

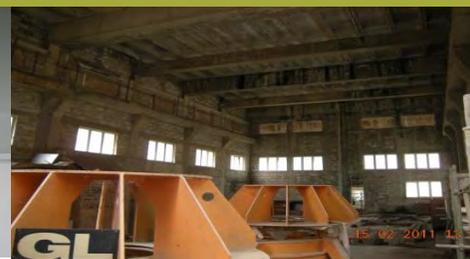
**RENEWABLE ENERGY AND ACCESS
WORKSHOP: ACCRA GHANA
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**RENEWABLE ENERGY PROFILE IN NIGERIA
WITH FOCUS ON SMALL HYDRO POWER**

By

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INTRODUCTION



- **Location:** Nigeria lies within latitudes: 4.32° N and 14° N and longitudes 2.72° E and 14.64° E with land area of about 924,000 sq km.
- **Population:** 158.2 million (UN 2010)
- **Govt. Structure:** Federalism - 36 States & FCT
- **Political System:** Multi party Democracy
- **Climate:** Nigeria have average Minimum temperature of 20°C - 25°C and Maximum of 25°C - 37°C And rain fall of 500 - 1800mm
- **Geography:** Nigeria consist of four district geographical regions namely: costal, forest, savannah & Sahel zones.

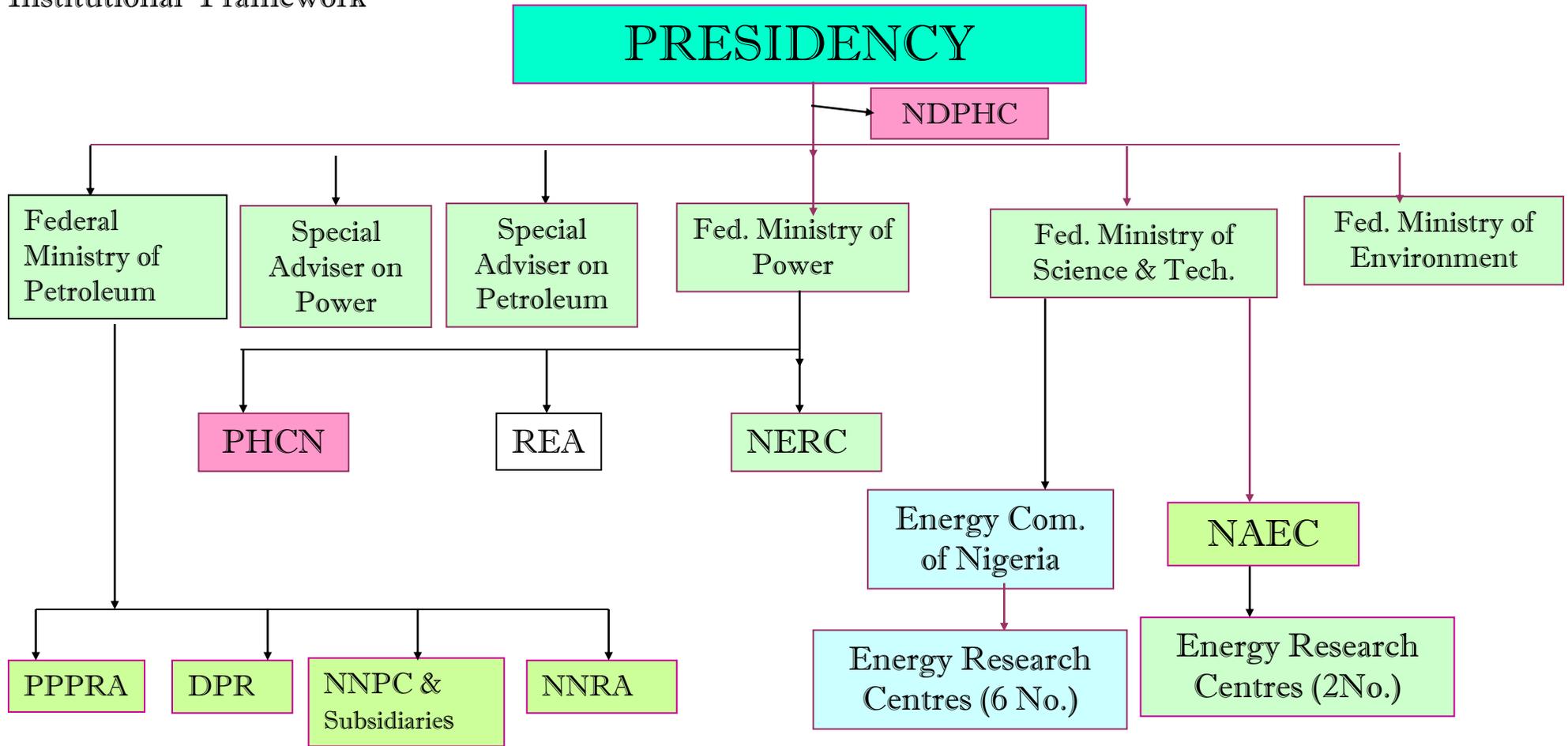
INTRODUCTION cont.

ECONOMY/SOCIAL INDICATORS

- **GDP** : US\$ 267.779b
- **Real GDP Growth Rate**: 7.72% (driven by oil and non oil production activities)
- **Per Capital GDP**: US\$ 1, 670 (2006)
- **Incidence of Poverty**: 54.4%
- **Life expectancy**: 47yrs (2007)
- **Population growth rate**: 2.3% (2009)
- **Electricity Access**: 40%
- **Electricity consumption/ capita (kWh/capita)**: 136KWh/capital (IEA key World Energy Statistics (2007))

ENERGY SECTOR ORGANIZATION

Institutional Framework



KEY:

PHCN	Power Holding Company of Nigeria
NDPHC	Niger Delta Power Holding Company
REA	Rural Electrification Agency
DPR	Department of Petroleum Resources
NERC	Nigerian Electricity Regulatory Commission
NAEC	Nigerian Atomic Energy Commission
NNRA	Nigerian Nuclear Regulatory Agency
PPPRA	Petroleum Product Pricing Regulatory Agency
NNPC	Nigerian National Petroleum Corporation

Energy Resources Reserve in Nigeria

- **Crude Oil:** Over 35 billion barrels
- **Natural Gas:** Over 187 trillion std. cubic feet (1ft=0.048m)
- **Coal:** Over 2.75 billion metric tones deposit
- **Hydropower:** Over 14,750 MW
- **Solar Radiation:** Over 3.5–7.0KWh/m²/day
(485million MWh/day, using 0.1% land)
- **Wind Energy:** Over 2.0 – 4.0 m/s (at 10 meters height)
- **Biomass:** Over 144m tonnes/year
- **Nuclear:** Lot (Not yet Quantified)
- **Wave/Tidal Energy:** Over 150,000 TJ/yr (16.6 x 10⁶ toe/yr)
- **Geothermal Energy:** Not yet explored
- **Tar Sands:** 31 billion barrels of oil equivalent

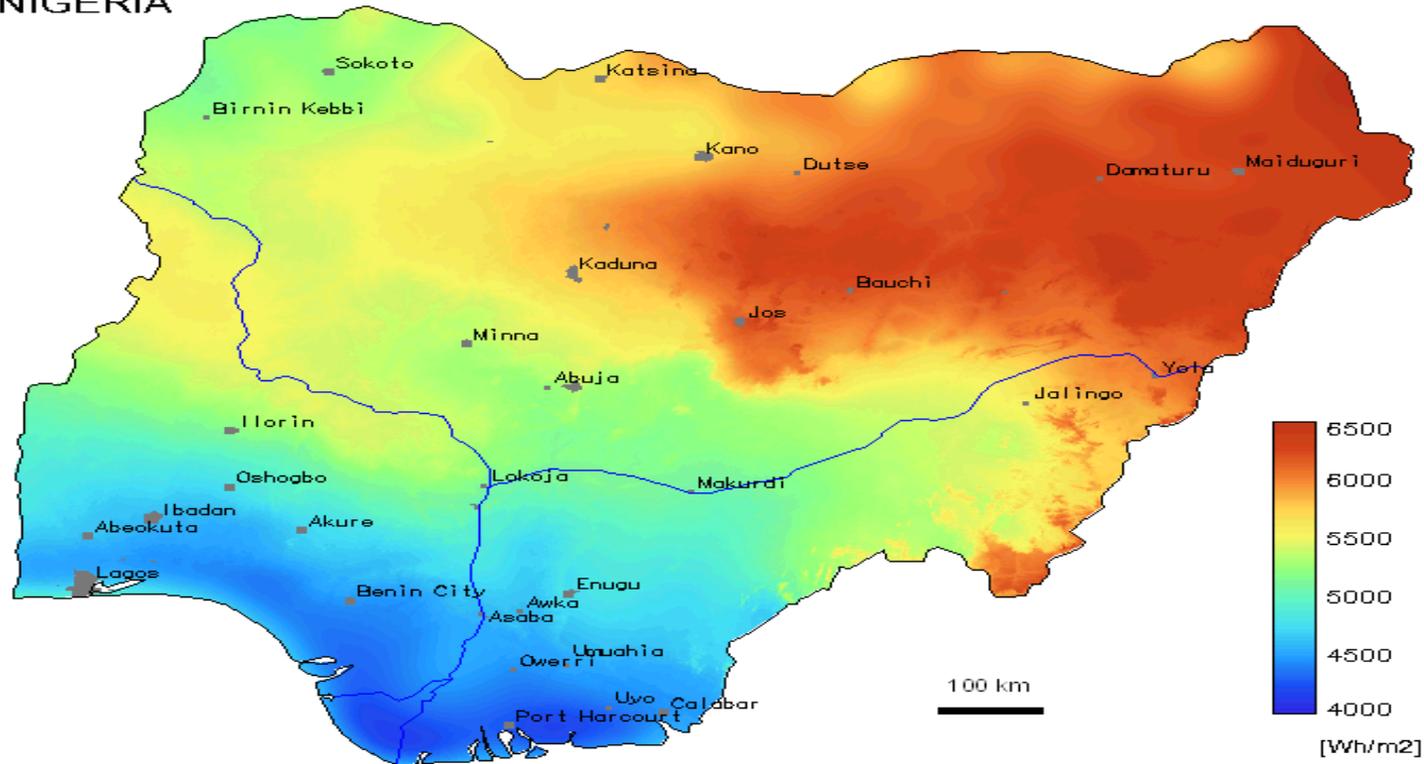
Sources: Nigerian National Petroleum Corporation (NNPC) 2007 Renewable Energy Masterplan (REMP) 2005 and Ministry of Mines and Steel Development (2008)

Energy Resources Reserves in Nigeria.(Cont.)

Solar Resource Map of Nigeria

Yearly average of daily sums of global horizontal irradiation
(HelioClim-1/PVGIS data, period 1985-2004)

NIGERIA

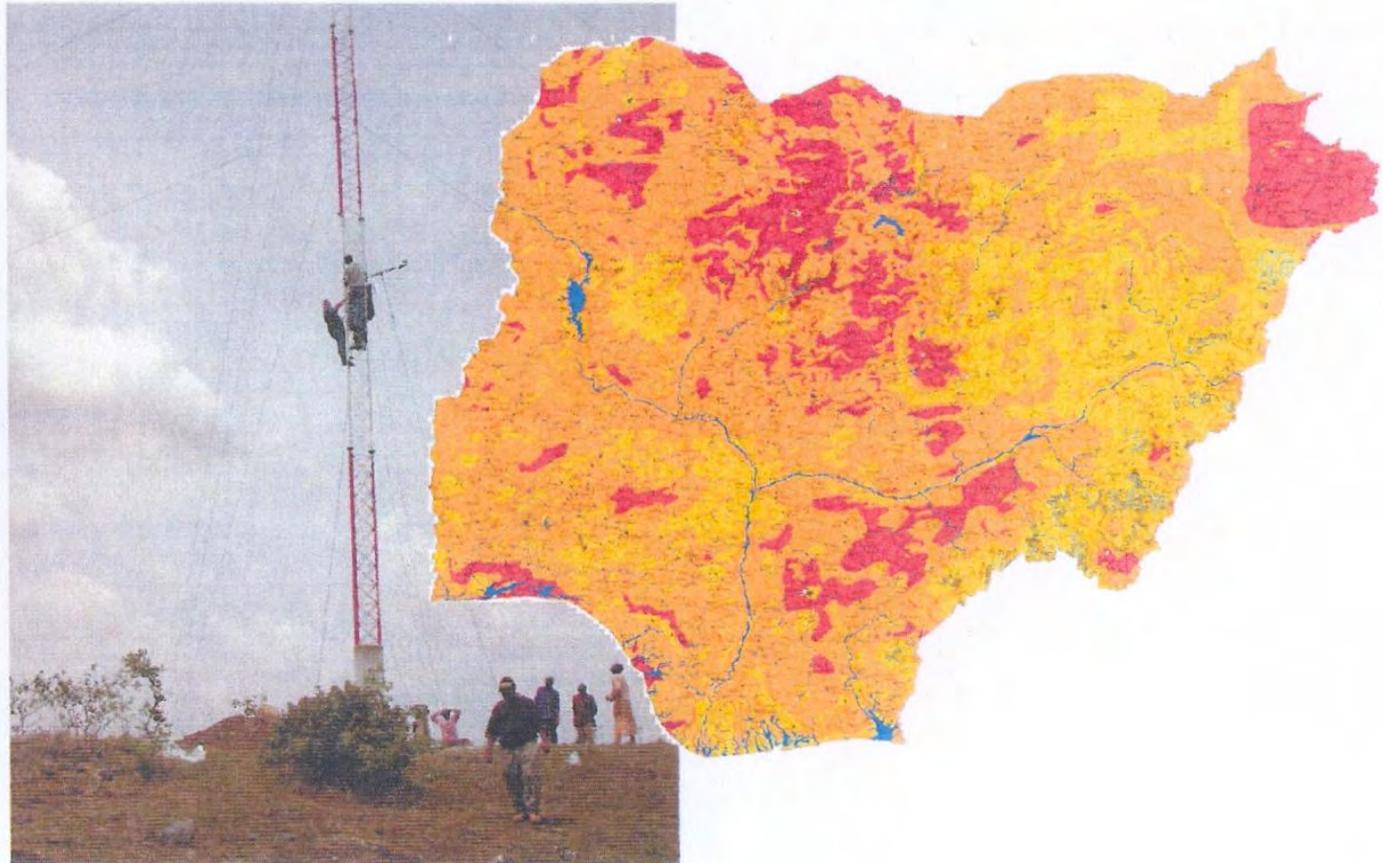


PVGIS (c) European Communities 2002-2006
HelioClim-1 (c) Ecole des Mines de Paris/Armines 2001-2006

<http://re.jrc.ec.eu.int/pvgis/pv/>
<http://www.soda-is.com/>

Energy Resources Reserves in Nigeria. (Cont.)

Wind Resource Map of Nigeria



The red colour portion indicate wind speed of between 6 – 7 m/s

ENERGY SUPPLY SITUATION

(a) Fossil Energy Resources

S/N	Resources	Reserves	Production (2008)	Utilization (2008)
1	Crude Oil	36.2billion barrels	1.98mb/day	0.45mb/day
2	Natural Gas	187 TSCF	2.28BSCF	<ul style="list-style-type: none"> ▪59.1% - Fuel, Industries, re-injection and gas lift. ▪26.8% - gas flare
3	Coal	2.7 billion tones	0	Negligible
4	Tar Sands	31 billion barrels of oil equivalent	0	0.224 million tones

Sources: CBN (2009)

ENERGY SUPPLY SITUATION

(b) Renewable and Nuclear Energy Resources

S/No	Resource Type		Reserves (Natural Units)	Utilization Level
1.	Large Hydropower		11,250 MW	1,972MW
2.	Small Hydropower		3,500 MW	64.2MW
3.	Solar Radiation		3.5 – 7 kWh/m ² /day. (485million MWh/d using only 0.1% of our land)	-10MW solar PV stand-alone -No solar thermal electricity
4.	Wind		(2-4) m/s at 10m height	-2x2.5KW electricity generator -10MW wind farm contracted in 2009.
5.	Biomass	Fuelwood	11 million hectares of forest and woodland	43.4 million tones of fuel wood/yr
		Animal waste	245 million assorted in 2001	-
		Energy Crops and Agric Residue	72 million hectares of Agric. Land	-
6.	Nuclear Element		Not yet quantified	8.5% cultivated

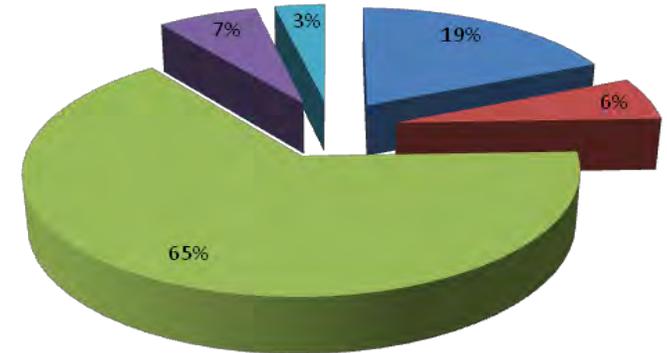
Sources: (i) Nigerian National Petroleum Corporation (NNPC) 2007
(ii) Renewable Energy Masterplan (REMP) 2005
(iii) Ministry of Mines and Steel Development (2008)

EXPECTED ELECTRICITY MIX RATIO (2015)

	EXPECTED OUTPUT (MW)	%
HYDRO-POWER	5,338	19
RENEWABLE	1,699	6
GAS (THERMAL)	18,769	65
COAL FIRED	2,000	7
NUCLEAR	1,000	3
TOTAL	28,806	100

Expected Energy Mix Ratio

■ Hydro-Power ■ Renewable ■ Gas(Thermal) ■ Coal Fired ■ Nuclear

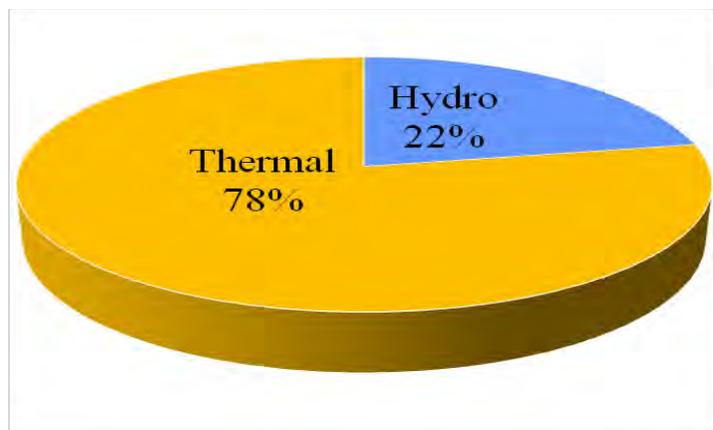


SUMMARY OF EXISTING POWER PLANTS IN NIGERIA

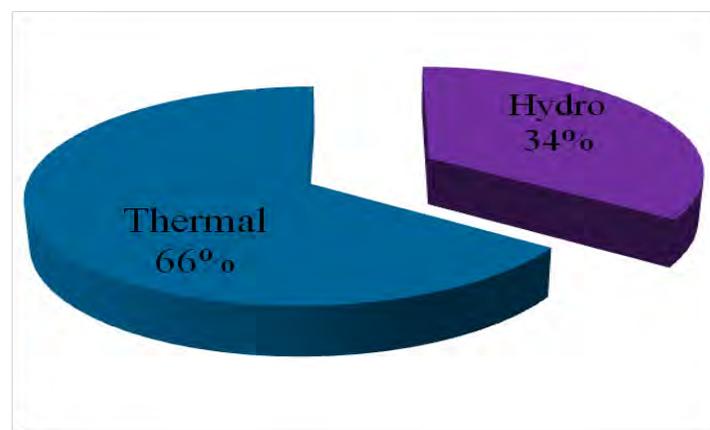
	STATION	INSTALLED CAPACITY (MW)	AVAILABLE CAPACITY (MW)
1	PHCN EXISTING POWER STATIONS	7198.4	3337
	a. Hydro	1938	1397
	b. Thermal	5258	1940
2	IPP POWER STATIONS	1566	715
	TOTAL	8764.4	4052

%AGE COMPARISON OF INSTALLED AND AVAILABLE CAPACITIES OF POWER PLANTS IN NIGERIA

**Installed Capacity
As at 2010**



**Available Capacity
As at 2010**



RENEWABLE ENERGY DEVELOPMENT IN NIGERIA - SHP

- **Renewable energy** is energy generated from natural resources such as sunlight, wind, rain, tides, and geothermal heat, which are renewable (naturally replenished). Renewable energy is derived from natural processes that are replenished constantly.
- Each of these renewable sources has unique characteristics which influence how and where they are used. Major renewable energy applications in Nigeria are in the areas of:
 - Electricity Generation
 - Biofuel for transportation
 - Other thermal applications (cooking, drying, heating, etc.)
- **Reform of the Power Sector:** The Nigerian Power Sector Road Map acknowledged the fact that Government is determined to ensure that a vast majority of all new power plants be financed and built by the private sector. Also, it acknowledges that **there is need for some involvement by the FGN in the financing of renewables for power generation e.g. hydro (or other renewables)** and in stimulating production of power from using coal.”
- **Nigeria’s Vision 20:2020:** Premised on ESPR Act, Vision 20:2020 and the Power Sector Road Map, Government began exploring the opportunities of harnessing renewable energies especially small and medium hydropower in meeting the nations Power demand. The target of vision 20:2020 is to generate 40, 000MW via sustainable energy mix that not only guarantee security but also the protection of the environment or climate. Nigeria RE penetration target of vision 20:2020 is 10% (4MW).

RENEWABLE ENERGY DEVELOPMENT

SMHP - DEVELOPMENT

- **Key Requirement for Developing Hydropower Resources:** Hydropower (HP) Projects are capital intensive and therefore demand that Government needs to put certain key elements in place to facilitate effective development and deployment of Hydropower in the electricity mix .
- These **key Elements** include
 - (i) Good bankable feasibility study(FS) report showing economic viability, generation profile , revenue stream or profile, detail EIA @ SIA
 - (ii) Credible regulator to ensure sharing balance in the sector
 - (iii) Credible policies, legal and Institutional Framework
 - (iv) Guaranteed political stability
 - (v) Enabling environment for private sector investment
 - (vi) Funding support by Government
 - (vii) Capacity Building.

RENEWABLE ENERGY DEVELOPMENT CONT.

- In Y2010, Government observed the existence of over 200 dams built over the years mainly for irrigation, water supplies and flood controls that has Hydropower potentials. Some of the dams were built as multipurpose dams with hydropower components either partially or not developed at all.
- Government in its ambition to increase the share of small and medium Hydropower in the electricity mix in Nigeria and to develop adequate power capacity to meet its social - economic needs appointed Consultants to conduct F.S on 14 selected dams with hydropower potentials and produce bankable reports for possible concessioning of the hydropower component of the dams to private investors for development.

DAMS WITH COMPLETE BANKABLE FEASIBILITY STUDIES FOR SHP

S/N	Dam	Location	Capacity
1	Oyan	Ogun State	10MW
2	Ikere Gorge,	Oyo State	6MW
3	Bakolori	Zamfara	3MW
4	Dadin Kowa	Gombe State	34MW
5	Challawa	Kano State	7.5MW
6	Tiga	Kano State	10MW
7	Kampe	Kogi State	0.5MW
8	Owena	Ondo State	0.450MW
9	Doma	Nasarawa State	1MW
10	Goronyo,	Sokoto State	3MW
11	Zobe	Katsina State	0.3MW
12	Jibia	Katsina State	4MW
13	Itisi	Kaduna	40MW
TOTAL			122.75MW

NOTE:

- i. There is proposal in Y2012 by government to carry out further studies on another set of 12 Dams to increase Power output from SMHP.
- ii. UNIDO efforts in Waya Dam, Bauchi, N.E 2 x 75KW, Ezioha-Mgbowo Enugu, S.E 35KW, and Tunga Dam, Taraba, N.E 2 x 200KW, are contributing to the development of SHP in Nigeria.

RENEWABLE ENERGY DEVELOPMENT IN NIGERIA

Policy Framework

- The strong link between energy and socio-economic development made the Federal Government of Nigeria to approve, in 2003, an overall National Energy Policy (NEP) and Enacted Electric Power Sector Reform Act (EPSR Act 2005) available at: www.energy.gov.ng which encourages the optimum utilization of the country's energy resources, including renewable for sustainable national development with the active participation of the private sector.

Regulation and Legislature

- The coordination of the national policies on energy in rests on the Energy Commission of Nigeria, established by law in 1979.
- The Nigerian electricity sector was liberalized by the Electric Power Sector Reform Act of 2005 with subsequent establishment of a strong regulatory institution, the Nigerian Electricity Regulatory Commission (NERC) by the National Assembly.
- NERC has the general mandate to regulate the entire electricity sector in the country with regards to tariff setting and regulation, supervision of market rules, performance monitoring, and overseeing the orderly transformation of the power sector to a more competitive environment.

CHALLENGES

- Financial Constraints :The funds provided by Government and the private sector in financing RE development is grossly inadequate
- Lack of effective energy pricing mechanism and cost recovery strategy
- The rate at which SMHP projects with associated infrastructure are developed is very low.
- Low local content input into RE technologies.
- Lack of adequate capacity at the local level .
- Sustainability for RE deployment especially in rural areas with poor rural dwellers is a big challenge .
- Interconnection issues of completed RE projects (SMHP) far from the Grid
- Lack of discipline in project implementation and constructional failures

CONCLUSIONS

- Government should put effective and appropriate energy pricing mechanism and cost recovery strategy in place to accelerate the development of RE by the private sector to increase electricity access .
- The prospect for SMHP development for Power (electricity) generation in Nigeria is quite very bright especially for distributed generation and power supply for rural community electrification access(for electrifying remote communities far from the National Grid access).
- The relevant sections of the NEP & EPSR focusing on providing incentives for private investment & FDI in Nigeria's energy sector, aimed at optimal utilization of the nation's energy resources for sustainable development www.nipc.gov.ng should be strengthened to attract private fund for the development and deployment RE
- Standard Organization of Nigeria (SON), charged with responsibility of setting and enforcing standards in Nigeria is currently developing codes and standards for solar systems in Nigeria. It is expected that this effort will be extended to SMHP for technologies harmonization .
- Energy conservation and efficiency technologies should be encouraged as a means of effective management of the available RE resources
- Continued capacity building in the entire spectrum of the Renewable Energy development is highly essential for sustainability.

REFERENCES

1. Central Bank of Nigeria (CBN) (2007): “Annual Report and Statement of Accounts”
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THANK YOU

