gains tax in respect of interest on foreign loans, dividends and services rendered from outside Nigeria to biofuel companies by foreigners.

viii. Granting a single-digit interest on a preferential loan to be made available to investors in the biofuels industry to aid the development of large-scale out-growers schemes and co-located power generating plants.

ix. Establishing agro-allied industries capable of benefiting from the incentives put in place to foster the development of the agro-allied industry in addition to other incentives.

Medium-Term

x. Reviewing, improving and continuation of short-term strategies in line with best practices.

xi. Establishing a research and development fund to encourage synergy between the private and public sectors in R and D in which all biofuel companies shall contribute 0.25% of their revenue for research in feedstock production, local technology development and improved farming practices.

xii. Persuading biofuel producers to use auditable feedstock weighing equipment and methodologies as may be prescribed.

Long-Term

xii. Reviewing, improving and continuation of medium-term strategies in line with best practices.

CHAPTER 7

ELECTRICITY POLICY

Electricity is a form of energy, which enjoys considerable and diverse applications because of its flexibility and ease of transmission and distribution. Availability of electricity remains a major factor in the location of industries and a strong instrument of social development. Its supply is however still inadequate in the country.

Commercial electricity is generated mainly from hydropower, steam and gas turbines in Nigeria. The installed capacity for electricity generation**,** which was 98% owned by the Federal Government, increased by a factor of 6 over the period 1968 to 1991 and by 1991, stood at 5881.6 MW**.** No further addition to generating capacity was experienced over the subsequent decade**.** Over the years, the availability varied from about 27% to 60% of installed capacity, while transmission and distribution losses accounted for about 28% of electricity generated**.** In December 2001, the available generating capacity was raised to 4000 MW, but this soon dropped to 2,600 MW within the first quarter of 2002. As at second quarter of 2018, the installed grid generating capacity was 12,910.40 MW with average available capacity of 7,652.60 MW, transmission wheeling capacity at 8,100 MW and 5,375 MW being the highest peak generated in the country but this dropped to 3,027.4 MW as at July 2018.
The annual consumption of electricity has been increasing very rapidly over the last three decades. It increased from 1,273 GWh in 1970 to 29,573 GWh in 2012 and decreased to 25,215GWh in 2017. This however represents a suppressed demand caused by inaccessibility to the national grid and inadequacies of the electricity supply. One consequence of this is that various industries and other consumers have installed generators, whose total capacity is estimated to be at least 80% of installed capacity of the national grid.

In recent times, the domestic sector has accounted for over 50% of the grid electricity consumed in the country while the commercial and industrial sectors have accounted for about 25% each.

In view of the ever-increasing demands for electricity in the country, there is the need to align National Energy Plans with the provisions of the Electric Power Sector Reform (EPSR) Act of 2005 to ensure commerciality of the electricity value chain, attract investment to the sub-sector, increase and utilize the available installed capacity and also decrease transmission and distribution losses. These justify the on-going reforms of the sub-sector.

Policies

i. The nation shall create an enabling environment to ensure a steady, reliable and competitive electric supply of power at all times for industrial, commercial and social activities.

ii. The nation shall continue to engage intensively in the development of electricity value chain and ensure availability of local capability to support the sector.

iii. The nation shall continue to promote private sector participation in the electricity sub-sector, while ensuring broad-based participation of Nigerians investors.

iv. The nation shall continue to pursue measures to ensure a strong and diversified energy mix.

v. The nation shall pursue market competitive and sustainable power.

vi. The nation shall encourage the state and local governments to provide access to electricity to the rural areas through off-grid and other rural electrification prgrammes.

Objectives

i. To make electricity available, accessible, affordable and reliable 100% to the population by the year 2030

ii. To stimulate industrialization in the rural areas in order to minimize rural-urban migration.

iii. To provide reliable, stable and secured power supply to the consumers, especially to industries.

iv. To ensure the removal of bottlenecks militating against the utilization of the full capacity of the existing electric power plants.

v. To broaden the energy options for generating electricity.

vi. To attract adequate investment capital, both foreign and domestic**,** for the development of the electricity industry.

vii. To maximize access by Nigerians to the investment opportunities in the electricity industry.

viii. To provide enabling environment for the local assembling and manufacturing of electrical components, within the country.

Strategies

Short-Term

i. Strengthening the institutional framework for the operational and regulatory aspects of the electricity industry.

ii. Establishing a viable cost reflective tariff that will encourage the private sector's investment in the power sector.

iii. Reinforcing the transmission network and supporting the development of the distribution network expansion to allow consumers to enjoy steady and reliable supply of electricity. Encouraging research and development in the generation, transmission and distribution of electricity.

iv. Regulating import duties to be paid on generation, transmission and distribution materials/equipments utilized in the whole electricity supply chain, to encourage investment and local production of power components.

v. Encouraging onshore training facilities as a primary source of human capital capacity development in the power sector.

vi. Ensuring the participation and involvement of indigenous engineers and applied research groups in the execution of on-going and future projects right from feasibility studies, with the objective of establishing local capacity in the long term.

vii. Developing a bankable feasibility studies for development of Renewable, coal, nuclear and large hydropower sources for power generation.

viii. Creating enabling 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

ix. Intensifying national effort in training, research and development in using nuclear, solar, wind and other renewable resources for electricity generation.

x. Taking effective measures to ensure the security of electricity supply components within the value chain.

xi. Providing appropriate incentives and support to investors to ensure adequate returns on investment.

xii. Providing enabling environment and encouraging financial institutions to support indigenous investments in the electricity industry.

xiii. Encouraging off-grid generation and supply of power in remote or isolated areas.

xiv. Ensuring the proper operationalization and utilization of the rural electrification fund to facilitate electrification of rural areas.

xv. Ensuring the proper operationalization of an affordable tariff regime for the low income and especially physically challenged electricity consumers, and providing a mechanism for funding the subsidy within the cost reflective tariff structure

xvi. Carrying out National Electricity Demand Studies, to cover 20 to 25 years, and to be updated every 5 years.

Medium-Term

xix. Reviewing, improving and continuation of short-term strategies.

xx. Establishing and strengthening basic engineering infrastructure for the local manufacture of power systems components.

xxi. Ensuring a balanced electricity supply mix to meet the set target

xxii. Establishing commercial bankable agreement, within the chain.

Long-Term

xxi. Reviewing, improving and continuation of medium-term strategies.

CHAPTER 8

POLICY ON ENERGY UTILIZATION

Industry

The industrial sector is one of the major energy consuming sectors and it accounts for about 25% of total commercial fuels currently consumed in the country.

Inadequate and unreliable supply of energy to industry is a major contributor to low industrial capacity utilization. To sustain the expected fast pace of industrialization in the future, reliable and appreciable supply of energy will be needed by Nigerian industries. The considerable energy resource base of the country is enough to satisfy the industrial energy demand under any plausible scenarios in the foreseeable future. The varied nature of the energy resource base allows for considerable flexibility in energy mix options. Recent findings indicate the existence of considerable scope in the improvement of energy efficiency and conservation in the industrial sector. It is essential that Nigeria improves its international competitiveness by accelerating transition to a low-carbon and resource-efficient economy particularly in the energy-intensive industries such as steel, non-ferrous metals, paper, and the chemicals industry.

Policies

i. The nation shall ensure that an adequate supply of energy is made available.

ii. The nation shall place emphasis on local sourcing of all the energy types to be used by industries.

iii. The nation shall pursue the optimal utilization of its available energy types for the various industrial activities in an environmentally sustainable manner.

iv. The nation shall ensure energy efficiency and conservation in industry.

v. The nation shall enhance the growth of cottage and small-scale industries through adequate supply of energy for the production processes.

Objectives

i. To encourage maximum capacity utilization by industries.

ii. To remove the burden of capital investments in energy supply infrastructure from the industries.

iii. To ensure national security and self-reliance.

iv. To ensure a balanced mix in the use of the nation's energy resources in the industrial sector.

v. To ensure long term availability of the nation's energy resources through the encouragement of energy conservation practices.

vi. To ensure the efficient utilization of all energy types and development of adequate energy management capabilities (human and equipment) in the industrial sector.

vii. To use energy in such a manner as to ensure minimal negative environmental impact as a result of industrial activities.

Strategies

Short-Term

i. Establishing a data bank on energy supply, demand and consumption in the industrial sector.

ii. Intensifying research and development efforts to determine the appropriate energy types for different industrial applications.

iii. Strengthening institutional arrangements to ensure energy conservation and efficient use of energy in industries.

iv. Providing adequate incentives to encourage industries to switch over to more appropriate energy types through import custom waivers, for example.

v. Ensuring strict compliance with energy related environmental pollution standards.

vi. Ensuring the development of appropriate energy inputs for small scale rural industries.

vii. Encouraging industries to sell excess electricity generated to other users.

viii. Providing adequate incentives to encourage industries to develop energy management capabilities.

ix. Implementing energy audits in the industrial sector to identify and quantify the structure of energy supply, demand, utilization patterns, efficiencies and substitution potentials etc., for both the small scale and large-scale industrial enterprises.

Medium-Term

x. Reviewing, improving and continuation of short-term strategies.

Long-Term

xi. Reviewing, improving and continuation of medium-term strategies.

Agriculture

Nigeria is an agrarian country and up until the 70s, the agricultural sector formed the backbone of the nation's economy. Most Nigerian farmers, who produce over 80% of the food needs of the country, live in the rural areas with little access to electricity and petroleum fuels and therefore rely mainly on manual techniques and solar energy in executing most pre- and post-harvest agricultural operations.

In developing an energy policy framework for the agricultural sector, the socio-economic status of the key players in the sector (i. e. rural farmers) as well as the energy conservation parameters has to be in proper focus. However, the growing energy needs of large-scale mechanized agriculture should also be considered.

Applications of current knowledge in key areas of nuclear, solar and other energy resource technologies to crop and animal production, forestry, fisheries, food science and technology are not well developed in this country. There is therefore the need for the formulation of a well-articulated agricultural energy development strategy, which will achieve food security, using techniques offered by nuclear science and other energy resources. It should also address capacity building in energy science with rational management of available human and material resources and the protection of the environment.

Policies

i. The nation shall ensure adequate and reliable supply of energy to the agricultural sector.

ii. The nation shall ensure that appropriate sources of energy are utilized judiciously and efficiently for the overall agricultural activities, with minimum harm to the environment.

iii. The nation shall emphasize the use of affordable, adaptable, reliable and sustainable agricultural technologies, possessing flexible energy utilization capabilities.

iv. The nation shall ensure sustainable storage facilities for agricultural products using energy efficient technologies.

Objectives

i. To increase agricultural productivity and efficiency through the use of appropriate energy sources.

ii. To exploit alternative sources of energy especially bio-energy resources (agro-forestry wastes), thereby minimizing the heavy dependence on electricity and petroleum in the total energy mix of the agricultural sector.

iii. To enhance the productive capacity of rural farmers who mainly rely on the cumbersome manual methods of farming.

iv. To develop and promote efficient technologies that would be flexible in their energy requirement.

v. To promote the establishment of storage facilities that would be flexible in energy requirement for all agricultural products especially the seasonal products.

Strategies

Short-Term

i. Supporting research and development activities for the evolvement of appropriate technologies that can use available/multiple energy sources, including renewable energy sources.

ii. Developing improved crops, quick growing trees for aforestation, and energy crops.

iii. Disseminating the developed technologies through extension programmes in the farming communities.

iv. Training the existing extension personnel in effective dissemination of the newly developed technologies.

v. Promoting the use of renewable energy resources for agriculture.

vi. Establishing a databank on energy demand, supply and consumption in the agricultural sector.

vii. Developing, training, and disseminating adaptable storage technologies.

viii. Implementing energy audits in the agricultural sector to identify and quantify the structure of energy supply, demand, utilization patterns, efficiencies and substitution potentials etc., for both the small scale and large-scale farming.

Medium-Term

ix. Reviewing, improving and continuation of short-term strategies.

x. Developing simple agricultural machines that can use multiple energy sources.

xi. Providing incentives for cost effective and adequate energy supply for agricultural activities.

Long-Term

xii. Reviewing, improving and continuation of medium-term strategies.

Transport

About 60% of world's oil is consumed in the transport sector. To achieve significant savings in this sector, the International Energy Agency (IEA) recommends action on:

- Fuel-efficient tyres;
- Mandatory fuel efficiency standards for light-duty vehicles;
- Fuel economy of heavy-duty vehicles;
- Eco-driving.

In Nigeria, the transport sector, especially the road transport mode, accounts for a large percentage of the nation's petroleum products consumption. This pattern in the nation's energy consumption is expected to continue. Furthermore, increased needs for road transport services contribute significantly to the higher energy consumption in the transport sector. The consequence of the above is increased pressure on the nation's available petroleum products and the need to ensure adequate and sustainable availability of these products, as well as strategies to harness alternative energy sources.

Fortunately, the nation has identified other alternative energy options such as natural gas, biofuels and electricity, which can be introduced into the transport sector. These measures should be augmented with other cost-effective strategies that will cut down on the demand for oil products and minimize environmental degradation arising from energy consumption in the transport sector. Looking to the future, it is therefore important that Nigeria expands its transport energy efficiency.

Policies

i. The nation shall vigorously pursue the development of an optimal energy mix for the transport sector with particular attention to gas.

ii. The nation shall ensure regular and adequate availability of all commercially viable fuel types for the transport sector.

iii. The nation shall ensure the use of energy efficient and environmentally friendly technologies in the transport sector.

iv. The nation shall vigorously promote the development of mass transit systems.

v. The nation shall pursue the development of an integrated transportation system through inter-modal transportation systems.

Objectives

i. To establish a rational utilization of available energy types for various transport applications.

ii. To promote a reliable and efficient use of energy with minimal negative environmental impact.

iii. To promote adaptive technology in energy utilization in the transport sector.

iv. To promote efficient and reliable operation of the transport sector so as to enhance economic growth.

v. To promote effective and efficient public transit systems.

vi. To promote inter-modal integration so as to enhance rational and efficient utilization of energy.

vii. To ensure that urban and commercial development planning takes into account the likely implications for transport and energy demand.

Strategies

Short-Term

i. Establishing a databank on the energy consumption pattern of the transport sector.

ii. Maintaining adequate stocks of the various transport fuels at levels that will ensure internal fuel security.

iii. Encouraging the development and use of mass transit systems.

iv. Pursuing and encouraging the establishment and use of inter-modal system that will ensure rational utilization of energy resources.

v. Using more stringent traffic management and speed limits to reduce travelling speeds on motorways and thereby cutting fuel consumption and transport emissions.

Medium-Term

vi. Reviewing, improving and continuation of short-term strategies.

vii. Encouraging the use of gas for commercial tri-cycles and private transportation, petrol for private cars and low-powered commercial transportation , electricity, gas and diesel for commercial mass transit (road and rail), and diesel for inland water, sea and other heavy powered engines.

viii. Pursuing vigorously the introduction of compressed natural gas into general use in the rail and road transport systems.

ix. Encouraging a shift towards more energy- efficient transportation systems like electric cars.

x. Maintaining an active interest in emerging and potentially more energy-efficient transport technologies, such as electric trains and buses for mass transit.

Long-Term

xi. Reviewing, improving and continuation of medium-term strategies.

Households

In Nigeria, the household sector is a large consumer of total delivered final energy in the economy. In spite of the uncertainty surrounding traditional and other biomass consumption in the country, when taken into consideration the household sector accounts for a significant percent of national energy consumption. The biomass is mainly wood-based consisting of fuelwood and charcoal. The fuelwood is gathered most often by women and children in both semi-urban and rural areas expending the time that would have been used on more value-adding activities. However, it is noteworthy that fuelwood is now on an increasing commercial scale in the country. LPG, kerosene and electricity are chiefly household and commercial sector fuels.

There exists a glaring dichotomy in the household energy consumption pattern between the urban and the rural households. While the bulk of the household commercial energy is consumed in the urban household sub-sector, majority of the traditional energy resource is consumed in the rural household sub-sector which incidentally is home to a larger population of the citizenry.

The energy services in the sector are essentially for cooking, lighting, cooling and other various miscellaneous electrical appliances usage. Studies have revealed that while the average high income urban household spends less than 10% of its income on energy, the low income household spends about 20% of its income on energy services. Appliances and equipment represent one of the fastest-growing energy loads in most countries. Considering all these, any energy demand management and supply strategy must pay particular attention to the household sector.

Policies

i. The nation shall vigorously pursue the development of an optimal energy mix for the household sector.

ii. The nation shall ensure regular and adequate availability of all fuel types for the household sector.

iii. The nation shall ensure the use of energy efficient and environmentally friendly technologies in the household sector.

iv. The nation shall ensure improved energy performance of building components and systems.

Objectives

i. To establish a sustainable consumption pattern of available energy sources.

ii. To promote adaptive technology in energy utilization in the household sector.

iii. To promote extensive use of renewable energy in both urban and rural households.

Strategies

Short-Term

i. Strengthening and populating the databank on the energy consumption pattern of the household sector taking into consideration both urban and rural household sub-sectors.

ii. Establishing an energy appliance labelling scheme.

iii. Encouraging the use of liquefied petroleum gas (LPG) or cooking gas as well as solar water heating systems in households.

iv. Discouraging heating and cooking with electricity in households.

v. Pursuing vigorously the electrification programme for both urban and rural households.

vi. Encouraging extensive use of renewable energy through incentives to households.

Medium-Term

vii. Reviewing, improving and continuation of short-term strategies.

Long-Term

viii. Reviewing, improving and continuation of medium-term strategies.

Commercial/Services

The commercial/service sector in the country is still in a developing process. Though the energy consumption trend in this sector is not as high as that of the industry, transport or household sector, however going by the international trend, it is believed that as the nation gravitates from a developing toward a developed economy, the service sector energy demand will be on the increase.

As the economy tends toward a service economy, the energy requirement of the sector may be competing with those of the energy consuming sectors of the economy. Buildings account for about 40% of energy used in most countries.

Nigeria has no energy standards for commercial buildings, which form an important component of the building sector in urban areas. Consequently, there is an urgent need to develop and implement mandatory energy efficiency standards for commercial and public buildings.

Policies

i. The nation shall vigorously pursue the development of an optimal energy mix for the services sector.

ii. The nation shall ensure regular and adequate availability of all fuel types for the services sector.

Objectives

i. To establish a rational utilization of available energy types for various services applications.

ii. To promote adaptive technology in energy utilization in the services sector.

Strategies

Short-Term

i. Establishing a databank on the energy consumption pattern of the services.

ii. Implementing building codes and certification schemes for public and commercial buildings.

iii. Promoting passive energy houses and zero-energy buildings.

iv. Developing and implementing energy performance test standards and labeling.

v. Phasing out incandescent bulbs and adopting efficient lighting technology in public and commercial buildings by reducing duties on importation of energy saving bulbs and encouraging local manufacturers.

vi. Ensuring least-cost lighting in non-residential buildings.

vii. Targeting market share of net zero energy consumption building in all new construction by 2025.

viii. Promoting the adaption of energy management and control systems that reduce energy consumption and better target energy saving opportunities through incentives

Medium-Term

ix. Reviewing, improving and continuation of short-term strategies.

Long-Term

x. Reviewing, improving and continuation of medium-term strategies.

CHAPTER 9

ENERGY EFFICIENCY AND CONSERVATION POLICY

There is significant potential for energy savings in the supply and demand sides of the nation's energy sector. Therefore, sector-wide adoption of supply and demand sides energy efficiency and conservation measures in the entire energy production and utilization is imperative.

Since expenditure on energy constitutes a large proportion of the country's GDP and a particularly large proportion of poor household expenditure, it is necessary to emphasize the effective and efficient use of energy. Fuel substitution is equally important to reduce the negative impact of the use of some fuels on the environment and to reduce the cost of energy services. For instance, substitution in the use of wood-fuel with LPG will reduce deforestation.

Energy efficiency and conservation is imperative in all sectors. As such, it is important to operationalize the energy efficiency measures in the approved 2015 NREEEP and other extant policies and regulations which accorded priority to residential, industrial, transportation, services/commercial, agriculture and energy efficient building designs.

Policies

i. The nation shall adopt and promote energy efficiency and conservation best practices in the exploration and utilization of the nation's energy resources.

ii. The nation shall mainstream energy efficiency and conservation best practices into all sectors of the economy.

iii. The nation shall adopt appropriate energy pricing, metering, and billing mechanisms.

iv. The nation shall integrate energy efficiency and conservation studies into the curricula of educational institutions.

v. The nation shall adopt, promote and enforce standardization of energy appliance standards and code for energy efficiency and conservation technologies.

Objectives

i. To guarantee energy access for all at appropriate costs and in a sustainable and environmentally friendly manner.

ii. To monitor the energy use patterns of the various sectors of the economy.

iii. To encourage and incentivize end-users to adopt energy efficiency best practices, minimize energy wastages and enhance energy security.

iv. To ensure the prudent exploitation of the nation's renewable and non-renewable energy resources.

v. To enhance self-reliance in the prudent exploitation of the nation's renewable and non-renewable energy resources.

vi. To reduce adverse effects of energy related activities on the environment.

vii. To increase the proportion of hydrocarbon resources available for special applications such as industrial feedstock and for export.

viii. To eliminate avoidable investments by promoting the development of local contents in energy supply infrastructure.

Strategies

Short-Term

i. Strengthening existing institutional and legal framework for the promotion of energy efficiency and conservation.

ii. Strengthening national, regional and international collaboration on energy efficiency and conservation.

iii. Adopting appropriate policy instruments – building standards/codes, mandatory labeling, mandatory energy audit, energy use disclosure, soft loans, tax credits, investment subsidies, etc.

iv. Conducting comprehensive energy end-use analysis in various sectors of the economy.

v. Mandating energy audits in key sectors of the nation's economy.

vi. Promoting education, information and public awareness campaign on energy efficiency and conservation best practices.

vii. Promoting and creating enabling environment for the establishment of Energy Services Companies (ESCOs).

viii. Launching a national Demand-Side Management (DSM) initiative.

ix. Providing economic, fiscal and financial incentives to promote energy efficiency in all sectors of the economy.

x. Promoting research, development and adaptation of internationally available energy-efficient technologies and measures.

xi. Introducing energy efficiency awards in all sectors of the economy.

xii. Increasing share of green electricity by 1% every year on Year-To-Date (YTD) basis.

xiii. Setting and enforcing targets about energy efficiency and conservation.

xiv. Establishing necessary guidelines and regulations on energy efficiency, conservation, consumption, technology, fuel mix, information gathering, etc, as appropriate.

xv. Enforcement of existing Minimum Energy Performance Standards (MEPS) for energy efficient appliance in the residential, industrial and the commercial sectors.

xvi. Replacing all incandescent light bulbs in every home, industry, institution and establishment in Nigeria with high energy saving lamps by year 2025.

Medium-Term

xvii. Reviewing, improving and continuation of short-term strategies.

xviii. Ensuring reduction of electricity generation, transmission and distribution losses from the current level of 15 – 40% to less than 10% within five years.

xix. Establishing appropriate energy efficiency regulatory and legislative framework.

xx. Establishing guidelines for energy efficiency best practices in all sectors of the nation's economy.

xxi. Ensuring the certification and accreditation of energy auditors and energy efficiency practitioners.

xxii. Integrating energy efficiency and conservation studies into the curricula of educational institutions in Nigeria.

Long-Term

xxiii. Reviewing, improving and continuation of medium-term strategies.

xxiv. Achieving, the establishment of a broad range of equipment energy efficiency standards and labeling within ten years.

xxv. Reducing the energy-related greenhouse gas emissions to 15% of trial by 2030.

Residential Sector

The residential sector accounted for about 56% of final energy demand in 2012. Much of this energy is consumed in the form of biomass in the rural areas, whereas an increasing amount of electricity is used in the middle and high income homes and more will be used as the national electrification programme reaches more users.

The fuelwood is burnt using inefficient traditional stoves. Improved stoves and kilns and substitution fuels (LPG, kerosene) for cooking are not extensively spread due to their cost, lack of awareness and other different socio-economic barriers.

Half of the urban households use electricity for lighting (using inefficient incandescent lamps) whereas the majority of rural households use kerosene, which is more expensive. Water boiling is mostly done on electric coils in urban centres, while the rural populace use fuelwood for the same purpose. Other appliances used (refrigerators, deep freezers, air conditioners, etc.) are old and mostly bought fairly used and are, therefore, inefficient.

Savings can be anticipated in thermal and electrical energy utilization from incorporating energy efficiency in the residential sector.

Policies

i. The nation shall promote the use of energy efficient and environmentally friendly technologies in the residential sector.

ii. The nation shall promote energy efficiency standards for heating and air conditioning systems, appliances, and other plug-in-loads such as lighting and consumer electronics in residential homes.

Objectives

i. To combat health-sensitive indoor pollutants.

ii. To reduce the effects of peak demand on power capacity.

iii. To introduce labeling/efficiency standards for household appliances.

iv. To introduce state-of-the-art energy-efficient technologies in residential sector.

Strategies

Short-Term

i. Promoting local content development and use of energy efficient domestic cookstoves in the residential sector.

ii. Designing, promoting and implementing Minimum Energy Performance Standards (MEPS) and mandatory labelling for household energy-consuming appliances.

iii. Raising awareness on the cost-benefits of energy efficiency in the home.

iv. Establishing demonstration projects to encourage investment in energy efficiency measures in the residential sector.

v. Encouraging widespread adoption of energy saving lamps e.g. light-emitting diodes (LEDs) and compact fluorescent lamps (CFLs) and the phasing-out of inefficient lamps e.g. incandescent bulbs.

vi. Encouraging a shift towards modern energy services and more energy-efficient household appliances through utility end-use energy efficiency schemes such as the Demand Side Management (DSM) techniques.

vii. Keenly following trend in technology changes in household energy appliances to take advantage of emerging energy efficient and renewable energy technologies (e.g. solar water heaters, solar PV etc.).

viii. Enforcing the Building Energy Efficiency code.

Medium-Term

ix. Reviewing, improving and continuation of short-term strategies.

x. Establishing a framework for adoption and promotion of installation of smart meters or Pay As You Consume (PAYC) meters in all households within five years.

Long-Term

xi. Reviewing, improving and continuation of medium-term strategies.

xii. Achieving within ten years universal access to safe, clean, affordable, efficient and sustainable cook stoves/fuel switching to LPG in all households.

Industrial Sector

The inefficient energy use has resulted in low performance output. The utilization of energy in Nigerian industrial sector is characterized by huge energy waste; most industries use obsolete and inefficient machines and equipment e.g. old boilers, motors, pumps, hence lowering the overall efficiency of the system. Activities on energy efficiency and conservation in industries have been limited to preliminary energy audits carried out by the government and few private entities. Also, some efforts have been directed on awareness creation among stakeholders.

Policies

i. The nation shall promote the adoption, development and application of industrial energy efficiency and conservation best practices.

ii. The nation shall require large, energy-intensive industries, and encourage other industrial energy users, to implement cost-effective energy savings best practices, and mandatorily report annually to designated-authorities.

iii. The nation shall adopt appropriate Minimum Energy Performance Standards (MEPS) for electric motors and other categories of industrial equipment, and implement portfolios of measures to address barriers to the optimization of energy efficiency in the design and operation of industrial systems and processes.

iv. The nation shall develop and implement a package of specially designed incentives and other measures to promote energy efficiency in small and medium scale enterprises (SMEs).

v. The nation shall over time, remove energy subsidies and internalize environmental costs to encourage industrial energy efficiency practices.

Objectives

i. To promote the efficient utilization of all energy types in industrial activities.

ii. To decouple the rate of growth of industrial energy consumption from the rate of growth in industrial output.

iii. To bring the energy intensities of industrial sectors in line with international standards and best practices.

Strategies

Short-Term

i. Mandating industries to provide information on equipment energy performance, training initiatives, audits, technical advice and documentation, and system-assessment protocols.

ii. Encouraging effective operational use of information flow in power factor, reduction peak load management and the use of energy efficient equipment and machinery.

iii. Setting up and promoting Minimum Energy Performance Standards (MEPS) and Labels for electric motors and other categories of industrial equipment such as distribution transformers, compressors, pumps and boilers, etc.

iv. Strengthening the existing testing laboratories to support national and regional Labeling and Standards (S&L) programmes.

v. Setting up guidelines for implementing energy efficiency projects in the industry, as well as, guidelines for consumers and manufacturers.

vi. Strengthening institutional framework to promote energy conservation and efficient use of energy in industries.

vii. Providing high-quality and relevant information on proven practices for energy efficiency in industries.

viii. Making available energy performance benchmarking information that can be easily used by industries and structured to allow international and national economy comparisons.

ix. Encouraging investment in energy-efficient industrial equipment and processes by putting in place targeted financial incentives such as tax incentives for energy-efficient investments in industry (particularly the SMEs).

x. Fostering public-private financing of energy efficiency upgrades in industry through risk-sharing or loan guarantees with private financial institutions and enabling the market for energy performance contracting.

xi. Reducing specific energy consumption of key industrial outfits within the range of international best practices.

Medium-Term

xii. Reviewing, improving and continuation of short-term strategies.

xiii. Identifying and assessing energy saving opportunities by benchmarking, measuring and documenting energy consumption in industries.

xiv. Implementing actions to capture identified energy-saving opportunities.

xv. Reporting publicly the energy-saving opportunities identified and the actions taken to capture them.

xvi. Ensuring that energy audits are carried out by qualified personnel in industry, and the audit reports are widely promoted and easily accessible.

Long-Term

xvii. Reviewing, improving and continuation of medium-term strategies.

xviii. Removing energy subsidies and internalize the external costs of energy through policies such as carbon pricing.

xix. Promoting the adoption of the more-efficient industrial equipment and machinery e.g. electric motors and drives in industry with the view to achieving 50% retrofit by 2030.

Transport Sector

The transport sector is the main consumer of petroleum products. Inadequate mass transport systems, poor mechanical conditions of vehicles and bad roads are some of the major factors affecting efficiency in the transport sector. Gaseous emissions from vehicles also constitute a significant portion of pollutants in towns and greenhouse gas emissions. Most of the vehicles used for transportation are mainly imported as second hand. Over the last ten years, there has been a tremendous increase in the number of vehicles.

Nigerian rail sector is currently experiencing intervention by the Federal Government to improve the operation of the sector. However, the operational efficiency of the rail system still needs more attention. For instance, current in-efficient practices and inadequate maintenance is already leading to poor condition of the rolling stock and the rails in Nigeria.

It is widely recognized that the transport sector remains one of the most challenging areas for improving energy efficiency and while in the past, measures have focused on technological improvements, there is the need to move towards a more holistic approach, which includes reduction of transport demands, shifting to more environmentally friendly and energy efficient modes, (e.g., substitution from passenger cars to mass transit), improving the quality or encouraging fuel mix in the transportation system, and improving the quality of transportation infrastructure.

For all modes of transport, substantial opportunities exist to improve transportation equipment. The technical savings potential for passenger cars and trucks is estimated at 15-55 percent. Energy savings in railway traffic are estimated at 10-35 percent worldwide. Significant reductions in energy use can be achieved by encouraging shifts to less energy-intensive modes of transport and urban planning.

Policies

i. The nation shall ensure the use of energy efficient and environmentally friendly technologies in the transport sector.

ii. The nation shall vigorously promote the development of mass transit systems.

iii. The nation shall establish regulations to provide incentives for the purchase and use of higher-efficient vehicles and disincentives for less-efficient vehicles.

iv. The nation shall encourage and establish an organized and reliable public transportation system.

v. The nation shall establish energy efficiency, fuel quality and emissions standards for vehicles.

vi. The nation shall establish and enforce regulations, standards & codes of practice which will stimulate the supply of energy efficient vehicle technologies.

vii. The nation shall encourage modal shift to public transport or non-motorised modes, walking and cycling, from road to rail and waterways and urban mobility planning.

viii. The nation shall encourage the enforcement of highway speed limit to 110 km/h or lower to save fuel and reduce vehicle emission.

ix. The nation shall encourage collaboration among relevant stakeholders, institutions and industries towards the development of energy efficiency and conservation in transport sector

x. The nation shall encourage carbon credit incentives for the use of non-fossil fuel vehicles

Objectives

i. To shift transport to more environmentally friendly and energy efficient modes.

ii. To reduce energy consumption and greenhouse gas (GHG) emissions from transportation systems.

iii. To encourage and/or enforce transport fuel efficiency in the design of public and private transport facilities.

iv. To orient the demand towards more efficient vehicles, and encourage people to drive less.

v. To lessen the huge reliance on private vehicles for mobility, and encourage car pooling system.

vi. To highlight the importance of transport energy and put in place actions to develop a more energy efficient transport system.

vii. To reduce transport-related environmental pollutions and associated health problems.

viii. To promote optimum and efficient utilization of petroleum fuels and substitution in order to reduce the nation's dependence on fuel imports, thereby releasing resources to deal with other imperatives and funding for more productive investment.

ix. To increase public knowledge and awareness of efficiency issues in the transport industry, including specific efficiency indicators.

x. To increase the overall energy efficiency of local, national and regional transport systems, and promote shifts of passengers and freight to more efficient modes.

xi. To ensure that transport infrastructure is built to support the most energy efficient transport modes.

Strategies

Short-Term

i. Embarking on public education and information programmes on energy efficiency in transportation system.

ii. Encouraging eco-driving techniques (training courses, awareness raising campaigns) that enable drivers to optimize their car fuel economy.

iii. Creating awareness on fuel economy and CO_2 emissions reduction strategies in transportation sector.

iv. Encouraging sustainable modal shift in transportation like: motorized modes to cycling and walking; private vehicles usage to public mass transport.

v. Energy use efficiency improvements through the use of less carbon emitting fuels, such as natural gas, as well as unleaded fuel.

vi. Introducing measures to encourage the use of cleaner vehicles like labelling, taxation and infrastructure charges, grants and subsidies and scrappage schemes.

vii. Implementing and periodically strengthening mandatory fuel-efficiency standards for light- and heavy-duty vehicles; via establishment of testing procedures.

viii. Adopting measures such as labelling, incentives and taxes to boost vehicle efficiency and accelerate the market penetration of new efficient vehicle technologies. This should include Infrastructure support and incentive schemes for very low CO_2 - emitting and fuel-efficient vehicles.

ix. Improving the performance of tyres, air conditioning, lighting and other non-engine components that affect vehicle's fuel efficiency, including mandatory fitting of tyre-pressure monitoring systems on new vehicles and the introduction of energy efficiency requirements for air-conditioning systems.

x. Increasing progressively km/fuel ratio of automobiles on Nigeria roads by a factor each year to meet international best practices.

Medium-Term

xi. Reviewing, improving and continuation of short-term strategies.

xii. Ensuring better integration between different public transport systems, walking and cycling.

xiii. Enforcing appropriate legislation of fuel economy standards, including compulsory fitting of speed limiters.

xiv. Mandating installation of pollution control devices such as catalytic converters in vehicular exhaust emission systems and the implementation of tougher legislation relating to exhaust emissions.

xv. Enforcing periodic emission testing, including; Implementing, monitoring and disseminating mandatory standards/regulations for vehicle efficiency.

xvi. Preparing master plan to include route evaluations, costs, efficiency, parking fees including reducing the flow of traffic within city limits, and ensuring the enforcement of adopted measures.

xvii. Introducing car purchase and circulation taxes, which are dependent on the fuel efficiency or CO_2 emissions of the vehicle.

Long-Term

xviii. Reviewing, improving and continuation of medium-term strategies.

xix. Reviewing the legislative and other arrangements for public-transportation management, regulation, and monitoring.

Commercial/Services Sector

The commercial/service sector of the nation's economy consists mainly of government facilities, service-providing facilities, and other public and private organizations. The major energy consuming activities in this sector are service driven, and they include lighting, air conditioning, heating, etc. Hence, the need for the usage of energy efficient appliances in this sector. During working hours, the demand for electricity in this sector is mostly high. Furthermore, the lack of metering of some facilities in this sector has resulted in poor energy conservation practices among end users, thereby causing additional energy wastage.

Policies

i. The nation shall ensure the use of energy efficient and environmentally friendly technologies in the commercial sector.

ii. The nation shall promote the adoption and development of energy efficiency and conservation best practices in the commercial and services sector.

iii. The nation shall require large, energy-intensive commercial/services companies, to implement cost-effective energy savings best practices, and periodically report on their efforts to designated authorities.

iv. The nation shall develop and adopt appropriate energy efficiency codes and standards for horizontal technologies and machineries used in the commercial sector.

v. The nation shall adopt appropriate Minimum Energy Performance Standards (MEPS) for major energy-consuming appliances and equipment.

vi. The nation shall promote energy efficiency standards for heating and air conditioning systems, appliances, and other plug loads such as lighting and consumer electronics in commercial/services sector.

Objectives

i. To promote a reliable and efficient use of energy with minimal negative environmental impact through the use of energy efficient technologies and gradual transition to modern energy services.

ii. To promote the efficient utilization of all energy types in commercial/services activities.

iii. To demonstrate the Government's commitment to sustainable energy development within its own building stock.

iv. To progressively upgrade the energy performance of existing public and commercial building stock.

v. To achieve best practice energy performance in new public and commercial building stock.

Strategies

Short-Term

i. Enforcing existing minimum energy performance standards (MEPS) for energy-related equipment and appliances for the sector.

ii. Encouraging a widespread adoption of light-emitting diodes (LEDs), compact fluorescent lamps (CFLs) and other high energy saving lamps, and the phase-out of incandescent bulbs for services sector lighting in order to reduce electricity demand.

iii. Encouraging a shift towards modern energy services and more energy-efficient services sector appliances through utility end-use energy efficiency schemes such as the Demand Side Management (DSM) techniques.

iv. Upgrading progressively the energy performance of existing public and commercial building stock.

v. Achieving best practice energy performance in new public and commercial building stock.

vi. Creating framework for the adoption and installation of smart meters or Pay As You Consume (PAYC) meters.

Medium-Term

vii. Reviewing, improving and continuation of short-term strategies.

viii. Promoting energy efficiency award for commercial/service sector

Long-Term

ix. Reviewing, improving and continuation of medium-term strategies.

x. Equipping 50% of educational institutions and all health centres, and 15% of all hotels and agro-food industries with solar thermal heating systems to meet their hot water needs within 10 years.

Energy Efficient Building Designs

The nation is in the midst of unprecedented scale of building boom, with significant consequences on energy use. Today, it is estimated that commercial and residential buildings account for about one-third of the nation's final energy consumption. Industry and transport each also use about one-third of energy. However, because most buildings today do not have smokestacks, most people give little thought to their contribution to increased levels of energy use and thus air pollution.

The building sector is a major energy consumer. Unlike cars or air conditioners, buildings last decades; therefore, the way buildings are designed and constructed today will translate directly to better or worse energy efficiency in the building sector, with an impact both on the operating

costs of the built environment as well as the nation's energy consumption patterns and environmental conditions for many years to come. The trend toward energy-efficient buildings is gaining momentum in Nigeria, with substantial initiatives promoting energy efficient building.

However, most building designs pay more attention to aesthetics with little or no concern to reduce energy use during building operation without negatively impacting occupancy comfort with respect to appropriate building orientation (having building oriented along long run on the east-west direction) to reduce solar heat gain and maximize utilization of natural ventilation.

Policies

i. The nation shall integrate and implement energy efficient building designs and conservation techniques and principles into the construction of a new building and retrofitting existing ones to be more-energy-efficient.

ii. The nation shall promote passive design techniques in building designs.

iii. The nation shall promote, implement and enforce building energy efficiency codes

Objectives

i. To ensure that the energy needs of buildings are met safely, efficiently and at reasonable prices.

ii. To minimize the environmental impact of energy production and use in buildings.

iii. To promote the efficient use and conservation of energy in buildings.

Strategies

<u>Short-Term</u>

i. Establishing Building Energy Consumption Indicators and Benchmarks for buildings.

ii. Initiating National Energy Efficiency Awards to draw public and professional attention and to encourage wider acceptance of the building energy efficiency and conservation codes.

iii. Introducing energy audit programs in buildings.

iv. Creating Building Energy Consumption Databases/Energy End-Use Database.

v. Establishing guidelines for energy efficient practices in all government buildings.

vi. Developing a framework for incentivizing energy efficiency by development control authorities nationwide.

Medium-Term

vii. Reviewing, improving and continuation of short-term strategies.

viii. Integrating the use of passive designs and climatic conditions in buildings (e.g. day lighting and natural ventilation).

ix. Enforcing building energy-efficiency and conservation standards and codes.

x. Promoting the adoption of an Energy Efficiency Registration Scheme for buildings.

xi. Introducing Green Building Standard and Certification System (GBDCS).

Long-Term

xii. Reviewing, improving and continuation of medium-term strategies.

Agriculture

Although agriculture is the main stay of Nigeria's economy, the sector's fuel consumption is negligible because of the largely non-mechanical nature of the sector. Therefore, energy consumption in agriculture is not usually accounted for in the national energy balance of Nigeria. However, agro-processing industries use a fairly substantial amount of fuel, including fuelwood and heavy diesel. This is normally accounted for under the industry sector.

Negligible amounts of diesel are used on the various automated farms. However, with the recent government efforts to boost mechanized farming in the country, it is anticipated that energy will play a major role not only in the processing industry but also on the modernized farms.

Policies

i. The nation shall promote the development and adoption of energy efficiency and conservation best practices in the entire agricultural value chain.

ii. The nation shall develop and adopt appropriate energy efficiency codes and standards for farm machineries and equipment.

Objectives

i. To promote the efficient utilization of all energy types in agricultural activities.

ii. To reduce energy use in agricultural practices while increasing outputs.

Strategies

Short-Term

i. Improving the efficiency of irrigation pump set.

ii. Increasing the efficiency of non-pumping farm machinery.

iii. Minimizing the need for traction through low-tillage agriculture.

iv. Using energy-efficient equipment and machinery for post-harvest drying and storage.

Medium-Term

v. Reviewing, improving and continuation of short-term strategies.

Long-Term

vi. Reviewing, improving and continuation of medium-term strategies.

CHAPTER 10

ENVIRONMENT AND CLIMATE CHANGE POLICY

The major environmental problems related to energy production, distribution and consumption in the country are mainly deforestation and pollution among others.

From available statistics, the nation's 15 million hectares of forest and woodland reserves could be depleted within the next fifty years. These would result in negative impacts on the environment, such as soil erosion, desertification, loss of biodiversity, micro-climatic change and flooding. Most of these impacts are already evident in different ecological zones in the country, amounting to huge economic losses and health challenges.

Pollution is the other major environmental concern. Combustion of fossil fuels, especially in the transport and industrial sectors, contributes greatly to air pollution in our major cities. The combustion products (CO_2, N_2O, CH_4, etc.) are greenhouse gases (GHGs) that lead to global warming, with attendant negative consequences on agriculture, water supply, forest resources, sea level rise, health, etc**.** Another source of air pollution is the continued flaring of large volumes of natural gas in the oil fields in the Niger Delta. Presently efforts are being made by the government to reduce gas flaring through gas gathering projects with some registered under the Clean Development Mechanism (CDM) of the Kyoto Protocol which Nigeria ratified on 10 December, 2004. Currently, the new market mechanism of the Paris Agreement will operate under article 6.2 and 6.4 of the Agreement.

In addition to air pollution, there is substantial water and land pollution occurring due to oil spillage during oil production and distribution. Over the years, oil spillage has had significant adverse impact on aquatic resources and land degradation.

There is need for collaboration with the Nigerian Meteorological Agency (NiMet) for provision of Meteorological services and information which includes real-time meteorological data – observations of temperature, wind velocity, rainfall, solar radiation and satellite imagery. Short-term and climatological forecast of these parameters. This data will be structured in a way that will help all the stakeholders (public, investors and policy-makers) make the best possible decisions for activities affected by weather and climate.

As a result of these possible negative impacts, there is a need to incorporate environmental considerations into the nation's energy development and utilization to ensure that bio-diversity and water are protected.

Policy

i. The nation's energy resources shall be exploited, distributed and utilized in an environmentally friendly and sustainable manner.

Objective

i. To ensure that in the course of producing, processing, distribution and utilizing energy, the environment is adequately protected.

Strategies

Short-Term

i. Ensuring the existence of adequate environmental standards for all major energy production, transportation, distribution, transmission and utilization operations.

ii. Strengthening and monitoring of the relevant regulatory agencies in order to ensure the enforcement and compliance of appropriate set standards.

iii. Setting appropriate targets for the attainment of definite progress in the mitigation and control of energy related environmental problems.

iv. Putting in place appropriate programmes to ensure the attainment of set targets for the mitigation and control of energy related environmental problems.

v. Ensuring monitoring, reporting and verification of vital environmental parameters in the production, processing and utilization of energy in order to alien with the set standards and for national reporting.

vi. Carrying out environmental impact assessments of major energy projects.

vii. Ensuring viable and affordable alternatives to fuelwood in order to minimize deforestation and decelerate the rate of desert encroachment and erosion.

viii. Sensitizing the populace on the need for utilization of appropriate technologies in the exploitation, distribution and utilization of the various energy resources to minimize the harmful effects on the environment.

ix. Encouraging research and development in the optimal utilization of various energy sources to minimize the associated adverse environmental impacts.

x. Encouraging the utilization of environmentally friendly energy sources.

xi. Ensuring the implementation of the Energy Sector measures in the Nationally Determined Contribution (NDC).

Medium-Term

xii. Reviewing, improving and continuation of short-term strategies.

Long-Term

xiii. Reviewing, improving and continuation of medium-term strategies.

CHAPTER 11

POLICY ON OTHER ENERGY ISSUES

Research and Development

The crucial dependence of the sustainable socio-economic advancement of any nation on research and development activities is now universally acknowledged. This dependence is applicable also to the development of vital sectors of the national economy, including the energy sector. For this sector therefore, it is important that research and development are given adequate attention with regards to key issues such as energy resources development and utilization.

Policy

i. The nation's energy resources shall be developed and utilized on sustainable basis through research and development.
ii. All viable innovation generated as a result of R&D activities should be protected with Intellectual Property (IP) right.

Objectives

i. To initiate and promote efficient energy related research and development programmes; and ensure that such programmes are applications-oriented and market driven.

ii. To promote participation in research and development by Nigerians in all areas of energy exploration, development and utilization.

iii. To develop intermediate and high-level manpower through research and development, training and retraining.

Strategies

Short-Term

i. Developing and promoting local capability in the nation's energy centres, secondary/technical colleges, tertiary institutions and research institutes for the design and fabrication of efficient energy devices and technologies for the utilization of renewable energy resources.

ii. Promoting the demonstration and dissemination of renewable energy devices and technologies for their adoption and market penetration.

iii. Monitoring and assessing international technological developments in all energy areas; and initiating and sustaining local capability for their applications in all sectors of the economy.

iv. Initiating and promoting energy educational programmes and research activities in secondary, technical colleges, tertiary institutions and research institutes.

v. Encouraging result-oriented research and development in the energy sector by making expenditure on such efforts tax deductible.

vi. Establishing research and development training programmes for the development of specialized energy manpower.

vii. Selecting and deploying appropriate energy technologies through research and development.

viii. Encouraging the energy producing and processing companies to set up research and development outfits in the country and to make use of research and development institutions in Nigeria.

ix. Energy Commission of Nigeria should relate with relevant MDA's to ensure that all viable innovations in the energy sector is protected.

Medium-Term

x. Reviewing, improving and continuation of short-term strategies.

Long-Term

xi. Reviewing, improving and continuation of medium-term strategies.

Bilateral, Regional and International Cooperation

Nigeria is involved in bilateral, regional and international corporation in the area of energy within the framework of its economic relations with other countries and multilateral institutions. This collaboration is designed to complement domestic efforts towards energy security for the nation. Energy supply, joint management and equity participation in the development of energy sources are important aspects of our bilateral and multilateral cooperation arrangements with other African Countries.

The nation's membership of sub-regional, regional and international organizations such as ECOWAS, APPA, AU, UN, IAEA, WEC, OPEC, AFREC, IRENA, IEC, etc, provides opportunity for it to play an active role in their energy agenda. It is necessary to foster this multilateral co-operation for rapid national economic development. From past experiences in the effort of the Africa region towards economic integration, it is clear that a step-by-step approach based on common interests and the pooling of resources offers the best prospects for a successful and lasting integration. In this respect, the energy sector offers some mutually beneficial opportunities for projects which can be implemented in the short to medium term.

Policies

i. The nation's energy resources shall be deployed in promoting and enhancing regional and international co-operation for the overall economic and technological advancement of the nation.

ii. The nation shall lay emphasis on fostering and strengthening energy cooperation and integration within the ECOWAS sub-region.

iii. The nation shall pursue international collaboration on energy.

Objectives

i. To enhance Nigeria's effective participation in energy related international organizations.

ii. To facilitate the adoption of technology for the development of the energy sector.

iii. To encourage a cooperative approach in the exploitation of energy resources and development of energy supply infrastructure.

iv. To optimize the utilization of the region's energy resources.

v. To grow the national economy, promote security and influence regional and international decision on energy.

vi. To expand access to energy services through international collaboration.

***Strategie*s**

Short-Term

i. Strengthening co-coordinated approach to regional and sub-regional energy planning based on co-operation and consultation among member countries of ECOWAS and other members of the African Union (AUDA-NEPAD)**.**

ii. Promoting the standardization and certification of energy related plants, machineries and spares and the establishment of infrastructural facilities within the community for their production.

iii. Mobilizing domestic capital and creating a favourable investment climate to attract international financing for energy development projects.

iv. Pooling available human resources through networking of national energy training and research centers.

Medium-Term

v. Reviewing, improving and continuation of short-term strategies.

vi. Ensuring Nigeria's active membership in energy related regional and international organizations.

vii. Promoting favourable trading relationships with member countries of ECOWAS and the AUDA-NEPAD which will ease the financing of energy supply and other energy-related projects.

viii. Promoting the standardization and certification of energy related plants, machineries and spares and the establishment of infrastructural facilities within the community for their production.

ix. Strengthening the West African Power Pool.

Long-Term

x. Reviewing, improving and continuation of medium-term strategies.

Local Content

To attain the Agenda 2050 intent and beyond, it is necessary that human capacity development be a major focus in the energy sector. Equally important is the necessity to transform the vast endowment of energy related resources in the country for the benefit of the nation. We need to develop in the country training institutions to enhance the support, design and fabrication not only in the oil and gas industry but in all spheres of the energy mix. We should also develop local coal technology and the vast renewable energy available to the country. Research in these areas should be pursued by encouraging collaboration between the industry and the tertiary institutions to foster world class technological development locally.

Policy

i. The nation shall encourage the use of locally available Resources in all aspects of the energy sector in Nigeria.

Objective

i. To encourage local production of inputs required for development of the energy sector.

Strategies

Short-Term

i. Identifying, quantifying and qualifying resources for use in energy sector in Nigeria.

ii. Conducting studies on national demand and export possibilities of locally produced materials in the energy sector.

iii. Providing incentives to encourage local manufacturing and production of equipment and consumables used in the energy sector.

iv. Enacting law(s) to ensure local sourcing of materials related to energy production and utilization.

v. Establishing a common and comprehensive local content measurement for the entire energy sector.

vi. Establishing a financing mechanism which will support indigenous investments in the energy sector industries.

vii. Putting in place other incentives, appropriate to each energy sub-sector, which will promote indigenous private sector participation and competitiveness in the sub-sector.

viii. Putting in place schemes to ensure broad-based access by Nigerians to shares in privatized energy sector industries.

ix. Increasing patronage of indigenous engineering and applied research groups in the execution of projects right from feasibility studies.

Medium-Term

x. Reviewing, improving and continuation of short-term strategies.

xi. Encouraging the establishment of energy sector production and service industries by indigenous investors.

xii. Creating appropriate motivation through the Memorandum of Understanding (MoU) and/or Operating Licenses in the energy sector, for increasing the local content of value added in the activities of energy sector industries.

Long-Term

xiii. Reviewing, improving and continuation of medium-term strategies.

Manpower Development and Training

Sufficient and well-trained manpower is critical in the energy sector as it constitutes the main pivot in the overall functioning of the entire energy organs, both in the public and private sectors of the economy. Currently, there seems to be a significant lack of indigenous energy manpower training experts in the country. There is inadequacy in capacity building – manpower training and development. Compared to the population of the country, there are insufficient energy related courses in most tertiary institutions in the country. It is necessary to provide linkages with related professional bodies both within and outside the country. Efforts must therefore be made by all to ensure manpower development and training in the nation's energy sector.

Policy

i. The nation shall promote manpower development and training in the nation's energy sector.

Objective

i. To develop the human capacity needed to meet the manpower requirement of the nation's energy sector.

Strategies

Short-Term

i. Establishing a national human resources data base in the energy sector.

ii. Determining periodically the manpower stock and needs.

iii. Developing a national programme to meet energy manpower needs.

iv. Ensuring the integration of research, development and manpower training in the energy sector.

v. Formulating legal framework for ensuring inter-agency collaboration in energy sector manpower development.

vi. Ensuring through legislation, that energy producers make available certain percentage of their annual profit to support/fund manpower development and training.

vii. Integrating energy studies into the curricula of secondary and tertiary institutions, while emphasizing their multi-disciplinary nature.

Medium-Term

viii. Reviewing, improving and continuation of short-term strategies.

ix. Introducing energy education at all levels of the nation's educational curricula.

x. Continuation of the periodic determination of the manpower stock and needs.

Long-Term

xi. Reviewing, improving and continuation of medium-term strategies.

xii. Continuation of the periodic determination of the manpower stock and needs.

Gender Issues

It is difficult for many traditional energy planners to understand how gender mainstreaming and empowerment relate to their work as these appear to be political or social welfare concerns far removed from decisions about fuel supplies and technology choices. Gender sensitivity may be viewed as an 'add-on' to energy programmes, one that is easy to drop off. Energy policy specialists rarely pay attention to gender issues and therefore do not consider gender issues in policy making. Energy planning in reality is gender-blind; it fails to recognize that the women's practical productive and strategic energy needs are different from those of men, so inadvertently discriminates usually against them.

Integrating energy projects into other types of development programmes can help to shift the focus from technology-driven interventions to more integrated initiatives that take into account a community's social and economic development needs. In that context, it is likely that concerns about women's need might seem more understandable. Promoting increased participation of women in energy decision making at all levels in another way to ensure that women concerns are taken into account.

Policies

i. The nation shall encourage and ensure gender mainstreaming in energy issues: infrastructure, programs and projects.

ii. The nation shall disaggregate energy use, supply, and impacts by gender in energy project design and implementation.

Objectives

i. To create awareness on gender issues in the energy sector.

ii. To provide better basis for incorporating gender in energy project design and implementation at the micro- and macro-policy levels.

Strategies

<u>Short-Term</u>

i. Promoting integrated approaches and various solutions that recognize the importance of wood energy and cooking for vunerable women and its health implications.

ii. Ensuring equal access to electricity for water pumping, agricultural processing, security, work productivity, and health in the framework of sectoral development initiatives.

iii. Providing equal access to credit facilities, extension support services, and training in energy and electricity supplies for women's domestic tasks as well as their micro-enterprise activities are met.

iv. Developing a reliable gender responsive statistical data.

v. Incorporating gender concerns into energy and rural development policies and programmes.

vi. Monitoring and evaluating the impacts of rural energy projects on poverty alleviation and gender equity

vii. Conducting gender audits of national energy and other related policies.

viii. Establishing gender units in all MDAs in the energy sector.

ix. Ensuring gender sensitive capacity building programmes in the energy sector.

Medium-Term

x. Reviewing, improving and continuation of short-term strategies.

Long-Term

xi. Reviewing, improving and continuation of medium-term strategies.

CHAPTER 12

POLICY ON ENERGY FINANCING

Funding requirements for the entire energy sector is substantial. This is against the backdrop of the country's potential, aspirations and current funding levels. Nigeria has vast potential to generate energy from oil 36.972 billion barrels proven reserve), gas 192 Tcf (trillion cubic feet) reserve coal and lignite 3 billion tons of indicated reserves in 17 identified coal field and from hydro, solar, wind, biofuels, etc.

Nigeria however generates below 10 GW of electricity in 2018, from gas 81% and hydro 19%, with a transmission grid that can carry only 8.100 GW wheeling capacity. Refineries operate at below 30% refining capacity in 2012, against an international bench mark of 90% refining capacity. Also, crude oil production peaked at 2.07 million barrels per day in 2017, the total installed capacity of the refineries remained at 446, 000bpd, of which the refineries could refine just 8.67% out of the production.

The nation's aspiration is to increase power generation to 40 GW by 2020 and to 350 GW by 2043 with gas to other sources of energy at a mix of 70:30 ratios. The country also intends to strengthen and increase transmission and distribution capacity. The nation's aspiration in oil and gas is to intensify exploration, increase refining capacity, and increase the use of sustainable fuels with an establishment of several gas networks.

Financing Requirements

The National Planning Commission has projected that, to upscale the power subsector, US$550 billion will be required to expand power generation from 10 GW to about 350 GW and extend total transmission lines from less than 14,000 km to about 39,000 km by 2043. US$350 billion is required for oil and gas to increase capacity from 8mcfpd to 11,000mcfpd gas production and distribution, oil production level to 2.23 mbd and refining capacity to 445,000 bpd. Development of all sources of energy will need over US$1 trillion in the next 30 years.

New investments are needed for exploration and exploitation activities. The required type of financing is long-term and involves both foreign and domestic financing resources.

Owing to other competing needs, government alone cannot continue to provide the major finance for the energy sector activities. Hence private sector participation is necessary and imperative.

The National Planning Commission in its draft Integrated Infrastructure Master Plan has projected that energy can share from the pool of US$90–100 billion through public current account, public debt, the sovereign wealth fund, pension fund and public private partnerships in the next 5 years.

It is also known that an estimated US$500million goes to developing countries annually for development assistance for renewable energy projects, training and market support from German Development Finance Group (KfW), World Bank Group, Global Environment Facility (GEF).

Policies

i. Investments in the nation's energy sector shall be accorded high priority within the economic sector.

ii. The nation shall provide financing policy frame work for achieving a sustainable development of the sector.

iii. The nation shall explore and adopt all viable financing options from local and international sources for cost effective exploitation of its energy resources.

iv. The nation shall encourage increase in private investments, both domestic and foreign, in the energy sector.

v. The nation shall implement an Integrated Infrastructure Master Plan (NIIMP) to enable cross sectoral harmony and financing framework

vi. The nation shall create an investment friendly environment through improving real and perceived risk by private investors measured through Transparency International corruption index, World Bank doing business index, millennium Challenge Corporation rating, etc.

Objectives

i. To ensure the availability of adequate funding for the energy sector.

ii. To ensure continuity in the funding of projects in the energy sector.

iii. To attract foreign investments from a highly competitive international finance market.

iv. To ensure that the energy supply options adopted are the most cost-effective for the country.

v. To increase foreign exchange earnings through export of energy products.

Strategies

Short-Term

i. Providing fiscal incentives for prospective investors in the energy sector.

ii. Reviewing the existing laws and regulations for the operation of energy sector industries so as to increase private sector participation in the industries.

iii. Ensuring periodic review of energy pricing to guarantee a reasonable return on investments.

iv. Employ the use of Public Private Partnership (PPP) models to finance viable energy projects.

v. Encouraging the inflow of offshore investment funds from international investments banks and brokerage firms.

vi. Encouraging energy firms to source development funds from the Nigerian capital market.

vii. Establishing a clear legal and regulatory framework for energy financing in Nigeria.

viii. Empowering the fiscal and monetary authorities to execute Energy financing in Nigeria.

Medium-Term

ix. Reviewing, improving and continuation of short-term strategies.

x. Furthering the internationalization of Nigeria's Capital Market by encouraging the stocks of Nigeria's energy corporate units to be quoted in the international Stock Exchange to attract foreign portfolio investment capital.

xi. Expanding the scope of venture capital financing to embrace investments in the energy sector.

xii. Establishing a financial mechanism for the energy sector such as:
   a. Infrastructure Project Development Facility (IPDF) to finance the development of a pipeline of bankable energy projects.
   b. Government Resource fund as independent source to support energy projects.
   c. Long term refinancing mechanisms for energy assets.
   d. Mechanisms for developing corporate bonds to unlock pension funds for energy finance.

Long-Term

xiii. Reviewing, improving and continuation of medium-term strategies.

CHAPTER 13

PLANNING AND POLICY IMPLEMENTATION

Energy planning and policy implementation in the country take place at four different levels. At the *National Level*, they involve macro-planning and policy implementation as part of the multi-sectoral national development policies and plans which are the responsibilities of the National Planning Commission.

At the *Sectoral Level*, they involve overall sectoral planning, monitoring and co-ordination of policy implementation for the energy sector, in all its ramifications. The function ensures consistency of sub-sectoral energy policies and plans with the overall national energy policies and plans and that the implementation of the latter is in accordance with provisions of Acts. At the *Sub-sectoral Level*, more specific sub-sectoral planning and policy implementation for the development, exploitation and utilization of particular energy resources, are carried out in the various energy sub-sectors, namely oil and gas, electricity, solid minerals, etc. These involve the Ministries of Petroleum Resources, Power and Mines and Steel Development. Other energy utilization sub-sectors such as transport, industry, agriculture, as well as research and development, are also relevant.

Finally, at the *Operational Level*, activities involve the execution of the policies and plans developed at the sub-sectoral level by operational agencies, parastatals and private operators.

This policy document applies to issues at the Sectoral Level.

Energy Planning

Energy issues are multidimensional in nature and there are strong interactions between factors that affect energy demand, supply and consumption, which must be recognized in order to have an effective energy plan.

To ensure full consideration of all the factors, and avoid inconsistencies in energy plans, it is imperative that a *comprehensive* and *integrated* approach to energy planning be evolved. The planning must consider the interactions between the energy sector and the rest of the economy, the interactions between the sub-sectors of the energy sector, and the plans within each sub-sector.

Policies

i. The nation shall develop an integrated energy planning system involving the energy related programmes and activities of the various sectors of the economy.

ii. The nation's energy planning system shall be comprehensive, covering the resource exploitation, processing, consumption and conservation activities.

iii. The nation's energy plans and programmes shall be consistent with the overall national development goals.

iv. The nation's energy planning process shall be carried out in collaboration with relevant ministries, departments and agencies at the federal, states and local levels as well as other stakeholders

v. The nation's energy planning process shall be evidence based.

Objectives

i. To ensure coherency in the energy plans and activities of the various sectors of the economy.

ii. To ensure that the various energy plans and programmes are consistent with the overall national energy policy and development plans.

iii. To provide a framework for decision making in energy related matters.

iv. To provide the enabling framework for the adequate supply of energy to different sectors of the economy.

v. To optimize the supply and utilization of the various energy resource types.

vi. To promote local content in the energy sector.

vii. To provide input into national development planning and policy formulation.

viii. To ensure an environmentally sustainable development of the energy sector.

ix. To ensure that planning is based on reliable, timely and relevant energy statistics.

Strategies

Short-Term

i. Strengthening co-operation between the Energy Commission of Nigeria and the other relevant stakeholders in the energy sector.

ii. Encouraging formal discussion and collaboration amongst institutions in the energy sector whose activities are inter-related.

iii. Encouraging the establishment of energy planning and implementation units at state level and encouraging the assignment of responsibilities for energy related matters at local government level.

iv. Ensuring that the strategic plans and programmes of the energy sub-sectors are appropriately appraised for ensuring consistency with the overall national energy policy and plans and resolving conflicts arising from sub-sectoral plans and programmes.

v. Establishing a national energy information management system which will involve consistent data gathering and processing of energy resource inventory, consumption pattern, energy technologies, and other relevant socio-economic parameters**.**

vi. Submitting energy data and information as may be required by the Energy Commission of Nigeria to carry out its monitoring, co-ordination and data banking functions at specified intervals, by the sub-sectoral agencies that generate or collect the primary data.

vii. Developing an energy master plan, which is based on the study of energy demand by energy type and category of end-use, energy supply, as well as energy-economy - environment interactions.

viii. Putting in place an effective programme for accelerated manpower development.

ix. Providing a system for the development of indigenous capabilities in energy conversion technologies

Medium-Term

x. Reviewing, improving and continuation of short-term strategies.

Long-Term

xi. Reviewing, improving and continuation of medium-term strategies.

Policy Implementation

No policy can succeed without proper implementation. To achieve the stated policy objectives and successfully implement the strategies, various instruments including economic and legislative measures, information, education and institutional arrangements need to be used.

Policy programme realization is often hampered by bureaucratic bottlenecks. These problems have to be effectively addressed for the successful implementation of the National Energy Policy.

Policies

i. The nation's energy related policies will derive from, and be consistent with, the overall National Energy Policy.

ii. The Energy Commission of Nigeria shall be the nation's focal point for the coordination, monitoring and evaluation of the policy implementation at the National, State and Local Government levels.

Objectives

i. To ensure the effective implementation of the national energy policy.

ii. To ensure that the energy sector plays it's expected role in the realization of the goals of the national development plan.

iii. To ensure consistency between the national energy policy and the various sub-sectoral policies on energy matters.

iv. To ensure that there is no conflict between the various sub-sectoral energy policies.

v. To strengthen the coordination, monitoring and evaluation functions of the Energy Commission.

vi. To ensure that the impact of the NEP is fully effective to all end users.

Strategies

Short-Term

i. Ensuring the existence of a forum to provide opportunities for regular discussions among agencies and departments involved in the production or utilization of energy.

ii. Encouraging private sector participation in the provision of energy services in the country, while recognizing the role of government in the provision of some basic energy infrastructure.

iii. Prioritizing of the policy strategies for implementation, with the setting of realistic targets and effective monitoring and evaluation of the implementation process.

iv. Instituting a system of carrying out regular checks and receiving reports on the implementation of the approved policy by all actors in the energy sector.

v. Ensuring that approved fiscal measures, which are necessary for the achievement of set objectives of the policy, are promptly carried out.

vi. Creating regular fora for public awareness, education and participation in the realization of the goals and objectives of the energy policy.

vii. Producing regularly publications on the state of the energy sector and creation of relevant/accessible website for effective dissemination of information.

Medium-Term

viii. Reviewing, improving and continuation of short-term strategies.

Long-Term

ix. Reviewing, improving and continuation of medium-term strategies.

Prioritization of Strategies into Short, Medium and Long Term

The implementation process of the Energy Policy requires strategies that allow for a number of factors including priority setting, policy continuity and a clear focus on key issues.

Accordingly, such strategies should be based on realistic targets, a defined time frame as well as effective target evaluation.

The advantages of this approach are two-fold: -

i.) it will enable planners and implementing organs to include the cost of each strategy in their respective budgets, as they fall due; and

ii.) it will aid monitoring organs to assess the progress of implementation of the various strategies.

In this regard, it is expected that short-term measures are those that could be evaluated within 3 to 5 years; 5 to 10 year period is advocated for the medium-term activities and over 10 years for the long term.

With this perspective, the recommended activities are as indicated below.

Short Term Measures

General

1. Prioritizing policy strategies for implementation, with the setting of realistic targets and the effective monitoring and evaluation of the implementation process.

2. Developing and implementing necessary machinery for constant monitoring of the implementation of the approved energy policy and compliance with the guidelines and regulations on various energy matters by all sectors of the economy.

3. Ensuring the implementation of fiscal measures necessary for the achievement of the set objectives of the energy policy.

4. Rehabilitating refineries, petroleum products distribution infrastructure, power plants, transmission and distribution networks.

5. Promoting the establishment of local services companies for the oil, gas, electricity, etc sub-sectors and encouraging their patronage by the energy companies in the private and public sectors.

6. Developing and implementing appropriate packages to enhance the utilization of renewable energy to solve rural energy problems and to make possible the extension of commercial energy and the associated technology to the rural sector.

7. Strengthening of all relevant regulatory agencies to ensure the enforcement of appropriate set of standards and procedures, including in particular standards and procedures on exploration, production and utilization of energy.

8. Improving the living standard of people in energy resource producing communities through the provision of socio-economic infrastructure.

9. Strengthening the programme on the liberalization and privatization of the energy sector.

10. Developing and implementing appropriate and dynamic pricing and tariff structures for petroleum products, gas, electricity and other energy types, which will encourage private sector participation, by ensuring a reasonable return on investments while giving due attention to the needs of the target markets.

11. Improving the effectiveness of energy planning and implementation by establishing energy planning and implementation units at state government levels and assigning responsibilities for energy related matters at local government levels.

12. Establishing a national energy information system which will involve consistent data gathering and processing of energy resource inventory, consumption pattern, energy technologies, and other relevant socio-economic parameters.

13. Reviewing and ensuring the implementation of the existing energy masterplan.

14. Encouraging interaction within existing fora for formal discussions and collaboration between institutions in the energy sector.

15. Enabling private sector participation in the energy sub-sectors through the review of existing relevant laws and regulations.

16. Establishing a strategy for the public awareness, education and participation in the realization of the goals and objectives of the energy policy.

17. Monitoring and assessment of technological developments in all energy areas and development of capabilities to apply them, as appropriate in the various sectors of the economy.

18. Establishing a plan to encourage increased placement of Nigerians in all positions in the energy producing, service and processing companies, including especially in key decision-making and technical positions in oil, gas, nuclear and other relevant energy industries.

19. Increasing funding to appropriate agencies for the provision of energy related engineering infrastructure.

20. Easing constraints on the importation of essential but scarce materials for the manufacture of engineering equipment's and spares.

21. Submitting energy data and information, as may be required by the Energy Commission of Nigeria to carry out its monitoring coordination and data banking functions, at specified intervals, by the sub-sectoral agencies that generate or collect the primary data.

Oil

22. Setting-up medium term reserves and producibility targets.

23. Updating the memorandum of understanding to ensure that it contains appropriate incentives that will attract investments in intensified crude oil exploration and development.

24. Maximizing petroleum production and processing efficiencies.

25. Improving and promoting the provisions put in place for the establishment of export refineries.

26. Ensuring the use of locally available materials such as bentonite and barytes for oil drilling.

Natural Gas

27. Reviewing and improving existing incentives to producing companies to encourage them to gather and utilize associated gas in order to maximize income from associated gas and eliminate gas flaring.

28. Establishing appropriate guidelines, regulations and incentives for the participation of indigenous and foreign entrepreneurs in the establishment of the infrastructure for, and business in, gas gathering, transmission and distribution.

29. Providing funding for the establishment of a nationwide infrastructure for gas gathering, transmission and distribution.

30. Reviewing and sustaining the implementation of incentives to industrial and domestic consumers to use gas or change over to gas.

31. Sustaining and expanding the measures presently in place for the establishment of infrastructure and markets for the export of natural gas.

32. Formulating suitable urban and regional planning regulations, which are needed for the effective distribution of natural gas to domestic and industrial consumers.

Tar Sands/Bitumen

33. Undertaking of more detailed geological studies**,** exploration and exploitation activities for the tar sands/bitumen deposits of the country.

34. Establishing an appropriate regulatory institution for the tar sands/bitumen sub-sector.

35. Putting in place necessary regulations and guidelines for the exploitation of tar sands/bitumen deposits.

36. Providing appropriate incentives to facilitate investments in the exploration and exploitation of tar sands/bitumen resources.

Coal

37. Developing and implementing appropriate measures for large scale production of coal stoves at affordable prices and for the establishment of coal-based industries, by local entrepreneurs.

38. Providing adequate funding to enable intensified coal exploration and production activities.

39. Re-introducing the use of coal for power generation.

40. Providing adequate incentives to indigenous and foreign entrepreneurs so as to attract investments in coal exploration and production**.**

Nuclear

41. Intensifying research, development and training in nuclear science and technology for peaceful applications.

42. Encouraging a rational nuclear development programme and institutional arrangements.

43. Strengthening of the Nigerian Nuclear Regulatory Authority to ensure nuclear safety and radiation protection.

44. Regular public enlightenment campaigns on peaceful applications of nuclear technology.

45. Intensifying the exploration activities for nuclear mineral resources**.**

46. Strengthening existing co-operation with the IAEA and actively participating in all IAEA programmes.

47. Providing adequate resources to the Nigerian Nuclear Regulatory Agency (NNRA) for the enforcement of nuclear laws and regulations.

Hydropower

48. Reviewing and improving constantly the multilateral agreements for monitoring and regulating the use of water in international rivers flowing through the country.

49. Increasing patronage of indigenous entrepreneurs involved in the planning, design and construction of hydropower plants.

50. Establishing appropriate fiscal measures as incentives to indigenous and foreign entrepreneurs for the local production of hydropower plants and accessories.

51. Establishing appropriate institutional arrangements, regulations, and guidelines for the development of small-scale hydropower plants.

Fuelwood

52. Cultivating fast growing tree species needed to accelerate the regeneration of forests.

53. Developing smokeless coal, sawdust, biogas and other energy technologies as alternatives to fuelwood.

54. Improving the efficiencies and performances of existing improved woodstoves and ovens.

55. Encouraging the establishment of private and community woodlots for the supply of fuelwood.

56. Ensuring the availability and effective distribution of kerosene as an alternative to fuelwood in the interim.

57. Establishing training programmes on the use, maintenance and fabrication of efficient woodstoves and other alternative technologies.

58. Promoting activities, such as extension and pilot projects, to disseminate solar, biogas and other alternative technologies to fuelwood.

59. Establishing micro-credit facilities for entrepreneurs, especially women groups, for the establishment and operation of commercial fuelwood lots and the production of renewable energy devices and systems**.**

Environment

60. Organizing systematic public enlightenment campaigns on the problems of desertification and soil erosion arising from deforestation.

61. Reviewing and enforcing forestry laws to effectively stop the willful felling of trees in prohibited zones.

62. Disseminating information on existing energy efficient and environmentally friendly technologies in the exploitation of various energy resources.

63. Strengthening existing guidelines and regulations on appropriate technologies for the exploitation of energy resources to minimize harmful environmental effects.

64. Intensifying research and development in more efficient and environmentally friendly utilization of various energy sources.

65. Encouraging the utilization of environmentally friendly energy resources and technologies.

66. Setting appropriate targets for the attainment of definite progress in the mitigation and control of major energy related environmental problems.

67. Putting in place appropriate programmes to ensure the attainment of the set targets for the mitigation and control of the major energy related environmental problems**.**

68. Reviewing the existing penalties for gas flaring and ensuring that they achieve the desired effect.

69. Establishing appropriate arrangements to ensure the implementation of the incentives and penalties to discourage gas flaring.

Solar, Biomass and Wind

70. Establishing demonstration and pilot projects as well as holding workshops and public education campaigns on solar energy, biomass, biogas, wind and other renewable energy resources to ensure their adoption and market penetration.

71. Establishing appropriate fiscal measures as incentives for the utilization of solar, wind and other renewable energy systems.

72. Establishing a set of regulations and guidelines to promote and sustain the local solar, biomass and other renewable energy industries**.**

73. Developing and implementing training packages for skilled craftsmen and technicians on the production, operation and maintenance of solar, wind, biomass and other renewable energy systems.

74. Providing adequate incentives to producers, developers and suppliers of solar, wind and biomass energy products and services.

Other Renewable Energy Resources

75. Gathering information on the advances in less developed renewable energy resources; Extension of the energy information acquisition, storage and dissemination activities to them.

Electricity

76. Completing on-going short term projects designed to satisfy national demand for electricity.

77. Expanding of the existing electricity transmission and distribution networks.

78. Intensifying research, development and training in alternative sources of energy for the generation of electricity.

79. Reviewing and strengthening of existing incentives for the encouragement of local manufacture of electrical equipment and devices.

80. Establishing effective measures to ensure the security of electrical installations and improving the operational efficiency of the electricity sub-sector, particularly the distribution activities.

81. Providing appropriate financing facilities to support indigenous investments in the electricity industry.

Industry

82. Developing and implementing appropriate measures to encourage fuel substitution in industries.

Agriculture

83. Promoting the utilization of renewable energy in agriculture through demonstration, pilot projects, workshops, etc.

84. Intensifying research and development activities for appropriate agricultural technologies that can use available and multiple energy resources, including animal traction.

Transport

85. Reviewing periodically transport fuels storage capacity, in accordance with developments in the transport sector, with a view to updating the storage capacity guidelines and storage infrastructure.

86. Comprehensive study of the transport fuel distribution systems and development of recommendations for their improvement.

87. Initiating discussion with relevant institutions in the transport sector to identify appropriate energy-efficient transport systems, strategies and equipment that should be introduced.

88. Encouraging relevant agencies to introduce fuel-efficient transport management systems.

89. Encouraging relevant agencies to improve and expand mass transportation and communication systems, countrywide.

Energy Efficiency and Conservation

90. Developing codes, standards, regulations and guidelines on energy conservation and use of energy-efficient methods, equipment, machinery and technologies in agriculture, industry, building design and construction, etc.

91. Establishing appropriate institutional arrangements and incentives for the promotion and monitoring of energy conservation and use of energy-efficient methods.

Research, Development and Training

92. Providing increased funding to research institutes, centers and tertiary institutions, who are undertaking research and development work on renewable, nuclear, coal and other energy resources to ensure productive research and development and the establishment of appropriate infrastructure.

93. Developing and implementing research and development programme in energy conservation and efficiency, including the development and manufacture of energy-efficient equipment and machinery.

94. Promoting the development and introduction of integrated energy and environment curricula and disciplines into the programmes of tertiary institutions.

95. Taking measures to ensure adequate institutional capacity for the production of adequate numbers and quality of high level and skilled technical and managerial manpower for the energy sector.

96. Establishing the necessary machinery to provide adequate funding from conventional energy sub-sectors, such as the dedication of a certain percentage of the nation’s income

from such sectors**,** to support research, development, demonstration and training in energy.

97. Developing and initiating of the implementation of an accelerated and effective manpower development programme for the energy sector.

Finance

98. Providing appropriate measures to encourage prospective investors in the energy sector.

99. Expanding the scope of venture capital financing (national risk fund plc) to embrace investments in the energy sector.

100. Encouraging energy firms to source development funds from the Nigerian capital market.

101. Establishing guaranteed and dependable repayment scheme for loans invested in energy projects.

Indigenous Participation

102. Establishing a financing mechanism which will support indigenous investments in energy sector industries.

103. Creating appropriate motivation through the memorandum of understanding and/ or operating licenses in the energy sector, for increasing the local content of value added in the activities of energy sector industries.

104. Setting aside significant percentages of the shares of privatized energy sector industries for acquisition by Nigerians.

105. Putting in place schemes to ensure broad-based access by Nigerians to shares in privatized energy sector industries.

Medium Term Measures

General

1. Reviewing and continuation of short-term activities.

2. Ensuring that the strategic plans and programmes of the energy sub-sectors are appropriately appraised with a view to ensuring consistency with the overall national energy policy and plans and resolving conflicts arising from sub-sectoral plans and programmes.

3. Developing other potential sites for hydropower, gas and coal plants for electricity generation.

4. Monitoring and ensuring the progress of the plan for achieving the placement of Nigerians in key decision making positions and other responsibilities in the energy industries.

5. Establishing and sustaining the implementation of a national energy masterplan.

Oil

6. Ensuring the attainment of a reserve target of 35 billion barrels and a production capacity of 3.5 mbpd.

7. Commercializing the operations of existing refineries while taking steps to promote private sector participation in the refining business.

8. Expanding the transmission and storage facilities for petroleum products to achieve the 45-day strategic reserves.

9. Ensuring adequate geographic coverage of petroleum products distribution network.

Natural Gas

10. Terminating gas flaring.

11. Sustaining funding for the expansion of the infrastructure for gas gathering, transmission and distribution nationwide.

12. Intensifying promotional activities for the use of gas and change over to gas by industrial and domestic consumers.

13. Implementing urban and regional planning regulations for effective distribution of natural gas.

14. Embarking on deliberate exploration for gas in all parts of the country.

Tar Sands/Bitumen

15. Continuing detailed exploration activities and mapping ***and*** exploitation of the Tar Sands/Bitumen deposits in the country.

16. Providing appropriate financing facilities to support indigenous investment in tar sands/bitumen development.

Coal

17. Reviewing, improving and effectively implementing measures for the production of coal stoves and the establishment of coal-based industries.

18. Establishing smokeless coal pilot projects for the promotion of the use of smokeless coal as an alternative to fuelwood.

19. Introducing clean coal technologies into coal utilization.

Nuclear

20. Acquiring additional nuclear research facilities and expansion of their applications in manpower training, agriculture, medicine and industry.

21. Commencing the exploitation of the nuclear mineral resource deposits in Nigeria.

22. Enforcing Nuclear Safety and Radiation Protection Regulations.

23. Establishing a nuclear radiation surveillance programme for the protection of the environment.

Hydropower

24. Introducing alternative technological options to reduce the impact of water shortage on hydropower plants.

25. Encouraging the private sector in the establishment and operation of hydropower plants.

26. Establishing basic engineering infrastructure for the production of hydropower plants equipment and accessories

27. Establishing mini - and micro- hydropower plants.

Fuelwood

28. Ensuring the availability and effective distribution of kerosene and other viable alternatives to fuelwood.

29. Conferring reserve status on greater acreage of forest and establishment of an effective system of forest regeneration.

30. Developing appropriate pricing structure to encourage substitution from fuelwood to alternative fuel types.

Environment

31. Implementing programmes for the attainment of set targets for the mitigation and control of major energy related environmental problems.

Solar, Biomass and Wind

32. Continuing the establishment and monitoring of renewable energy pilot projects and other overflow short-term activities.

33. Establishing of pilot projects to assist local entrepreneurs in the manufacture of biomass energy conversion devices.

34. Enabling the establishment of facilities for the manufacture of renewable energy equipment and devices such as solar cells, PV panels and systems, wind energy equipment and biogas generators, etc.

Other Renewables

35. Continuing data gathering, storage and dissemination activities while encouraging RESEARCH AND DEVELOPMENT activities in the less developed renewables with a view to possible exploitation.

36. Prioritizing the level of need, technological developments and viability of emerging renewable energy resources.

Electricity

37. Implementing the programme for the liberalisation and privatisation of the electricity sub sector.

38. Encouraging off-grid generation and supply of power in remote or isolated areas**.**

39. Establishing a Rural Electrification Fund to facilitate electrification in the rural areas.

Agriculture

40. Ensuring wider adoption of animal traction and simple agricultural technologies that can use multiple energy resources.

41. Training of existing extension personnel in the effective dissemination of the newly developed energy technologies for agriculture.

Transport

42. Rehabilitating and expanding the road, rail and river transport networks as well as port facilities for the handling of coal.

43. Developing and implementing appropriate strategies to attract investments in natural gas pipeline networks and to promote conversion to natural gas for road, river and rail transportation.

44. Encouraging the building of natural gas filling stations as part of road, river and rail networks.

45. Implementing the approved recommendations of the study of the transport fuel distribution system.

46. Implementing the approved recommendations from the investigations on the appropriate energy efficient transport systems, strategies and equipment.

Energy Efficiency and Conservation

47. Implementing the codes, standards, regulations and guidelines on energy conservation and use of energy- efficient methods, equipment, machineries and technologies in agriculture, industry, building design and construction, etc.

48. Establishing the expanded use of energy efficient mass transportation and communication systems.

Research, Development and Training

49. Strengthening the existing National Electricity Research, Development and Training Institute to undertake R, D & T activities in generation, transmission and distribution of electricity, and Zonal Training Centres for the training of various cadres of professional and skilled manpower for the electricity sub sector.

50. Developing, through adequate funding, of the capabilities of the petroleum training institutions to include RESEARCH AND DEVELOPMENT activities on oil and gas related issues and on tar sands for the production of lubricants and other heavy oil products.

51. Providing equipment for energy related research, development and training institutes and centres to enable them provide the necessary facilities and services needed by enterprises involved in the development of the energy sector.

52. Establishing training programmes for the development of specialized energy manpower.

Finance

53. Establishing special risk fund scheme for the commercialization of new and emerging energy technologies, such as renewable energy technologies.

54. Encouraging the attraction of long-term financing from international finance institutions comprising international capital markets and brokerage firms and allowing international brokerage firms to establish and operate in Nigeria.

55. Encouraging the establishment of offshore banking units to attract regular inflow of off-shore funds.

Indigenous Participation

56. Putting in place other incentives, appropriate to each energy sub-sector, which will promote indigenous private sector participation and competitiveness in the sub-sector.

57. Encouraging the establishment of energy sector production and service industries by indigenous investors.

Long Term Measures

General

1. Reviewing, improving and sustaining the medium-term measures.

2. Increasing indigenous participation in the energy industries.

3. Reviewing, strengthening and sustaining the implementation of the national energy masterplan.

4. Integrating fully, renewable, nuclear and conventional energy resources into an optimal energy mix.

Oil

5. Ensuring the attainment and maintenance of a minimum crude oil and condensate reserve of 40 billion barrels and a production capacity of at least 4 mbpd.

6. Completing the privatization of the petroleum processing industries.

7. Furthering expansion of the transmission and storage facilities for petroleum products to achieve at least 90-days strategic reserves.

Natural Gas

8. Putting in place an effective nationwide infrastructure for gas gathering, transmission and distribution, and for the export of natural gas.

Tar Sands/Bitumen

9. Continuing the exploration activities to identify and quantify areas with tar sands/bitumen deposits in Nigeria.

10. Establishing tar sands/bitumen production and processing industry in the country.

11. Developing and implementing a strategy for discouraging the importation of heavy crude oil.

Nuclear

12. Planning the introduction of nuclear power into the national energy mix.

13. Designing, constructing and commissioning of nuclear power plants.

Hydropower

14. Encouraging the wide-spread construction of mini- and micro- hydropower plants.

Solar, Biomass and Wind

15. Encouraging the wide spread production and installation of renewable energy systems.

Electricity

16. Establishing the infrastructure for the local manufacture of electrical equipment, devices and materials.

Finance

17. Internationalizing Nigeria's capital market to enable Nigerian corporate units stocks, listed in the international stock exchanges to attract inflow of foreign investment capital.

Environment

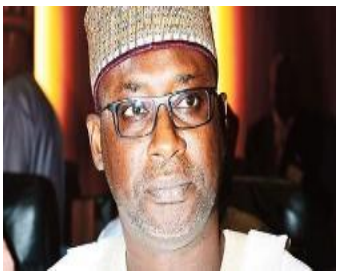
18. Ensuring adequate environmental standards for all energy production and utilization processes.

Chairman and Members of Energy Commission of Nigeria (ECN)

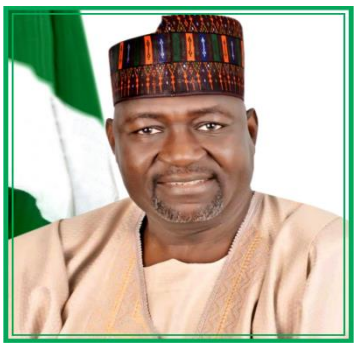
PRESIDENT MUHAMMADU BUHARI
President, Commander-In-Chief of The Armed Forces, Federal Republic of Nigeria.
Chairman of the Commission

Dr Ogbonnaya Onu
Minister of Science, Technology & Innovation

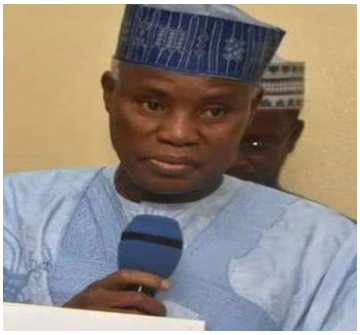
Zainab Shamsuna Ahmed ***Minister of Finance, Budget and National Planning***



Engr. Suleiman Adamu
Minister of Water Resources



Engr. Abubakar Aliyu
Minster of Power



Maj. Gen. Bashir Magashi (rtd)
Minister of Defence

Geoffrey Onyeama
Minister of Foreign Affairs

Olamilekan Adegbite
Minister of Mines & Steel Development

Mohammed Mahmoud Abubakar
Minister of Agriculture

Timipre Silva
Minister of State for Petroleum Resources

Prof. Eli Jidere Bala, FNSE, FAENG,
Director General/CEO
Secretary of the Commission