

**COUNTRY REPORT ON
NIGERIA ENERGY SYSTEM**

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1. GENERAL INFORMATION ON NIGERIA

1.1. Country Overview

1.1.1. Governmental System

Nigeria is a constitutional democracy and operates a federal system of government. The Nigerian federation consists of a Federal Government at the apex and thirty-six states, a Federal Capital territory which includes the administrative capital, Abuja. There are also 774 Municipal Councils or Local Government Areas in the federation. The Federal Government has the exclusive responsibility for foreign policy, national security, defense, monetary policy and national planning. Nigeria operates a presidential system of government similar to the American system. At the federal or national level, there is an Executive President elected popularly on the platform of a political party. The president forms a government of Ministers (Secretaries). The federal legislature consists of the Senate and House of Representatives of elected members. Each state has an elected Executive Governor and members of the State House of Assembly while the Local Governments elect a Chairman and councilors. The three-tiers of government share revenues and allocate responsibilities according to the provisions of the Constitution. The official currency is the Naira (₦1 = 100 Kobo).

1.1.2. Geography and Climate

Nigeria is located on the west coast of Africa. It is bordered on the north by the Niger and Chad; on the east by Cameroon; on the west by the Republic of Benin; and is bounded on the south by the Gulf of Guinea and Equatorial Guinea. It has a total area of 923,766 square kilometers of which the land area consists of 910,768 square kilometers, while the balance of 13,000 square kilometers is water, with a total coastline of 853 kilometers. The land area spans over six ecological zones, ranging from swampy coastal rain forest of the South to the semi-arid fertile grassland of the Eastern region, *about 600 meters over the Northern region and 300 meters over the Western region*. The Coastal southern regions are the low-lying grounds which are generally below 300 meters and are characterized by creeks and lagoons on both sides of the Niger delta. The main drainage systems are the Niger-Benue Rivers, the Lake Chad and the coastal river systems as shown in the map in Figure 1.



Figure 1: Map of Nigeria.

Source: UN Statistics Division

The official language is English, and the major indigenous languages are Hausa, Yoruba and Igbo. The main religions are Islam (50%), Christianity (40%) and Traditional (10%). The main commercial and industrial cities are Lagos, Onitsha, Kano, Ibadan, Port Harcourt, Aba, Maiduguri, Kaduna, Warri, Benin. Sea ports are located at Lagos (Apapa, Tin-can Island), Warri, Port Harcourt, Onne Deep Sea and Hub Port and Calabar (EPZ), while international airports are at Lagos, Kano, Port Harcourt and Abuja. In the area of transportation, the road network consists of over 15,000 km of intercity all weather paved roads, including dual carriage express trunks. There are two main railway lines (South-West to North-East; South-East to North-West) inter-linked and terminating at Lagos, Port Harcourt, Kaura Namoda, Maiduguri and Nguru; with major junctions at Kaduna, Kafanchan and Zaria. Gauge: 1067mm; and a total length of 3505 route km.

The vegetation is typical of what is obtainable in a tropical climate. There are four broad vegetation belts: the Mangrove Swamp on the coast, the Rain Forest, the Woodland Savannah, and the Guinea and Sudan Savannah in the North.

Temperatures across the country are relatively high with a very narrow variation in seasonal and diurnal ranges (22-38 degrees Celsius). There are two basic seasons: wet season which lasts from April to October; and the dry season which lasts from November till March. The dry season commences with the Harmattan, a dry chilly spell that lasts till February and is associated with lower temperatures, a dusty and hazy atmosphere brought about by the North-Easterly winds blowing from the Arabian peninsula across the Sahara; the second half of the dry season, February - March, is the hottest period of the year when temperatures range from 33 to 38

degrees centigrade. The extremes of the wet season are felt on the southeastern coast where annual rainfall might reach a high of 330cm; while the extremes of the dry season, in aridity and high temperatures, are felt in the north third of the country.

1.1.3. Population

Nigeria, with a population of more than 150 million, is a highly populated country with a wide diversity of peoples. The population is made up of about 374 distinct ethnic groups. Three of them, Hausa, Ibo and Yoruba are the major groups and constitute over 40 per cent of the population. In fact, about 10 ethnic linguistic groups constitute more than 80% of the population: the other large groups are Ijaw, Tiv, Ibibio, Kanuri, Nupe, Gwari, Igala, Jukun, Idoma, Fulani, Edo, and Urhobo. The gender divide of Nigeria's population, as indicated by the last census in 2006, reflects an unusual imbalance in favour of male dominance; 51% male: 49% female. Tables 1 to 6 depict the national demographic, economic and energy statistics.

TABLE 1. POPULATION INFORMATION

Year	1970	1980	1990	2000	2006*	2008**	Average annual growth rate (%)
							2000 to 2006
Population (millions)	61.86	75.55	86.97	116.03	140.43	149.65	3.18
Population density (inhabitants/km ²)	67	82	94	125	152	162	
Urban Population as % of total			37	40	45	47	
Area (1000 km²)	923.77	923.77	923.77	923.77	923.77	923.77	

* Latest available data from national census **Extrapolated data from 2006

Source: National Population Commission, Abuja

1.1.4. Economic Data

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

	1970	1980	1990	2000	2005	2007**	Average annual growth rate (%) 2000 to 2007
GDP (millions of current US\$)	7,392	32,450	44,160	75,910	98,830	144,062	9.15
GDP (millions of constant 2000 US\$)	18,181	59,127	59,609	75,910	85,063	116,774	
GDP per capita (PPP* US\$/capita)	182	1248	1750	2333	2935	3383	
GDP per capita (current US\$/capita)	119	671	718	994	1,159	1626	

* PPP: Purchasing Power Parity ** Latest available data

Sources: Nigerian Federal Bureau of Statistics, Abuja; and

<http://www.economywatch.com/economic-statistics/Nigeria/GDP Per Capita PPP US Dollars>

1.1.5. Electricity Situation

In Nigeria, electricity is produced mainly from gas fired thermal plants and Hydro dams. Other sources from which electricity can be generated include: Nuclear, Clean Coal, Solar PV, Wind, etc. Solar PV, Wind and other Renewable sources of electricity generation hold mixed blessings of exciting prospects and challenges to be overcome.

Until the recent implementation of the power sector reforms and privatization of the Power Holding Company of Nigeria (PHCN) assets, electricity power generation, transmission and distribution were the exclusive responsibilities of the Federal Government of Nigeria which national monopoly PHCN held absolute control.

Thus State Governments in the part only intervene in the provision of power distribution infrastructure due to PHCN's lack-lustre performance in connecting communities to the national grid and/or expanding/maintaining existing power supply networks to meet growing demands.

1. CURRENT ENERGY POLICY AND MEASURES OF NIGERIA

Hitherto, existing policies in the energy sector have been those of individual energy sub-sectors such as electricity, oil and gas, and solid minerals. These have been developed from limited perspectives of each of the sub-sectors and had resulted in some cases to conflicting policies and programs, to the detriment of the country as a whole.

The National Energy policy for Nigeria is the one released by the Energy Commission of Nigeria April, 2003. The policy document covers the development, exploitation and supply of all the Nation's energy resources. It also covers key energy utilization sectors; energy related issues such as environment, energy efficiency and energy financing and Energy Policy implementation. It includes strategies for systematic exploitation of the energy resources, the development and effective use of man power, supply of rural energy needs, efficient energy technology and use, energy security, energy financing and private sector participation.

The strategies are finally harmonized and grouped into short, medium and long term measures for easier implementation. The major objectives of the National Energy Policy include:

- 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 resources mix.
- ii. To guarantee increased contribution of energy productive activities and 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 and indigenous participation in energy sector industries, for stability and self-reliance.
- vi. To promote increased investments and development of the energy sector industries with substantial private sector participation.
- vii. To ensure a comprehensive, integrated and well informed energy sector plans and programmes for effective development.
- viii. To foster international co-operation in energy trade and projects development in both the African region and the world at large.
- ix. To successfully use the nation's abundant energy resources to promote international co-operation.

ENERGY SOURCES

Oil

Policies

- i. The nation shall engage intensively in crude oil exploration and development with a view to increasing the reserve base to the highest level possible.
- ii. Emphasis shall be placed on internal self-sufficiency in, and export of, petroleum products.
- iii. The nation shall encourage indigenous and foreign companies to fully participate in both upstream and downstream activities of the oil industry.
- iv. The nation shall encourage the adoption of environmentally friendly oil exploration and exploitation methods.
- v. The nation shall progressively deregulate and privatize the oil industry.
- ix. To attract increased private sector capital inflow to the oil industry.

Natural Gas

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 engage intensively in gas exploration and development with a view to increasing the reserve base to the highest level possible.
- iii. The nation shall put in place necessary infrastructure and incentives to encourage indigenous and foreign companies to invest in the industry.
- iv. The nation shall put in place necessary infrastructure and incentives to ensure adequate geographical coverage of the gas transmission and distribution network.

Tar Sands

Policy

- i. The nation shall encourage tar sands exploration, exploitation and development for full utilisation by the country.
- ii. The exploitation of the tar sands resources shall be private sector driven, while indigenous participation shall be actively promoted.

Coal

Policies

- i. The nation shall pursue vigorously a comprehensive programme of resuscitation of the coal industry.
- ii. Extensive exploration activities to maintain a high level of coal reserves shall be carried out.
- iii. Private sector as well as indigenous participation in the coal industry shall be

activity promoted.

iv. The exploitation and utilization of the coal reserves shall be done in an environmentally acceptable manner.

Nuclear

Policy

The nation shall pursue the exploitation of nuclear energy for peaceful purposes.

Hydropower

Policies

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

ii. The nation shall pay particular attention to the development of the mini and micro hydropower schemes.

iii. The exploitation of the hydropower resources shall be done in an environmentally sustainable manner.

iv. Private sector and indigenous participation in hydropower development shall be actively promoted.

Fuelwood

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 use of wood as a fuel shall be de-emphasized 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.

Solar

Policies

i. The nation shall aggressively pursue the integration of solar energy into the nation's energy mix.

ii. The nation shall keep abreast of worldwide developments in solar energy technology.

Biomass

Policy

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.

Wind

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.

Hydrogen

Policy

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

Other Renewables

Policy

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

ENERGY UTILIZATION

Electricity

Policies

- i. The nation shall make steady and reliable electric power available at all times, at economic rates, for economic, industrial, and social activities of the country.
- ii. The nation shall continue to engage intensively in the development of electric power with a view to making reliable electricity available to 75% of the population by the year 2020.
- iii. The nation shall promote private sector participation in the electricity subsector, while ensuring broad-based participation of Nigerians.

Industry

Policies

- i. The nation shall ensure that an adequate supply of energy is made available to meet the full requirements of industrial activities.
- ii. Emphasis shall be placed on local sourcing of all the energy types to be used by industries.
- iii. Optimal utilization of the nation's available energy types for the various industrial activities shall be pursued in an environmentally sustainable manner.
- iv. The nation shall promote energy efficiency and conservation in industry.

Agriculture

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.

Transport

Policies

- i. The nation shall vigorously pursue the development of an optimal energy mix for the transport sector.
- ii. The nation shall ensure regular and adequate availability of all fuel types for the transport sector.
- iii. The nation shall ensure the use of energy efficient and environmentally friendly technologies in the transport sector.

Households

Policy

There shall be the provision of a mix of energy supply available for households for cooking, lighting, refrigeration, cooling and heating at affordable cost without let and hindrance to improve the standard of living.

ENERGY ISSUES

Environment

Policy

The nation's energy resources shall be exploited in an environmentally safe and sustainable manner.

Energy Efficiency and Conservation

Policies

- i. Energy conservation shall be promoted at all levels of exploitation of the nation's energy resources.
- ii. The nation shall promote the development and adoption of energy efficient methods in energy utilization.

Research, Development and Training

Policy

The nation's energy resources shall be developed and utilized on a self-sustainable basis through research, development and training.

Bilateral, Regional and International Cooperation

Policies

- i. Nigeria'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. Nigeria shall lay emphasis on fostering and strengthening energy cooperation and integration within the ECOWAS sub-region.

ENERGY FINANCING

Financing

Policies

- i. The nation shall explore and adopt all viable financing options from local and international sources for cost effective exploitation of its energy resources.
- ii. Investments in the energy sector shall be accorded high priority within the economic sector.
- iii. Government shall encourage private investments, both domestic and foreign, in the energy sector.

Indigenous Participation

Policies

- i. Indigenous companies and individual Nigerian citizens shall be fully and effectively integrated into ownership participation in the deregulated and privatized energy sector.
- ii. The local content of value added in the energy sector activities shall be raised to, and maintained at, a high level.

PLANNING AND POLICY IMPLEMENTATION

Policies

- i. An integrated energy planning system shall be developed involving the energy related programmes and activities of the various sectors of the economy.
- ii. The energy planning system shall be comprehensive, covering the resource exploitation, processing, and consumption activities.
- iii. The energy plans and programmes shall be consistent with the overall national development goals.

Policy Implementation

Policy

- i. All Government energy related policies will derive from, and be consistent with, the overall National Energy Policy.
- ii. The Energy Commission shall be the focal point for the monitoring and coordination of the implementation of the national energy policy.

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 and, in line with usual planning horizon, it is expected that short-term measures are those that could be evaluated within 1 to 2 years. A 5-year period is advocated for medium-term activities. With this perspective, the recommended activities are as indicated below.

Short Term Measures

General

- 1) Prioritization of the policy strategies for implementation, with the setting of realistic targets and the effective monitoring and evaluation of the implementation process.
- 2) Establishment of necessary guidelines and regulations on energy efficiency, conservation, consumption, technology, fuel mix, information gathering, etc, as appropriate.
- 3) Development and implementation of the 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.
- 4) Ensuring the implementation of fiscal measures necessary for the achievement of the set objectives of the energy policy.
- 5) Rehabilitation of refineries, petroleum products distribution infrastructure, power plants, transmission and distribution networks.
- 6) Continuation of the promotion of 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.
- 7) Increased patronage of indigenous engineering and applied research groups in

the execution of projects right from feasibility studies.

8) Development and implementation of 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.

9) Implementing energy audits in the agricultural and industrial sectors to identify and quantify the structure of energy supply, demand, utilization patterns, efficiencies and substitution potentials etc., for both the small scale and largescale farming and industrial enterprises.

10) Strengthening of all relevant regulatory agencies in order to ensure the enforcement of appropriate set of standards and procedures, including in particular standards and procedures on exploration, production and utilization of energy.

11) Improving the living standard of people in energy resource producing communities through the provision of socio-economic infrastructure.

12) Establishment of a programme for the liberalization and privatization of the energy sector.

13) Development and implementation of 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.

14) Improvement of 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.

15) Establishment of 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.

16) Intensification of action on the development of an energy Master Plan.

17) Encouragement of interaction within existing fora for formal discussions and collaboration between institutions in the energy sector.

18) Enabling of private sector participation in the energy sub-sectors through the review of existing relevant laws and regulations.

19) Establishment of a strategy for the public awareness, education and participation in the realization of the goals and objectives of the energy policy.

20) 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.

21) Establishment of a plan which will 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.

22) Strong encouragement of the energy producing and processing companies to set up R & D outfits in the country and to make use of R & D institutions in

Nigeria.

23) Increased funding to appropriate agencies for the provision of energy related engineering infrastructure.

24) Easing of the constraints on the importation of essential but scarce materials for the manufacture of engineering equipment's and spares.

25) Submitting of 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

26) Setting of medium term reserves and producibility targets.

27) Updating of the memorandum of understanding to ensure that it contains appropriate incentives that will attract investments in intensified crude oil exploration and development.

28) Maximization of petroleum production and processing efficiencies.

29) Improvement and promotion of the provisions put in place for the establishment of export refineries.

30) Ensuring the use of locally available materials such as bentonite and barytes for oil exploration.

Natural Gas

31) Review and improvement of existing incentives to producing companies to encourage them to gather and utilize associated gas in order to maximise income from associated gas and eliminate gas flaring by 2008.

32) Review of existing penalties for gas flaring and ensuring that they achieve the desired effect.

33) Establishment of appropriate arrangements to ensure the implementation of the incentives and penalties to discourage gas flaring.

34) Monitoring the implementation of measures to achieve the termination of gas flaring by 2008.

35) Establishment of 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.

36) Provision of funding for the establishment of a nationwide infrastructure for gas gathering, transmission and distribution.

37) Review and sustenance of the implementation of incentives to industrial and domestic consumers to use gas or change over to gas.

38) Sustenance and expansion of the measures presently in place for the establishment of infrastructure and markets for the export of natural gas.

39) Formulation of suitable urban and regional planning regulations, which are needed for the effective distribution of natural gas to domestic and industrial consumers.

Tar Sands

- 40) Undertaking of more detailed geological studies, exploration and exploitation activities for the tar sands deposits of the country.
- 41) Establishing an appropriate regulatory institution for the tar sands sub-sector.
- 42) Putting in place necessary regulations and guidelines for the exploitation of tar sands deposits.
- 43) Providing appropriate incentives to facilitate investments in the exploration and exploitation of tar sands resources.

Coal

- 44) Development and implementation of appropriate measures for large scale production of coal stoves at affordable prices and for the establishment of coalbased industries, by local entrepreneurs.
- 45) Provision of adequate funding to enable intensified coal exploration and production activities.
- 46) Re-introducing the use of coal for power generation.
- 47) Providing adequate incentives to indigenous and foreign entrepreneurs so as to attract investments in coal exploration and production.

Nuclear

- 48) Intensification of Research, Development and Training in Nuclear Science and Technology for peaceful applications.
- 49) Evolution of a rational nuclear development programme and institutional arrangements.
- 50) Strengthening of the Nigerian Nuclear Regulatory Authority to ensure Nuclear safety and Radiation Protection.
- 51) Commissioning of the pilot-scale gamma irradiation facilities for food preservation, sterilization and other industrial applications.
- 52) Commissioning the Nuclear Research Reactor.
- 53) Regular public enlightenment campaigns on peaceful applications of nuclear technology.
- 54) Intensification of exploration activities for nuclear mineral resources.
- 55) Fostering of co-operation with the IAEA through encouragement of the national counterpart agency to actively participate in all IAEA programmes.
- 56) Providing adequate resources to the Nigerian Nuclear Regulatory Agency (NNRA) for the enforcement of nuclear laws and regulations.

Hydropower

- 57) Constant review and improvement of multilateral agreements for monitoring and regulating the use of water in international rivers flowing through the country.
- 58) Increased patronage of indigenous entrepreneurs involved in the planning,

design and construction of hydropower plants.

59) Establishment of appropriate fiscal measures as incentives to indigenous and foreign entrepreneurs for the local production of hydropower plants and accessories.

60) Establishment of appropriate institutional arrangements, regulations, and guidelines for the development of small-scale hydropower plants.

Fuelwood

61) Cultivation of fast growing tree species needed to accelerate the regeneration of forests.

62) Development of smokeless coal, sawdust, biogas and other energy technologies as alternatives to fuelwood.

63) Improvement of the efficiencies and performances of existing improved woodstoves and ovens.

64) Encouragement of the establishment of private and community woodlots for the supply of fuelwood.

65) Ensuring the availability and effective distribution of kerosene as an alternative to fuelwood in the interim.

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

67) Promotional activities, such as extension and pilot projects, to disseminate solar, biogas and other alternative technologies to fuelwood.

68) 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

69) Organization of systematic public enlightenment campaigns on the problems of desertification and soil erosion arising from deforestation.

70) Review and enforcement of forestry laws to effectively stop the willful felling of trees in prohibited zones.

71) Dissemination of information on existing energy efficient and environmentally friendly technologies in the exploitation of various energy resources.

72) Development and implementation of guidelines and regulations on appropriate technologies for the exploitation of energy resources to minimize harmful environmental effects.

73) Intensification of research and development in more efficient and environmentally friendly utilization of various energy sources.

74) Encouragement of the utilization of environmentally friendly energy resources and technologies.

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

76) 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.

Solar, Biomass and Wind

77) Establishment of 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.

78) Establishment of appropriate fiscal measures as incentives for the utilization of solar, wind and other renewable energy systems.

79) Establishment of a set of regulations and guidelines to promote and sustain the local solar, biomass and other renewable energy industries.

80) Development and implementation of training packages for skilled craftsmen and technicians on the production, operation and maintenance of solar, wind, biomass and other renewable energy systems.

81) Providing adequate incentives to producers, developers and suppliers of solar, wind and biomass energy products and services.

Other Renewable Energy Resources

82) Gathering information on the advances in less developed renewable energy resources; Extension of the energy information acquisition, storage and dissemination activities to them.

Electricity

83) Completion of on-going short term projects designed to satisfy national demand for electricity.

84) Expansion of the existing electricity transmission and distribution networks.

85) Intensification of research, development and training in alternative sources of energy for the generation of electricity.

86) Establishment and commencement of a programme for the liberalization and privatization of the electricity sub-sector.

87) Development of appropriate infrastructure, guidelines, laws and regulations for the management of a liberalized and privatized electricity sub-sector.

88) Commercialization of electric utility agencies and granting them managerial and financial autonomy to enable them operate efficiently.

89) Establishing a reduced tariff regime for very low and especially handicapped electricity consumers and a mechanism for funding the subsidy.

90) Review and strengthening of existing incentives for the encouragement of local manufacture of electrical equipment and devices.

91) Establishment of effective measures to ensure the security of electrical installations and improving the operational efficiency of the electricity subsector, particularly the distribution activities.

92) Providing appropriate financing facilities to support indigenous investments in the electricity industry.

Industry

93) Development and implementation of appropriate measures to encourage fuel substitution in industries.

Agriculture

94) Intensive promotion of the utilization of renewable energy in agriculture through demonstration, pilot projects, workshops, etc.

95) Intensification of research and development activities for appropriate agricultural technologies that can use available and multiple energy resources, including animal traction.

Transport

96) Periodic review of transport fuels storage capacity, in accordance with developments in the transport sector, with a view to updating the storage capacity guidelines and storage infrastructure.

97) Comprehensive study of the transport fuel distribution systems and development of recommendations for their improvement.

98) Initiation of discussion with relevant institutions in the transport sector to identify appropriate energy-efficient transport systems, strategies and equipment that should be introduced.

99) Encouragement of the relevant agencies to introduce fuel-efficient transport management systems.

100) Encouragement of the relevant agencies to improve and expand mass transportation and communication systems, countrywide.

Energy Efficiency and Conservation

101) Development of codes, standards, regulations and guidelines on energy conservation and use of energy-efficient methods, appliances, equipment, machinery and technologies in homes, agriculture, industry, building design and construction, etc.

102) Establishment of appropriate institutional arrangements and incentives for the promotion and monitoring of energy conservation and use of energy-efficient methods.

Research, Development and Training

103) Provision of increased funding to research institutes, centers and tertiary institutions, who are undertaking R & D work on renewable, nuclear, coal and other energy resources to ensure productive R & D and the establishment of appropriate infrastructure.

104) Development and implementation of a programme of R & D in energy conservation and efficiency, including the development and manufacture of energy-efficient equipment and machinery.

105) Promotion of the development and introduction of integrated energy and environment curricula and disciplines into the programmes of tertiary institutions.

106) 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.

107) Establishment of 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.

108) Development and initiation of the implementation of an accelerated and effective manpower development programme for the energy sector.

Finance

109) Provision of appropriate measures to encourage prospective investors in the energy sector.

110) Expansion of the scope of Venture Capital Financing (National Risk Fund Plc) to embrace investments in the energy sector.

111) Encouraging energy firms to source development funds from the Nigerian capital market.

112) Establishment of guaranteed and dependable repayment scheme for loans invested in energy projects.

Indigenous Participation

113) Establishing a financing mechanism which will support indigenous investments in energy sector industries.

114) 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.

115) Setting aside significant percentages of the shares of privatised energy sector industries for acquisition by Nigerians.

116) Putting in place schemes to ensure broad-based access by Nigerians to shares in privatised energy sector industries.

.Medium Term Measures.

General

1) 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 subsectoral plans and programmes.

3) Development of 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) Establishment and sustenance of the implementation of a national energy masterplan.

6) Continuation of the priority given to the provision of facilities for the production of ferro-alloys and flats for the manufacturing industries.

Oil

7) Ensuring the attainment of a reserve target of 35 billion barrels and a production capacity of 3.5 mbpd.

8) Commercialization of the operations of existing refineries while taking steps to promote private sector participation in the refining business.

9) Expansion of the transmission and storage facilities for petroleum products to achieve the 45-day strategic reserves.

10) Ensuring adequate geographic coverage of petroleum products distribution network.

Natural Gas

11) Termination of gas flaring.

12) Sustaining funding for the expansion of the infrastructure for gas gathering, transmission and distribution nationwide.

13) Intensification of promotional activities for the use of gas and change over to gas by industrial and domestic consumers.

14) Implementation of urban and regional planning regulations for effective distribution of natural gas.

15) Embarking on deliberate exploration for gas in all parts of the country.

Tar Sands

16) Continuation of detailed exploration activities and mapping ***and*** exploitation of the Tar Sands deposits in the country.

17) Providing appropriate financing facilities to support indigenous investment in tar sands development.

Coal

18) Review, improvement and effective implementation of measures for the production of coal stoves and the establishment of coal-based industries.

19) Establishment of smokeless coal pilot projects for the promotion of the use of smokeless coal as an alternative to fuelwood.

20) Introducing clean coal technologies into coal utilization.

Nuclear

- 21) Acquisition of nuclear research facilities and expansion of their applications in manpower training, agriculture, medicine and industry.
- 22) Completing the accelerator project and industrial irradiator.
- 23) Commencement of the exploitation of the nuclear mineral resource deposits in Nigeria.
- 24) Enforcement of Nuclear Safety and Radiation Protection Regulations.
- 25) Establishing a nuclear radiation surveillance programme for the protection of the environment.

Hydropower

- 26) Introduction of alternative technological options to reduce the impact of water shortage on hydropower plants.
- 27) Encouraging the private sector in the establishment and operation of hydropower plants.
- 28) Establishment of basic engineering infrastructure for the production of hydropower plants equipment and accessories
- 29) Establishment of mini - and micro- hydropower plants.

Fuelwood

- 30) Ensuring the availability and effective distribution of kerosene and other viable alternatives to fuelwood.
- 31) Conferment of reserve status on greater acreage of forest and establishment of an effective system of forest regeneration.
- 32) Development of appropriate pricing structure to encourage substitution from fuelwood to alternative fuel types.

Environment

- 33) Implementation of programmes for the attainment of set targets for the mitigation and control of major energy related environmental problems.

Solar, Biomass and Wind

- 34) Continuation of the establishment and monitoring of renewable energy pilot projects and other overflow short-term activities.
- 35) Establishment of pilot projects to assist local entrepreneurs in the manufacture of biomass energy conversion devices.
- 36) 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

37) Continuation of data gathering, storage and dissemination activities while encouraging R & D activities in the less developed renewables with a view to possible exploitation.

38) Prioritizing the level of need, technological developments and viability of emerging renewable energy resources.

Electricity

39) Implementation of the programme for the liberalisation and privatisation of the electricity sub sector.

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

41) Establishing a Rural Electrification Fund to facilitate electrification in the rural areas.

Agriculture

42) Ensuring wider adoption of animal traction and simple agricultural technologies that can use multiple energy resources.

43) Training of existing extension personnel in the effective dissemination of the newly developed energy technologies for agriculture.

Transport

44) Rehabilitation and expansion of the road, rail and river transport network as well as port facilities for the handling of coal.

45) Development and implementation of appropriate strategies to attract investments in natural gas pipeline networks and to promote conversion to natural gas for road, river and rail transportation.

46) Encouragement of the building of natural gas filling stations as part of road, river and rail networks.

47) Implementation of the approved recommendations of the study of the transport fuel distribution system.

48) Implementation of the approved recommendations from the investigations on the appropriate energy efficient transport systems, strategies and equipment.

Energy Efficiency and Conservation

49) Implementation of 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.

50) Establishment of expanded use of energy efficient mass transportation and communication systems.

Research, Development and Training

51) Establishment of a 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.

52) Development, through adequate funding, of the capabilities of the petroleum training institutions to include R & D activities on oil and gas related issues and on tar sands for the production of lubricants and other heavy oil products.

53) Adequate provision of equipment for the 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.

54) Establishing training programmes for the development of specialized energy manpower.

Finance

55) Establishment of a special risk fund scheme for the commercialization of new and emerging energy technologies, such as renewable energy technologies.

56) 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.

57) Encouraging the establishment of offshore banking units to attract regular inflow of off-shore funds.

Indigenous Participation

58) Putting in place other incentives, appropriate to each energy sub-sector, which will promote indigenous private sector participation and competitiveness in the sub-sector.

59) Encouraging the establishment of energy sector production and service industries by indigenous investors.

Long Term Measures

General

1) Review, improvement and sustenance of medium-term measures.

2) Effective Nigerianization of the personnel in the energy industries.

3) Review, strengthening and sustaining of the implementation of the national energy masterplan.

4) Full integration of 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) Complete privatization of the petroleum processing industries.

7) Further 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

9) Continuation of exploration activities to identify and quantify areas with tar sands deposits in Nigeria.

10) Establishment of a tar sands production and processing industry in the country.

11) Development and implementation of 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) Encouragement of the wide-spread construction of mini- and microhydropower plants.

Solar, Biomass and Wind

15) Encouragement of the wide spread production and installation of renewable energy systems.

Electricity

16) Establishment of the infrastructure for the local manufacture of electrical equipment, devices and materials.

Finance

17) Internationalization of 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.

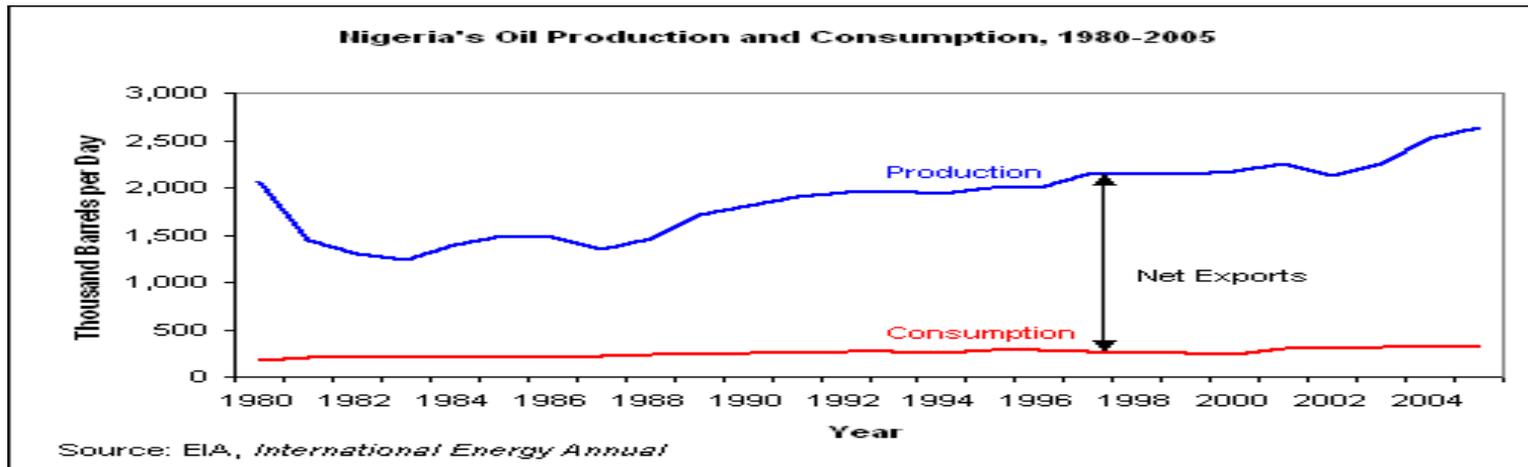
1. PAST ENERGY DEMAND AND SUPPLY OF NIGERIA

The past Energy demand and supply of Nigeria could be understood looking at the publication released by the US Energy Information Administration, in a systematic order:

Nigeria, Africa's most populous country, is experiencing its longest period of civilian rule since independence from the United Kingdom in 1960. The country had not held successful elections under a civilian government since independence.

Oil Production

Nigeria is the largest oil producer in Africa and the tenth largest producer of crude oil in the world. In 2005, total Nigerian oil production, including lease condensates, natural gas liquids and refinery gain, averaged 2.6 million bbl/d (of which 2.4 million bbl/d was crude oil). With the help of new projects coming online, the Nigerian government hopes to increase oil production to 3 million bbl/d in 2006 and 4 million bbl/d by 2010.



In recent years, Nigeria has experienced increased pipeline vandalism. In October 2005, a pipeline fire in the south-western Delta State of Nigeria resulted in the deaths of about 60 people. This was followed by a December attack, in which armed men in speed boats dynamited Shell's pipeline in the Opobo Channel. In January 2006, a pipeline attack from the Brass Creek fields to the Forcados terminal forced Shell to announce a force majeure on Forcados commitments to end-February. Additional attacks made on the pipeline and the Forcados terminal in February

made it necessary for Shell to extend the force majeure beyond the end-February date. Shell estimates that 455,000 bbl/d of its oil production is currently shut-in because of the attacks. A February 2006 attack on the Escravos pipeline, that supplies oil to the Warri refinery, caused the refinery to shutdown. Officials are unsure of how long it will take to repair the damage. Nigeria had re-commissioned the Escravos-Warri pipeline in January 2005 after 18 months of repairing the damage caused by sabotage during the 2003 Niger Delta Crisis. In addition to pipeline vandalism, Nigeria has seen an increase in kidnappings of expatriate oil workers in the Niger Delta region. In January 2006, four foreign employees of Royal Dutch Shell were kidnapped and then held for 19 days before being released on "humanitarian grounds". In February 2006, nine additional oil workers were kidnapped in the Niger Delta region. The Movement for the Emancipation of the Niger Delta (MEND) is taking responsibility for the kidnappings and for blowing up a crude oil pipeline owned and operated by Royal Dutch Shell. As of March 3, 2006, six of the nine hostages were released, but MEND has stipulated numerous conditions that must be met before the remaining three hostages will be released. Chief among the conditions is the release of Ijaw prisoners and the establishment of a United Nations inquiry that would assess the Niger Delta problem.

Despite the recent attacks on Shell's oil facilities, the company's deepwater Bonga field began producing oil at the end 2005. Bonga is estimated to hold recoverable reserves of 600 million barrels of oil. At peak production, the field will produce around 225,000 bbl/d and 150 million cubic feet (MMcf) of natural gas. Oil from the field will be stored in a floating production, storage and offloading (FPSO) unit, with a capacity of 2.0 million barrels.

ExxonMobil produces around 750,000 bbl/d of oil in Nigeria. The company plans to invest \$11 billion in the country's oil sector through 2011, with the hope of increasing production to 1.2 million bbl/d. The majority of the increase will occur at the 150,000-bbl/d Erha development, which is located on Block OPL 209. First production is expected in March 2006, with output increasing to 200,000 bbl/d by the end of the year. Oil from Erha will be stored in a FPSO, with a capacity of 2.2 million barrels oil. Very Large Crude Carriers (VLCC), capable of holding up to 300,000 deadweight tons will be used for exporting the oil from the terminal. ExxonMobil also operates the Yoho field, with current full-field output of around 150,000 bbl/d. Yoho contains around 400 million barrels of oil reserves. Yoho will be re-injected with associated natural gas to maintain field pressures and to eliminate natural gas flaring. The \$1.2 billion field is located in the shallow waters of Block OML 104. ExxonMobil's Bosi, and Eti/Asasa fields with capacities of 120,000 bbl/d, and 25,000 bbl/d, respectively, are scheduled to come online between 2006 and 2007.

Total, Chevron, Agip, and ConocoPhillips are also involved in the Nigerian oil sector. Output at Total's Amenam field reached 120,000 bbl/d in January 2005. The Amenam field contains reserves of around one billion barrels of oil equivalent. Total's Akpo field is expected to come online in 2008, with estimated output capacity of 225,000 bbl/d. In 2004, Chevron produced an average of 366,000 bbl/d of oil, while Agip produced 255,000 bbl/d of oil.

In past years, the amount of oil that Nigeria produced has led to disputes with the Organization of Petroleum Exporting Countries (OPEC), as Nigeria frequently exceeded its production quotas. The multinationals see Nigeria's OPEC production quota as a major hindrance to increased production at several deepwater fields. Currently, Nigeria's OPEC quota for crude production is 2.3 million bbl/d. In January 2006, Nigerian Minister of State for Petroleum, Edmund Daukoru, became the new OPEC president. Industry analysts have indicated that he will be faced with the

double challenge of guaranteeing cohesion among OPEC members, while allowing Nigeria to increase its oil production.

Refining and Downstream

Nigeria's refining capacity is currently insufficient to meet domestic demand, forcing the country to import petroleum products. Nigeria's state-held refineries (Port Harcourt I and II, Warri, and Kaduna) have a combined nameplate capacity of 438,750 bbl/d, but problems including sabotage, fire, poor management and a lack of regular maintenance contribute to the current operating capacity of around 214,000 bbl/d. The Nigerian government is granting permits to build several independently-owned refineries in Nigeria. Sapele Petroleum Limited is waiting for final approval to construct a \$105-million, 120,000 bbl/d oil refinery in Delta State. The refinery is one of the more probable to be built and could save Nigeria as much as \$2 billion in costs for refined petroleum imports.

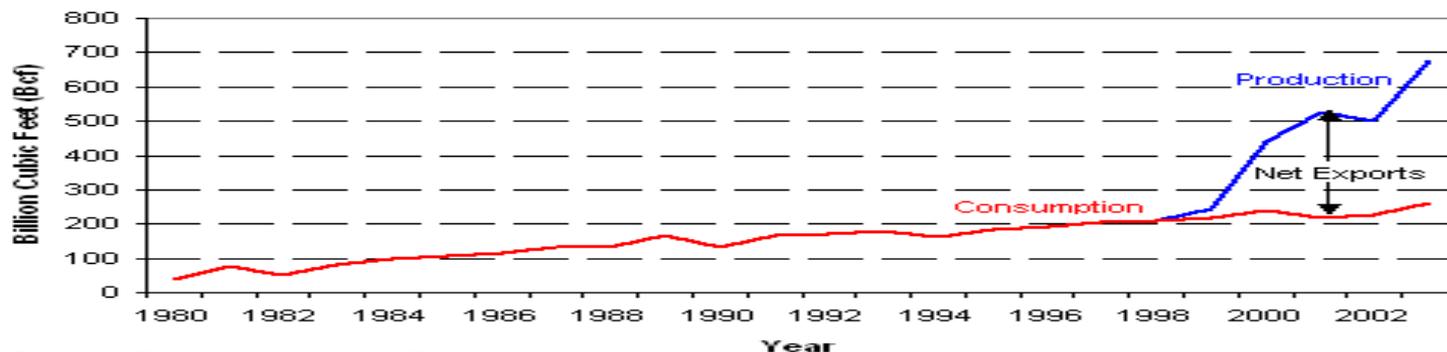
Nigeria is trying to privatize state entities by selling NNPC's four oil refineries, petrochemicals plants, and its Pipelines and Products Marketing Company (PPMC). However, multinational oil companies have shown little interest in investing in refinery privatization. The Nigerian government recently opened negotiations with Libyan, Indian, and Chinese investors. In July 2004, the Group Managing Director of NNPC announced that a two-year program was underway with Accenture and Shell Global Solutions to reengineer PPMC to make it competitive in global markets.

Considerable opposition to the proposed measures have been voiced by the National Union of Petroleum and Natural Gas Workers (NUPENG) and the Petroleum and Natural Gas Senior Staff Association of Nigeria (PENGASSAN), which fear that job losses and higher product prices will result from the privatizations. In February 2005, Majestic Oil (Sierra Leone) bought the Nigerian government's 48.4 percent stake in the West Africa Oil Refinery in Freetown. Majestic also acquired Unipetrol Nig LPC's 24.2 percent share, when the company failed to invest in the rehabilitation of the facility.

Natural Gas

The *OGJ* estimates that Nigeria had an estimated 185 trillion cubic feet (Tcf) of proven natural gas reserves as of January 2006, which makes Nigeria the seventh largest natural gas reserve holder in the world and the largest in Africa. In October 2004, Nigeria announced that its natural gas reserves could be as high as 660 Tcf. The government plans to raise earnings from natural gas exports to 50 percent of oil revenues by 2010. However, NNPC estimates that \$15 billion in private sector investments is necessary to meet its natural gas development goals by 2010.

Nigeria's Natural Gas Production and Consumption, 1980-2003



Source: EIA, *International Energy Annual*

The vast majority of natural gas found in Nigeria is associated, meaning that it occurs in crude oil reserves as free gas. Because many of the fields lack the infrastructure to produce the associated natural gas, it is flared. Nigeria flares more natural gas than any other country in the world, with 43 percent of its total annual natural gas production being flared. NNPC estimates that Nigerian flared natural gas accounts for approximately 20 percent of the world total. Nigeria is working to end natural gas flaring by 2008. However, Shell announced in its 2004 People and Environment Annual Report that it would not be able to meet the 2008 goal of eliminating natural gas flaring.

Production

A significant portion of Nigeria's natural gas is processed into liquefied natural gas (LNG). Nigeria's most ambitious natural gas project, the \$3.8 billion NLNG facility on Bonny Island, was completed in September 1999. In January 2006, NLNG sent its first shipment of LNG exports to the United States from its newly-commissioned fourth train. The company's fifth train began operating in January 2006 as well. The additional two trains have increased annual production capacity to 17 million tons per year of LNG. Plans have been approved for a sixth train (to come online in 2007), which is expected to bring total capacity to 22 million tons per year. The facility is currently supplied from dedicated (non-associated) natural gas fields, but it is anticipated that, within a few years, half of the input natural gas will consist of associated (currently flared) natural gas from existing oil fields. In January 2005, ExxonMobil signed a memorandum of understanding (MOU) with NNPC to study the possibility of constructing a second LNG plant on Bonny Island to come online in 2010. The plant would produce around 4.8 million tons per year of LNG.

Plans for additional LNG facilities in Nigeria are also being developed. In January 2005, Chevron announced the possibility of constructing a \$7 billion LNG plant, OK-LNG, at Olokola in western Nigeria. The plant would have an initial capacity of 11 million tons per year and a

maximum capacity of 33 million tons per year. Construction is expected to begin in 2006, with completion in 2009. Chevron's final investment decision (FID) deadline for the project is March 2006. If Chevron decides not to financially commit to the project, Shell has been named as a possible alternative operator. In December 2005, ConocoPhillips, Chevron and Agip met with NNPC to sign a shareholders agreement for the establishment of the \$3.5 billion Brass River LNG plant. If the project continues along the current timetable, its two LNG trains will be operational by late 2009. A FID for the project is scheduled to be made in September 2006.

Chevron's Escravos Gas Project (EGP) came online in 1997. In 2000, total capacity was 285 MMcf/d of natural gas. The facility's output capacity will be expanded to 630 MMcf/d of natural gas in 2007. Chevron is also working on the Escravos gas-to-liquids (GTL) project that is expected to have production capacity of 33,000 bbl/d. Completion of the GTL project is scheduled for 2009. However, the project has been slowed by community complaints over not employing local residents to work at the facility. It is likely that Chevron will look for state intervention to help resolve the issue. A year earlier, the Nigerian government halted the implementation of the Escravos GTL project due to high costs. Future plans for the project include linking the Escravos pipeline system with the [West African Gas Pipeline](#) (WAGP) for natural gas export to Benin, Togo and Ghana.

Electricity

The Nigerian power sector operates well below its estimated capacity, with power outages being a frequent occurrence. In 2003, total installed electricity capacity was 5.9 gigawatts (GW). Total electricity generation during 2003 was 15.6 billion kilowatthours (Bkwh), while total consumption was 14.5 Bkwh.

According to Power Company Holding of Nigeria (PHCN), the country's peak electric demand in February 2006 was 7,600 megawatts (MW), but actual generation capability was 3,600 MW. The discrepancy between electricity demand and actual generation is mostly due to low water levels and inadequate plant maintenance. During 2005, electricity generation capacity fluctuated between 2,600 MW and 3,600 MW. The hydropower stations Kainji, Jebba, and Shiroro have seen generation affected by insufficient water, and the Lagos Egbin, Delta, and Port Harcourt Afam plants are also operating at below capacity due to poor maintenance.

Only 40 percent of Nigerians have access to electricity, the majority of whom are concentrated in urban areas. Despite endemic blackouts, customers are billed for services rendered, partially explaining Nigeria's widespread vandalism, power theft and PHCN's problems with payment collection. Nigeria's Bureau of Public Enterprises (BPE) hopes to see increased stability in Nigeria's electricity sector once the privatization of PHCN takes place.

Sector Organization

The Nigerian power sector is controlled by state-owned Power Company Holding of Nigeria (PHCN), formerly known as the National Electric Power Authority (NEPA). In March 2005,

President Obasanjo signed the Power Sector Reform Bill into law, enabling private companies to participate in electricity generation, transmission, and distribution. The government has separated PHCN into eleven distribution firms, six generating companies, and a transmission company, all of which will be privatized. Several problems, including union opposition, have delayed the privatization, which is now scheduled for 2006. In February 2005, the World Bank agreed to provide PHCN with \$100 million to assist in its privatization efforts.

Environment

While Nigeria's development of the oil sector has been good for the country's economy, oil sector development has had an adverse impact on the country's environment. Oil extraction in the Niger Delta region has caused severe environmental degradation, owing to the legacy of oil spills, lax environmental regulations, and government complicity during military regimes that once governed the country. Although the situation is improving with more stringent environmental regulations for the oil industry, marine pollution is still a serious problem. Air pollution from natural gas flaring, exhaust emissions from the explosion in car ownership, and electricity generators continue to leave Lagos shrouded in smog.

The use of solid biomass, such as fuel wood, is prevalent and constitutes a major energy source for rural Nigerians. The production and consumption of commercial renewable energy in Nigeria remains quite limited. With Nigeria's population continuing to increase, the pressure on the country's environment appears likely to increase as well, even with the added focus on cleaning up the Niger Delta and tightening environmental laws and regulations.

Energy Overview

Proven Oil Reserves (January 1, 2006E)	35.9 billion barrels
Oil Production (2005E)	2,629.4 thousand barrels per day, of which 93% was crude oil.
Oil Consumption (2005E)	319.3 thousand barrels per day
Net Oil Exports (2005E)	1,310.1 thousand barrels per day
Crude Oil Refining Capacity (2006E)	438.8 thousand barrels per day
Proven Natural Gas Reserves (January 2006E)	1,184.7 trillion cubic feet
Natural Gas Production (2003E)	0.7 trillion cubic feet
Natural Gas Consumption (2003E)	261.7 billion cubic feet
Net Natural Gas Exports (2003E)	490.6 billion cubic feet
Recoverable Coal Reserves (2003E)	209.4 million short tons
Coal Production (2003E)	0.1 million short tons
Coal Consumption (2003E)	0.1 million short tons
Electricity Installed Capacity (2003E)	5.9 gigawatts
Electricity Production (2003E)	15.6 billion kilowatt hours
Electricity Consumption (2003E)	14.5 billion kilowatt hours
Total Energy Consumption (2003E)	1 quadrillion Btus*, of which Oil (64%), Natural Gas (27%), Hydroelectricity (8%), Coal (0%), Nuclear (0%), Other Renewables

Total Per Capita Energy Consumption (2003E)	7.9 million Btus
Energy Intensity (2003E)	7,278.1 Btu per \$2000-PPP**

Environmental Overview

Energy-Related Carbon Dioxide Emissions (2003E)	93.5 million metric tons, of which Natural Gas (52%), Oil (48%), Coal (0%)
Per-Capita, Energy-Related Carbon Dioxide Emissions (2003E)	0.8 metric tons
Carbon Dioxide Intensity (2003E)	0.7 Metric tons per thousand \$2000-PPP**

* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power. The renewable energy consumption statistic is based on International Energy Agency (IEA) data and includes hydropower, solar, wind, tide, geothermal, solid biomass and animal products, biomass gas and liquids, industrial and municipal wastes. Sectoral shares of energy consumption and carbon emissions are also based on IEA data.

1. OUTLOOK OF ENERGY DEMAND AND SUPPLY OF NIGERIA

The outlook of Energy Demand and Supply in Nigeria can be summarized as in the International Journal of energy Policy, research and Development (JEPRD) published by the energy Commission of Nigeria. JEPRD is to serve as the vehicle for dissemination of research and development efforts and strategic policies on Energy in Nigeria as well as from other parts of the world, deemed relevant to Nigeria Energy development. This study is actually the work of Professor Sambo, A.S who is the Director General, Energy Commission of Nigeria and Vice-Chair, World Energy Council – Africa (WEC-Africa). The paper highlights the energy outlook of Nigeria's energy demand over a period of 30 years; in which bottom-up analysis of Nigeria's energy demand over a period 2005-2030, conducted by Energy Commission of Nigeria, for meeting the Socio-economic development aspiration of Nigeria. The Energy requirements for the country's development aspirants were assessed within the framework of scenario analysis by using the model for analysis of Energy Demand (MAED), which was developed by the International Atomic Energy Agency (IAEA).

The energy commission of Nigeria is required by law to prepare, review and update National Plans periodically to ensure that all reasonable demands for Energy are met in a sustainable manner.

Having applied the model for analysis of Energy Demand to develop an outlook for the period 2005-2030, the results of the energy analysis gives the energy implications of the development

aspiration of Nigeria and the challenges of supplying the projected energy demands. The structure of Energy consumption in the base year that current systems of energy supply and use are clearly not sustainable in economic, environmental and social terms, with overdependence on traditional fuel and low modern energy (electricity and petroleum products) consumption and generally low energy and electricity consumption per capita. With more vigorous government action, the trend can be changed to a sustainable path. There should be a strong commitment to increase investment in the provision of adequate modern energy sources in order to power the development aspirations. The aspirations cannot be met with current energy system based mainly on traditional fuels and inadequate and unreliable modern energy (Ojosu et al, 2009). Reliance on importation of motor fuels is not sustainable in the long term. Government needs to create the enabling environment to encourage private sector participation in the establishment and management of refineries in the country.

The country has four refineries with a nominal capacity of 445,000 bpd. Presently, average capacity is less than half of the total installed capacity. Much of the country's current consumption is imported. Natural gas is used for power production, LPG for heating and exports as liquefied natural gas. The West African Gas Pipeline opens as additional opportunity for gas exports. Presently the nominal electricity generating capacity is less than 6,000 MW. Actual output represents about half of the installed capacity. Government plans to boost power production through new gas plants and Independent Power Producers (IPPs).

With the privatization of the Power Sector for effective Private Participation and the upgrading of the transmission lines, improved power supply is guaranteed.

Access to cost-effective and sustainable energy services is critical to re-launching the Nigerian economy and meeting MDG and NEEDS targets. However, barely 40 percent of all Nigerians have access to electricity services. This leaves about one hundred million Nigerian literarily in the dark, while generation shortages and poor transmission and distribution infrastructure consigns the industrial and services sectors to under-performance. The power sector is so inadequate that it constitutes a major roadblock to economic progress and social well-being. The economy suffers from petroleum product supply constraints as well as poor gas infrastructure and utilization. Beyond the formal sector, denudation of forest resources and wood scarcity remain a crisis unfolding in slow motion. Biomass energy accounts for 37% of aggregate national demand, and 95% of rural energy use. The diminishing stock of fuel wood will compound the problem of poverty reduction and challenge efforts to empower women, children and fuel wood merchants.

The National Energy Policy (NEP) sets the framework for the development of the nation's renewable energy resources. Among other things, the policy seeks to ensure the development of the nation's energy resources for the achievement of national energy security and an efficient delivery system with optimal energy resource mix. It further aims at guaranteeing adequate, reliable and sustainable supply of energy at appropriate costs and in an environmentally friendly manner.

1. MAJOR DIFFICULTIES AND BOTTLENECKS CURRENTLY FACED IN FORMULATING ENERGY POLICIES IN NIGERIA

The difficulties faced in the formulation of Energy Policies could be enumerated under the following:

- (i) **Political Influence:** In Nigeria, before now change of government through military coup was very rampant and each government comes with its own interests, which most often are in conflict with the previous governments and even in the democratic government, the passage of the drafted policies could take a long time because of personal interests.
- (ii) **Stakeholders Influence:** The individual stakeholders will always want to see that the policies do not bear on their freedom to operate.
- (iii) **Lack of Experienced Personnel:** Most of the workforce is not technically competent to draft a workable policy for the industry because of lack of good understanding of the sector.
- (iv) **Lack of Adequate Information and Data:** Vital information and data needed to formulate a workable policy are not usually available because of bureaucratic process.
- (v) **Multicultural Diversity of the Country:** This sometimes makes the country to be polarized along ethnic and religious sentiments as a result; coming to terms becomes difficult among the political class.
- (vi) **External Influence:** Sometimes the Influence from the international communities could pose a problem in the system.

2. SUBJECTS TO STUDY

- (i) Policy framework and mechanism for attracting investors in the area of Grid and Off-Grid potentials in my state in order to boost power supply.
- (ii) Tools for developing energy policies that will encourage investors in developing Grid and Off-Grid potentials that will serve communities where available

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