Implementing Sustainable Strategies in Nigeria Renewable Sector

By

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Outline

1. Introduction
2. Overview of Energy Resources in Nigeria
3. Institutional Arrangements for RE
4. Opportunities and Challenges
5. Renewable Energy Targets
6. Nigeria Energy and Emissions 2050 Calculator
7. Conclusion

1. Introduction

- Nigeria continues to face critical challenges related to its energy sector.
- Energy is currently supplied in insufficient quantity, at a cost, form and quality that has limited its consumption by the majority of the population
- There is predominance of traditional fuels (fuelwood, charcoal, crop residues) in energy consumption;
- natural gas (70%) and hydro (30%) are the only sources of electricity generation making the energy system vulnerable.

1. Introduction ….Contd.

- Drastic interventions need to be taken to provide access to basic energy services to those lacking access in order to enhance social and economic development
- In light of current situation – GHG emissions from fossil fuels- renewable energy has emerged as a viable option that can effectively contribute to addressing the country's energy challenges

1. Introduction ….Contd.

Socio-Economic Indicators (2012)

Total Area	92.4 million hectares (Land 86%, Water 14%)
Forest and Woodlands	**11.6%**
Polity	Democracy (Presidential System)
Population / growth rate	168.5 million @ 3.2 %
Economic Indicators	
• GDP growth rate	6.6%
• Inflation rate	12%
• Interest rate	MPR:12%; Prime:16.54%; Maximum:24.61%
• Exchange rate	1$ = N158.84
• Major contributor to foreign Exchange earnings	Oil (approx. 97%)
Social Indicators	
• GDP/Capita	$1513.4
• Energy Intensity	0.043 kgoe/ US$
• Energy Consumption/Capita	67.7 kgoe
• Electricity Consumption/Capita	175.9 kWh
• Urbanization	50%
• Electricity Access	60%
• Adult Literacy rate	67%
• Life Expectancy	48 years
• Unemployment rate	25.7%

1. Introduction ….Contd.

Nigeria's Energy Supply and The Economy

S/N	ITEMS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1.	Electricity generation (billion kWh)	22.03	23.9	24.22 (503)* (10,695)**	23.8	23.3	21.27 (562)* (18,603)**	20.8	25.02	27.7 (619)* (20,407)**	29.6
2,	Energy Consumption per Capita (kgoe/Capita)	151.3	125.5	132.6 (680)* (1,780)**	87.1	81.4	80.8 (670)* (1,830)**	83.1	77.8	73.6 (670)* (1880)**	65.7
3.	Electricity Consumption/capita (kWh/Capita)	174.6	176.4	181.4 (563)* (2596)**	167.6	161.2	142.9 (571)* (2782)**	135.2	157.1	165 (592)* (2933)**	175.9
4.	GDP/Capita (US$/Capita)	620.7	658.0	826.3 (2314)* (8,492)**	1030.3	1223.5	1286.3 (2540)* (9550)**	1,106.8	1440.7	1470.6 (1281)* (7520)**	1513.4
5.	Energy Intensity (kgoe/ US$)	0.244	0,191	0.161 (0.294)* (0.210)**	0.085	0.067	0.063 (0.264)* (0.192)**	0.075	0.054	0.050 (0.550)* (0.250)**	0.043
6.	GDP Growth Rate (%)	9.6	6.6	6.5	6.0	6.5	6.0	7.0	8.0	7.4	6.6

Sources: CBN (2005-2012), NCC, Osogbo (2009 -2012),
****Africa Average - IEA (2007, 2010, 2013)***
*****World Average - IEA (2007,2010, 2013)***

1. Introduction ….Contd.

Energy Supply & the Economy in Nigeria cont'd…. .

S/N	ITEMS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
7.	**Major Contributors to GPD @ 1990 Constant Prices**:										
	i Agriculture (%)	41.01	40.98	41.19	41.72	42.20	42.1	41.7	40.8	41.2	39.2
	ii Petroleum (%)	26.53	25.72	25.26	21.85	19.35	17.54	16.3	15.9	14.8	13.8
	Major Contributor to Federal revenue (net)										
	Petroleum (%)	75.0	77.0	72.4	77	68	83	69	73	78	75

Sources: CBN (2005-2012), NCC, Osogbo (2009 -2012),
****Africa Average - IEA (2007, 2010, 2013)***
*****World Average - IEA (2007,2010, 2013)***

2. Overview of Energy Resources in Nigeria

a) Fossil Energy Resources and Nuclear Energy Sources

S/N	Resources	Reserves	Production (2012)	Domestic Utilization (2012)
1	Crude Oil	37.2billion barrels	0.853billion barrels	0.164billion barrels
2	Natural Gas	187 Tscf	2.58Tscf	77% : Utilized 23% : flared
3	Coal	2.7 billion tonnes	0	Negligible
4	Tar Sands	31 billion barrels of oil equivalent	0	0.224 million tonnes
5	Nuclear	Yet to be quantified	0	30kW experimental nuclear reactor

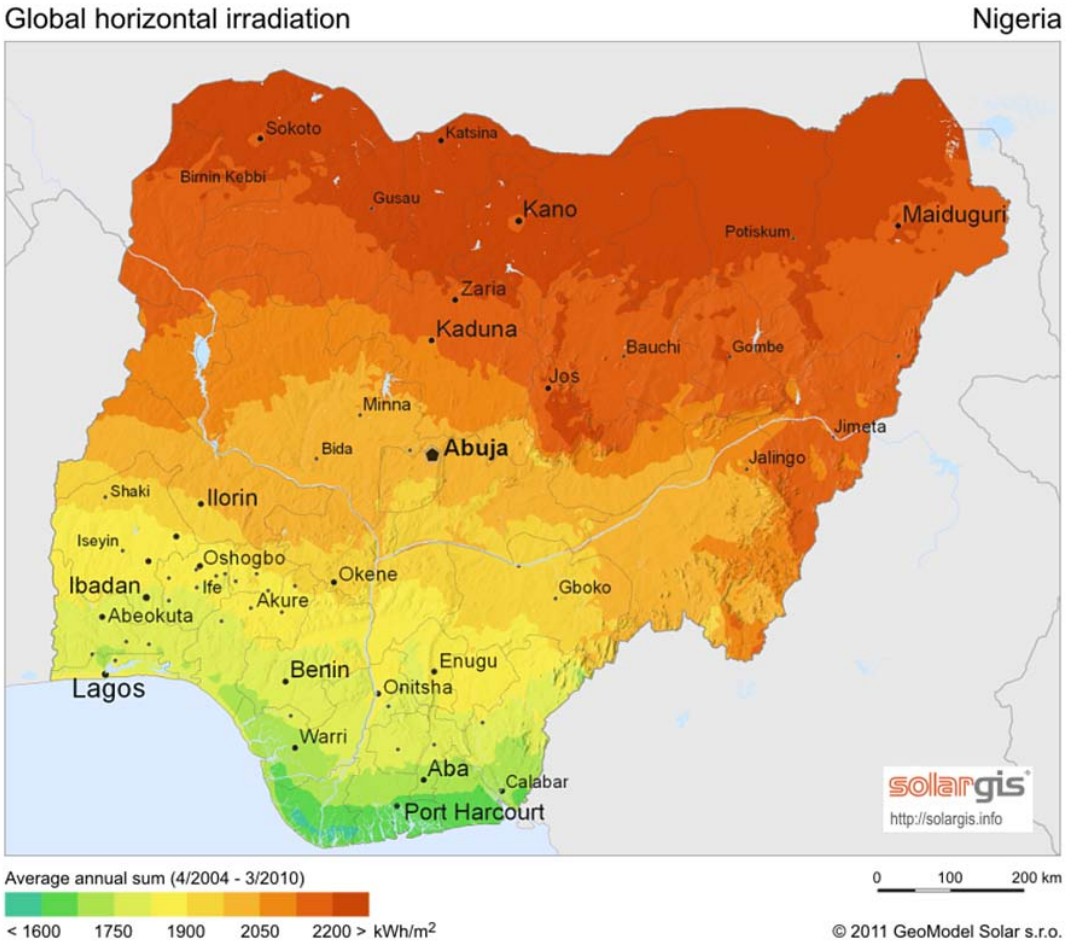
2. Overview of Energy Resources…. contd

b) Renewable Energy Resources

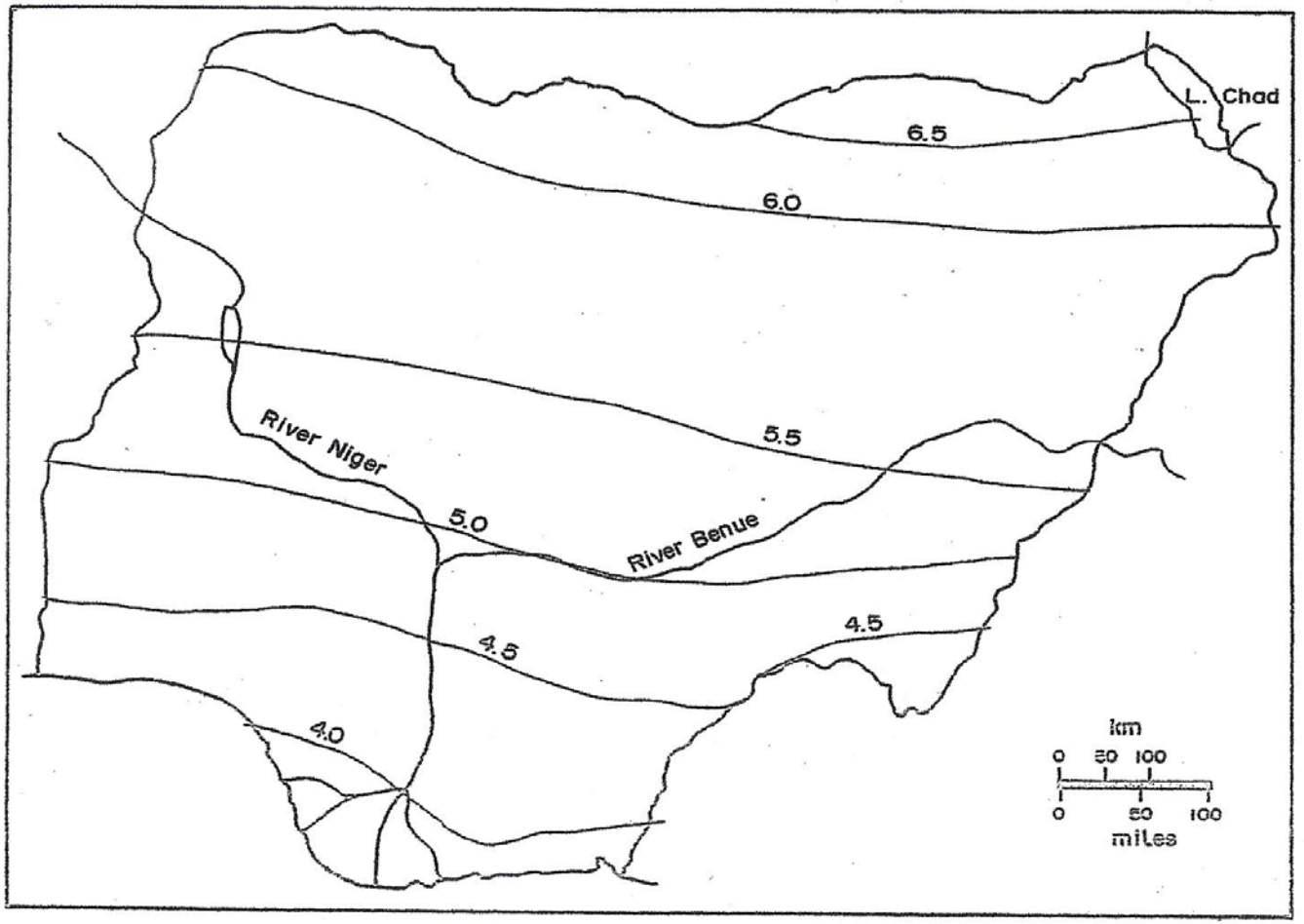
S/No	Resource		Reserve	Utilization Level
1	Large hydro power		11,250MW	1,900MW
2	Small Hydro power		3,500MW	64.2MW
3	Solar Energy		4.0 kWh/m^2/day 6.5kWh/m^2/day	15MW solar PV stand-alone No solar thermal electricity
4	Wind		2-4m/s at 10m height	2x2.5KW electricity generator; 10MW wind farm in Katsina
5	Biomass	Fuel wood	11 million hectares of forest and woodlands	43.4 million tonnes of firewood/yr
		Municipal waste	- 18.3 million tonnes in 2005* & about 30 million tonnes/yr now	-
		Animal waste	- 243 million assorted animals in 2001	-
		Energy Crops and agric waste	- 28.2 million hectares of Arable land	8.5% cultivated

2. Overview of Energy Resources…. contd

Solar Energy Resource in Nigeria



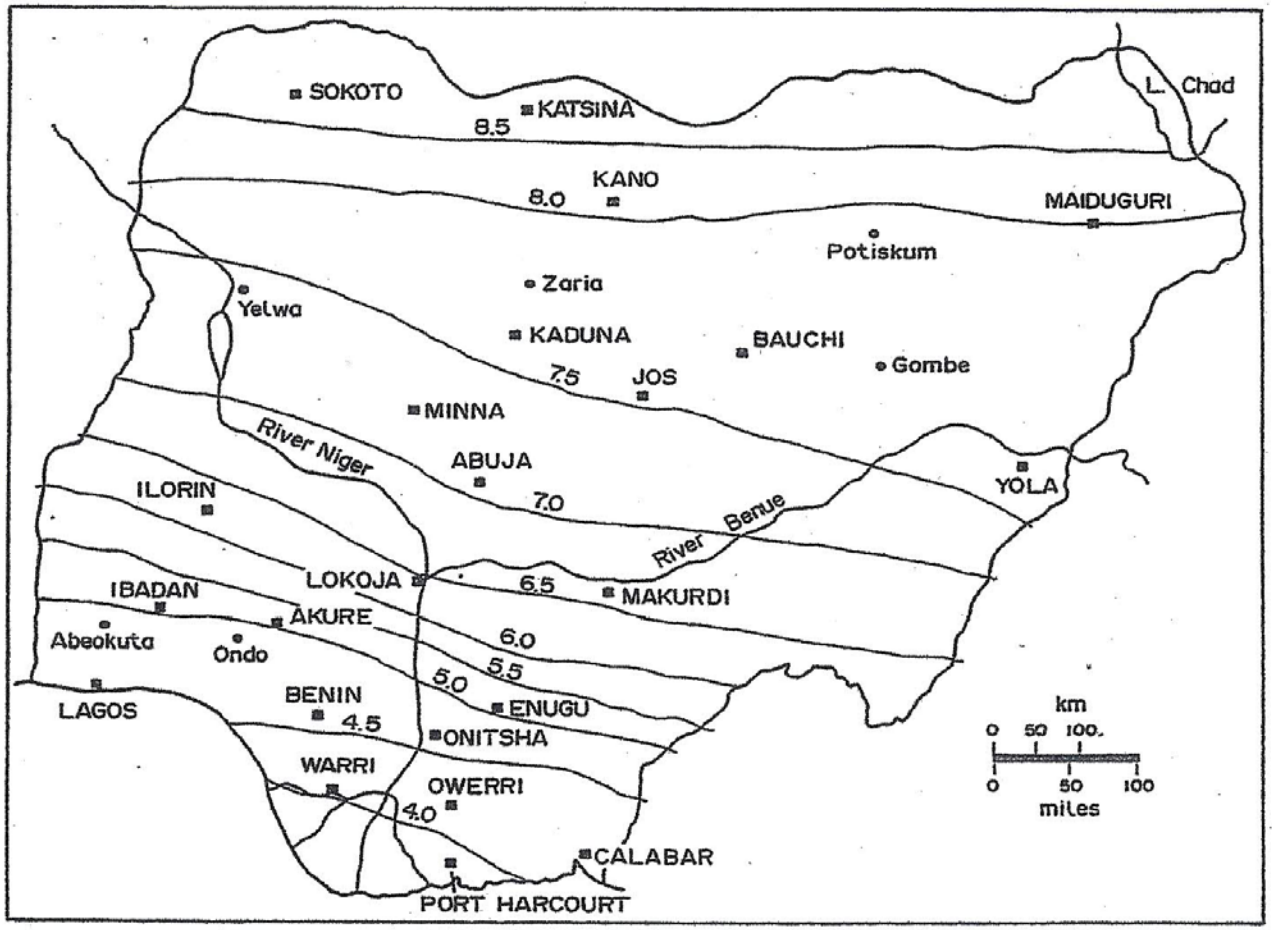
2. Overview of Energy Resources…. contd



Solar Radiation Distribution in Nigeria (kWh/m^2/day)

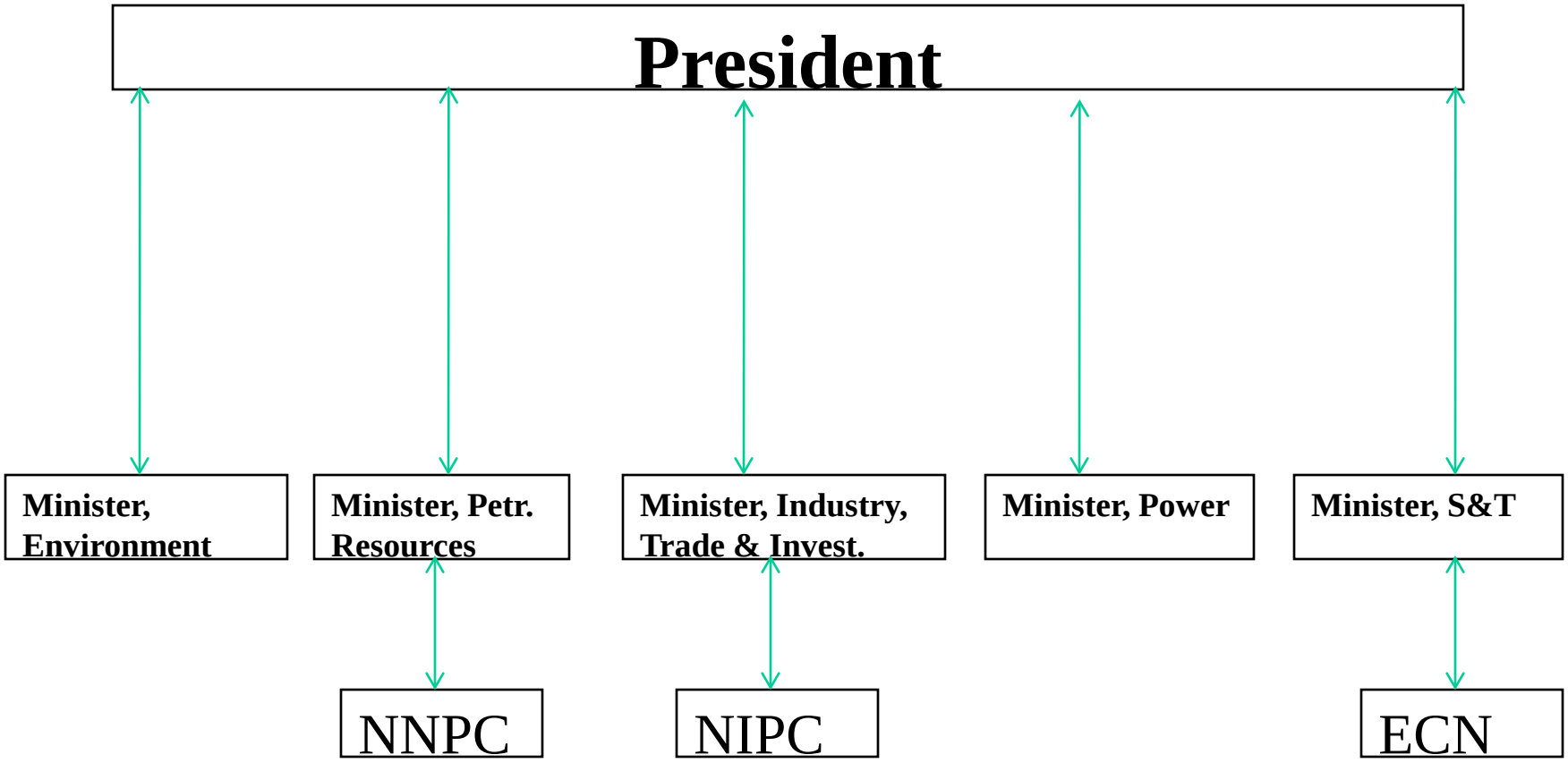
Source: J. O. Ojosu (1990).

2. Solar Energy Resource …….Cont'd

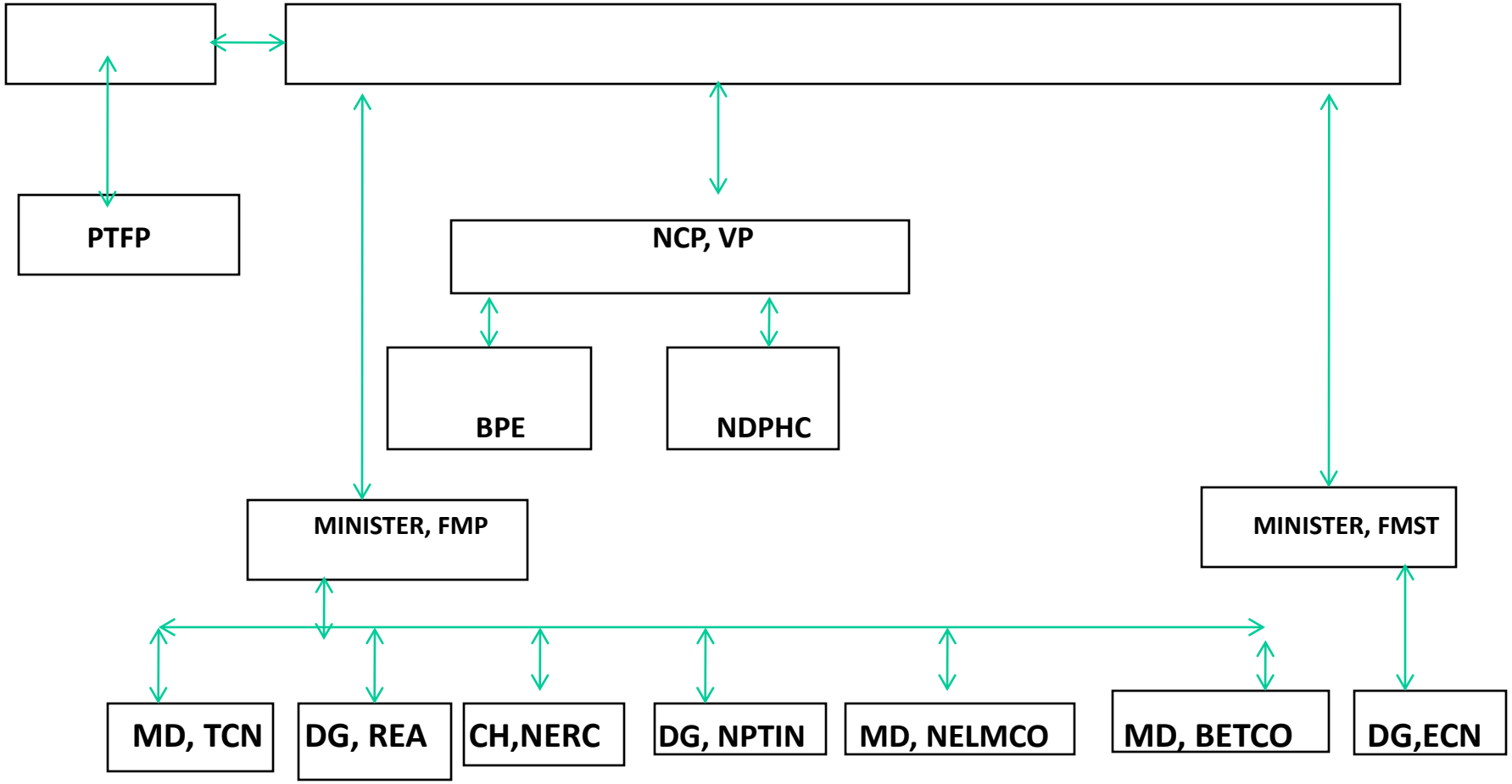


Sunshine Durations in Nigeria (Hrs/day)
Source: J. O. Ojosu (1990).

3. Institutional Arrangement



3. Institutional Arrangement



4. Opportunities & Challenges

- Sustenance of political will towards private sector active participation in the electricity / energy industry;
- To increase and maintain generation, transmission and distribution to support 40,000MW demand by 2020;
- To attract investments of about $6billion annually from 2014;
- To attain high percentage for the use of pre-paid meters by customers;
- To diversify generation energy mix to include gas, large hydropower, coal, nuclear and new renewable energy sources;
- Renewable sources of energy to contribute about 20% to electricity production by 2030;
- Promotion of energy efficiency and conservation and doubling its penetration by 2030; and
- Provision of appropriate incentives in the industry.

4. Opportunities and Challenges

- There is a strong political will from government on privatization & liberalization of the electricity industry;
- There are opportunities for independent power production
- There are opportunities for local manufacturing of power equipment and machinery;
- There is opportunity for human capacity development in the electricity industry;
- There is opportunity for investment into gas infrastructure with the establishment of cost reflective gas tariff;
- There are natural incentives:
  - Big electricity market of about 170 million people in Nigeria and 230 million in the surrounding ECOWAS sub region
  - Trainable resourceful and cost-effective workforce with 60% as youth
  - Relative absence of natural disasters/calamity i.e. no earthquake, hurricane or major floods
  - High returns on investments (RoI) of between 35% and 45% generally

4. Opportunities and Challenges Cont'd…

- There are statutory incentives:
  - FGN guarantees backed by World Bank on Power Purchase Agreement (PPA)
  - Zero import duties on power equipment and machinery
  - Pioneer status with 3 – 5 years tax holidays
  - Unhindered repatriation of profit
  - Very low value added tax (VAT) regime of 5%
  - Feed-in-Tariff available
- But then, what are the Challenges:
  - Inadequate sources of both local and international funds;
  - Inadequate local power equipment and machinery manufacturing companies;
  - Inadequate skilled power engineers, technicians and crafts men.

5. Renewable Energy Targets

- The National Energy Policy encourages the diversification of the nation's energy mix to include new renewable energy sources such as solar, SHP, wind, biomass and other emerging renewable through the active participation of the private sector.
- **Drivers of Renewable Energy Development in Nigeria**
  - Increasing the quantum of energy supply
  - Diversification of energy sources to enhance security of supply
  - Environmental benefits in reduced GHG emissions as compared with conventional energy sources.
  - Potentials for job and employment creation.

5. Renewable Energy Targets

- Opportunities exist for investments in the development of Nigeria's renewable energy resources for:
  - electricity, fuels and process heat production.

- Nigeria has developed a Renewable Energy Masterplan (REMP) which outlines the strategies to develop the renewable energy sector in Nigeria

- The REMP is captured in the following programmes
  - National Biomass Energy Programme
  - National Solar Energy Programme
  - National Hydropower Programme
  - National Wind Energy Programme

5. Renewable Energy Targets

Biomass Programme Targets

S/No.	Activity/Item	Timeline / Quantity		
		Short - term	Medium - term	Long - term
1.	Biomass Electricity (MW)	5	30	100
2.	Improved Woodstoves	300,000	500,000	1,000,000
3.	Biogas Digesters (No.)	500	6,000	8,000
4.	Biomass Briquetting Machines (No.)	30	50	80
5.	Biofuels (Million litres/day) -Bioethanol (B10) -Biodiesel (2.0	 5.3 2.0	 9.7 3.4	 24.2 11.7

5. Renewable Energy Targets

Solar Programme Targets - Electricity

S/No.	Activity/Item	Timeline / Quantity		
		Short - term	Medium - term	Long - term
1.	Solar PV Home Systems (MW)	5	10	15
2.	Solar PV Water Pumping (MW)	50	1,000	5,000
3.	Solar PV Community Services (MW)	45	500	3,000
4.	Solar PV Refrigerators (MW)	20	100	2,000
5.	Solar PV Street & Traffic Lighting (MW)	100	1,000	10,000
6.	Solar PV Large Scale PV Plants (1 MW) capacity	300	990	9,990
7.	Solar Thermal Electricity (MW)	300	2,136	18,127

5. Renewable Energy Targets

Solar Programme Targets - Thermal

S/No.	Activity/Item	Timeline / Quantity		
		Short - term	Medium - term	Long - term
1.	Solar Water Heaters (No.)	4,000	60,000	150,000
2.	Solar Cookers (No.)	2,000	50,000	150,000
3.	Solar Dryers (No.)	150	2,000	6,000
4.	Solar Stills (No.)	100	3,000 ?	2,000 ?
5.	Solar Pasteurizers (No.)	300	4,000	10,000

4. Renewable Energy Targets

Hydropower Programme Targets

S/No.	Activity/Item	Timeline / Quantity		
		Short - term	Medium - term	Long - term
1.	Large Hydropower (MW)	4,000	9,000	11,250
2.	Small Hydropower (MW)	100	760	3,500

4. Renewable Energy Opportunities in Nigeria

Wind Energy Programme Targets

S/No.	Activity/Item	Timeline / Quantity		
		Short - term	Medium - term	Long - term
1.	Wind Electricity (MW)	23	40	50
2.	Wind Water Pumping Systems (No.)	20	100	200

6. Nigeria Energy and Emissions 2050 Calculator

- The UK - Department of Energy and Climate Change (UK - DECC) has developed a UK Energy and Emissions 2050 Calculator
- The UK-DECC, the Energy Commission of Nigeria (ECN) and the British High Commission of Nigeria (BHC) are collaborating to develop a Nigerian version of the 2050 Calculator – Nigeria Energy and Emissions 2050 Calculator.
- UK-DECC and BHC are providing both the funding and technical support for the development of the calculator.
- It is a 1-year project which we commenced in November 2013 and is expected to end by December 2014.
- The Energy and Emissions 2050 Calculator tool forecasts energy and GHG emissions from a range of development scenarios.
- We intend to adapt the UK version of the tool to the development of the Nigerian version of the tool.

6. Nigeria Energy and Emissions 2050 Calculator

- So far we are developing scenarios / trajectories for the development of the following sectors of the Nigerian economy:
  - Household and Services
  - Industry
  - Transport
    - Road
    - Air
    - Rail
    - Inland Waterways
    - Pipelines
  - Electricity
    - Hydro, wind, solar, natural gas, coal, nuclear, biomass
  - Land use and Land Use Change
- The next stage of our activities is to call stakeholders meetings to deliberate on the scenarios / trajectories we have developed.

7. Conclusion

- Government's political will towards active private sector participation in the electricity /energy sector remains ever strong.
- The demand for electricity /energy in Nigeria will continue to grow in view of its growing population and the desire for fast industrialization.
- Opportunities for investment into electricity production from the varied and huge sources of energy in the country are enormous.
- Opportunities for consultancy services exist for engineers.
- Natural and Statutory incentives are available for investors.

Thank You

AND GOD BLESS!

APPENDIX

- Investment opportunities - Hydro Power
  - Large hydropower development
    - 3,050MW Mambilla Hydro Power Plant Project
    - 360MW Gurara II Hydro Power Plant Project
  - Potential Sites – Medium Size
    - 38MW Dadinkowa Hydro Power Plant Project
    - 40MW Itisi Hydro Power Plant Project

APPENDIX

Small & Medium Hydro Power Projects

Dam	State	Capacity (MW)	Estimated Cost US$ ' million
Oyan	Ogun	10	7.5
Ikere Gorge	Oyo	6	11.0
Bakolori	Zamfara	3	4.275
Challawa	Kano	7.7	33.5
Tiga	Kano	10	44.562
Kampe	Kogi	3	8.125
Owena	Ondo	0.45	1.2875
Doma	Nasarawa	1	4.9
Zobe	Kasina	0.30	1.532
Jibia	Katsina	4	91.25
Total		**83.25**	**207.931**