ENERGY SECURITY: CHALLENGES & PROPECTS IN NIGERIA

OMOWUMI O. ILEDARE, PHD, DFNAEE, SFUSAEE
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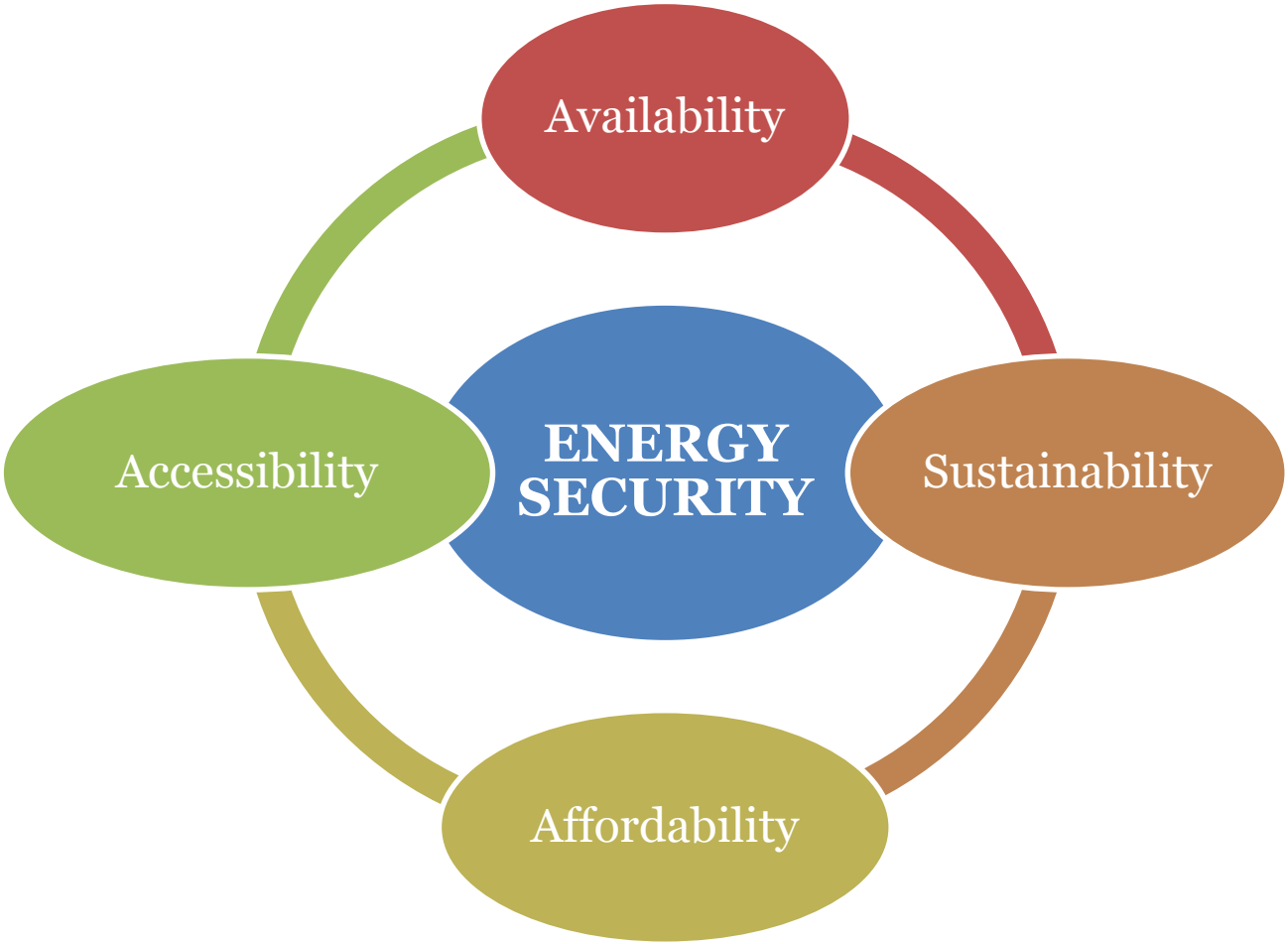
PROFESSOR OF PETROLEUM ECONOMICS & DIRECTOR
EMERALD ENERGY INSTITUTE, UNIPORT, NIGERIA
PROFESSOR EMERITUS, LOUISIANA STATE UNIVERSITY, USA

Presentation Outline

- Background
  - Energy & the economy
  - Energy & the environment
- Energy Security Anchors
  - Availability
  - Affordability
  - Accessibility
  - Sustainability
- Nigeria: A case study in SSA
  - Challenges
  - Outlook
- Concluding Remarks

Energy Security Components



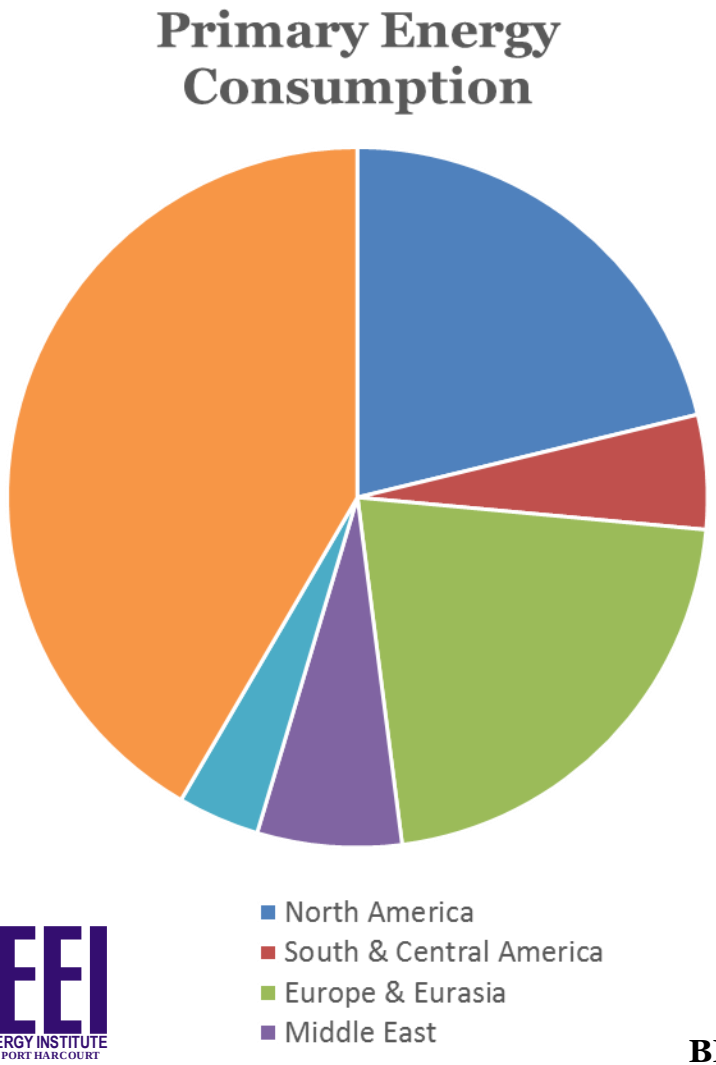
Energy Security Components

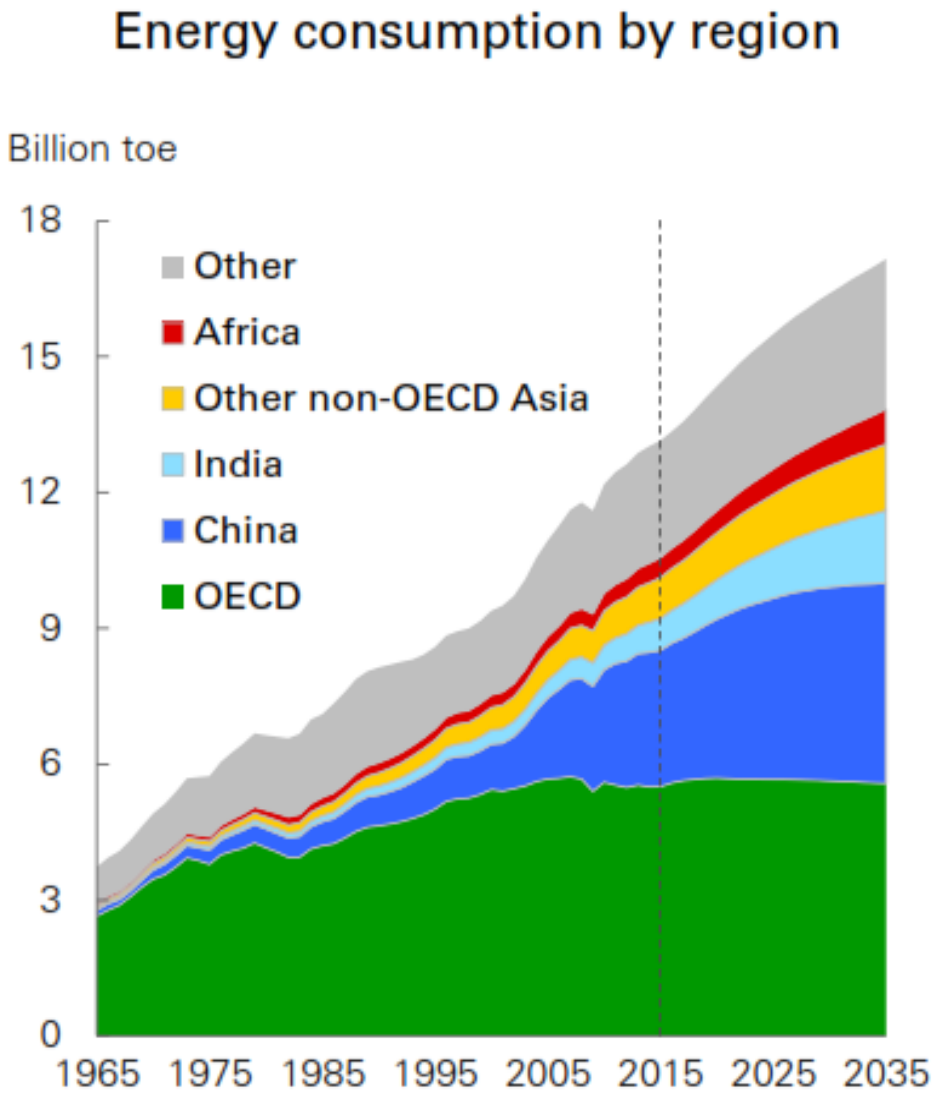
- Energy Availability Determinants
  - massive investment is required
  - diversification of energy sources
  - geopolitics and energy trade policy
  - sufficiency relative to demand
  - durability of energy flow irrespective of unforeseen factors
- Energy Affordability Features
  - the importance of price for the end users
  - market structure
  - public policy instruments
  - regulatory institutions and governance structure

Energy Security Elements

- Energy Access Notables
  - It is not about access to energy sources
  - energy requirements must be met in terms of security of energy flow;
  - social development in terms of economic output expansion and improved quality of life;
  - pricing of energy is also key to accessibility
- Energy Sustainability Drivers
  - environmental acceptability;
  - uninterrupted flow to end-users;
  - global equity & geopolitics & trade

GLOBAL ENERGY CONSUMPTION





BP Statistics 2016

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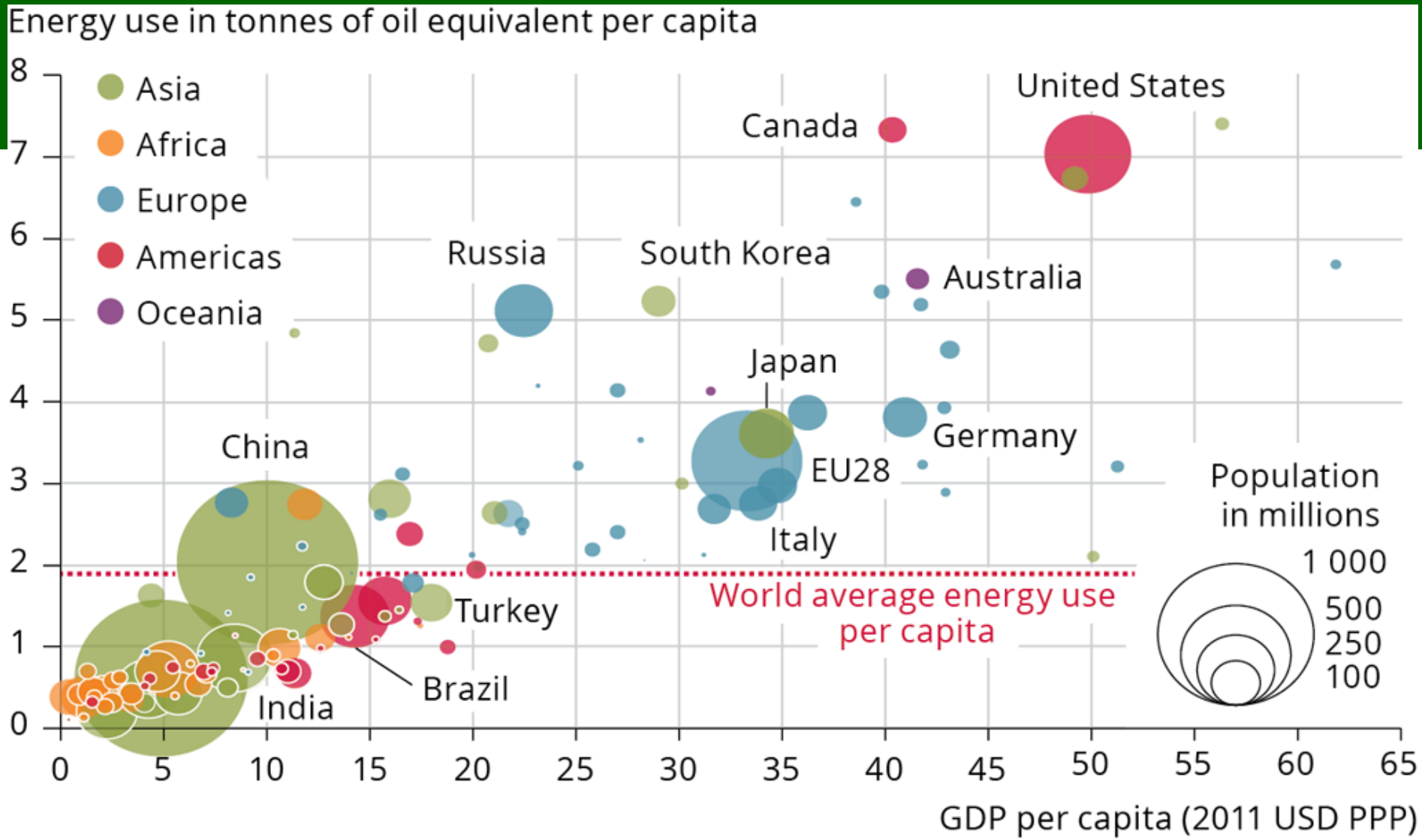
FUNDAMENTAL ENERGY SECURITY ISSUES OF CONCERN FOR NIGERIA

- Nigeria's per capita electricity consumption is amongst the lowest in the world and far lower than many other African countries.
  - Nigeria's per capita electricity consumption is just 7% of Brazil's and just 3% of South Africa's.
  - Brazil has 100,000 MW of grid-based generating capacity for a population of 201 million people.
  - South Africa has 40,000 MW of grid-based generating capacity for a population of 50 million people.



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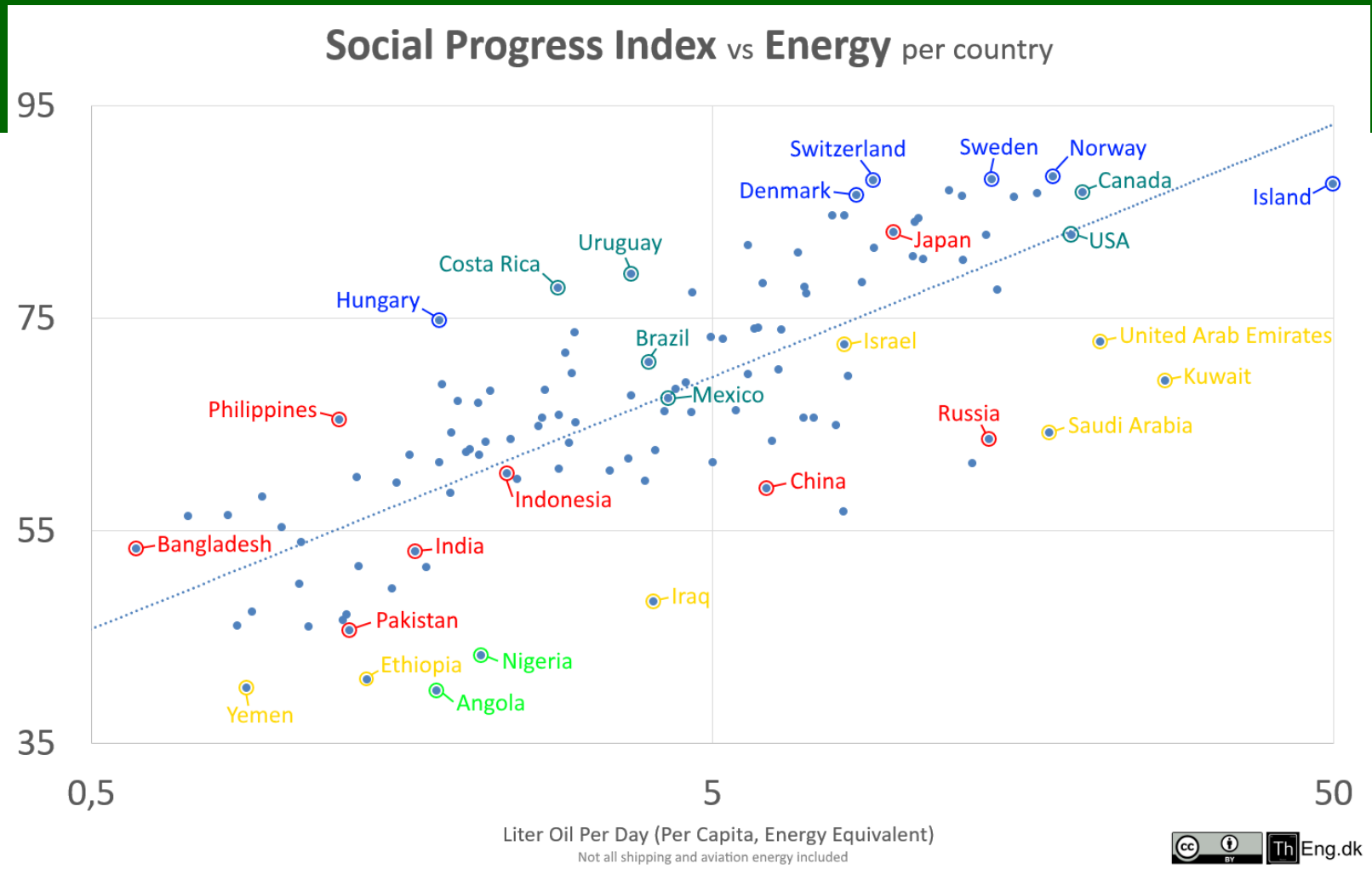

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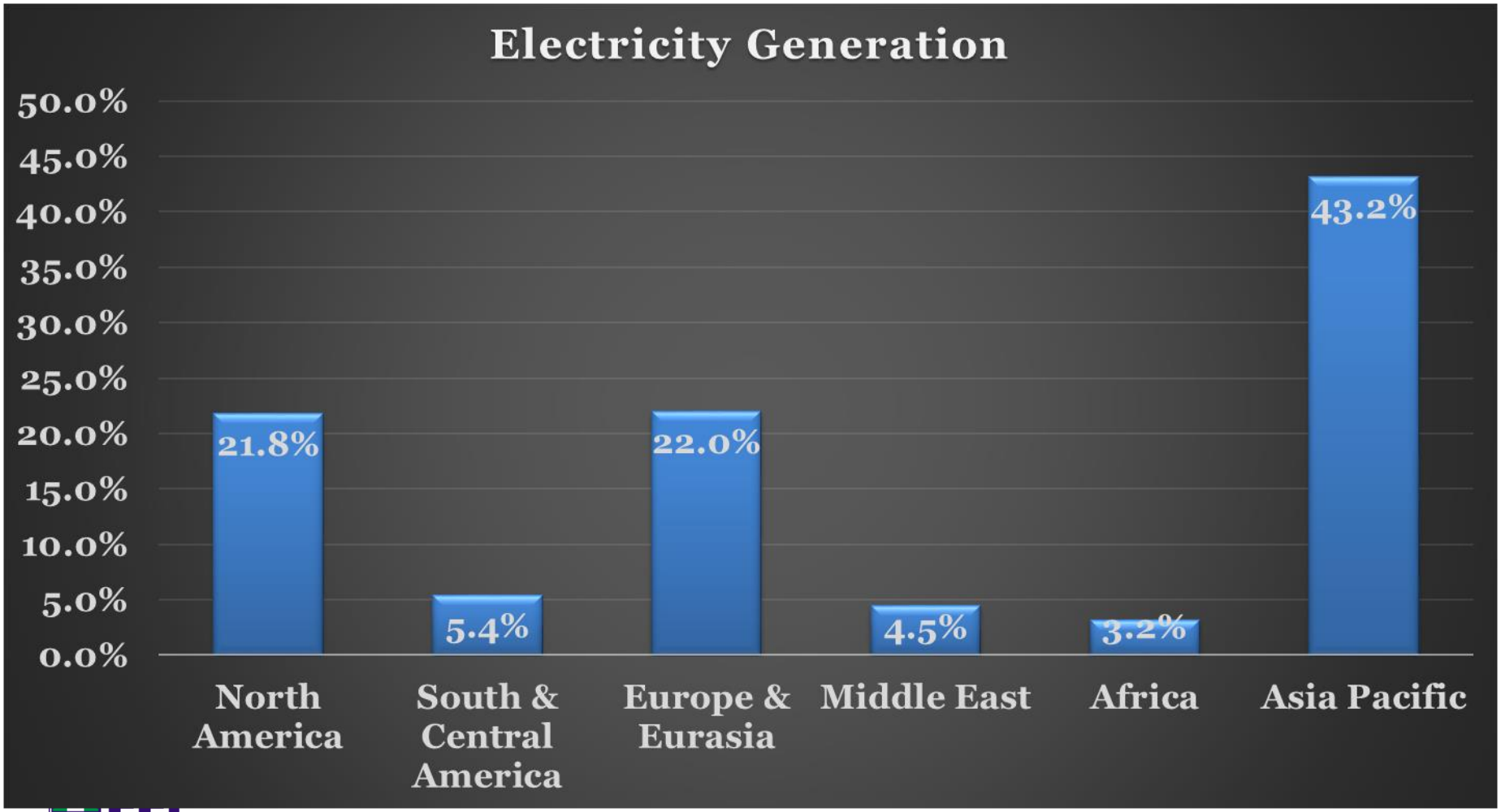
FUNDAMENTAL ENERGY SECURITY ISSUES OF CONCERN FOR NIGERIA

- Tackling energy poverty and doing it in a sustainably manner in both the short run and long run require massive investments.
  - Is privatization the answer to energy investment requirements in Nigeria?
- Energy access in Africa especially Nigeria is paramount for the attainment of global energy security.
  - In Nigeria, energy access is constrained by inadequate and intermittent power in on-on grid areas and off-grid supply options are currently expensive
  - 600 MM SSA has no access to electricity and about 15% are in Nigeria
- Comparative advantage dilemma
  - The shift in supply route and low oil prices is changing the geopolitical dynamics of the international petroleum market.
  - Uneven distribution of energy resources and geopolitics of energy trade premised more on the ability to pay than potential energy need
- Morality of energy use, population growth, and climate change policy demands

Global Electricity Generation (Terawatts-hours)



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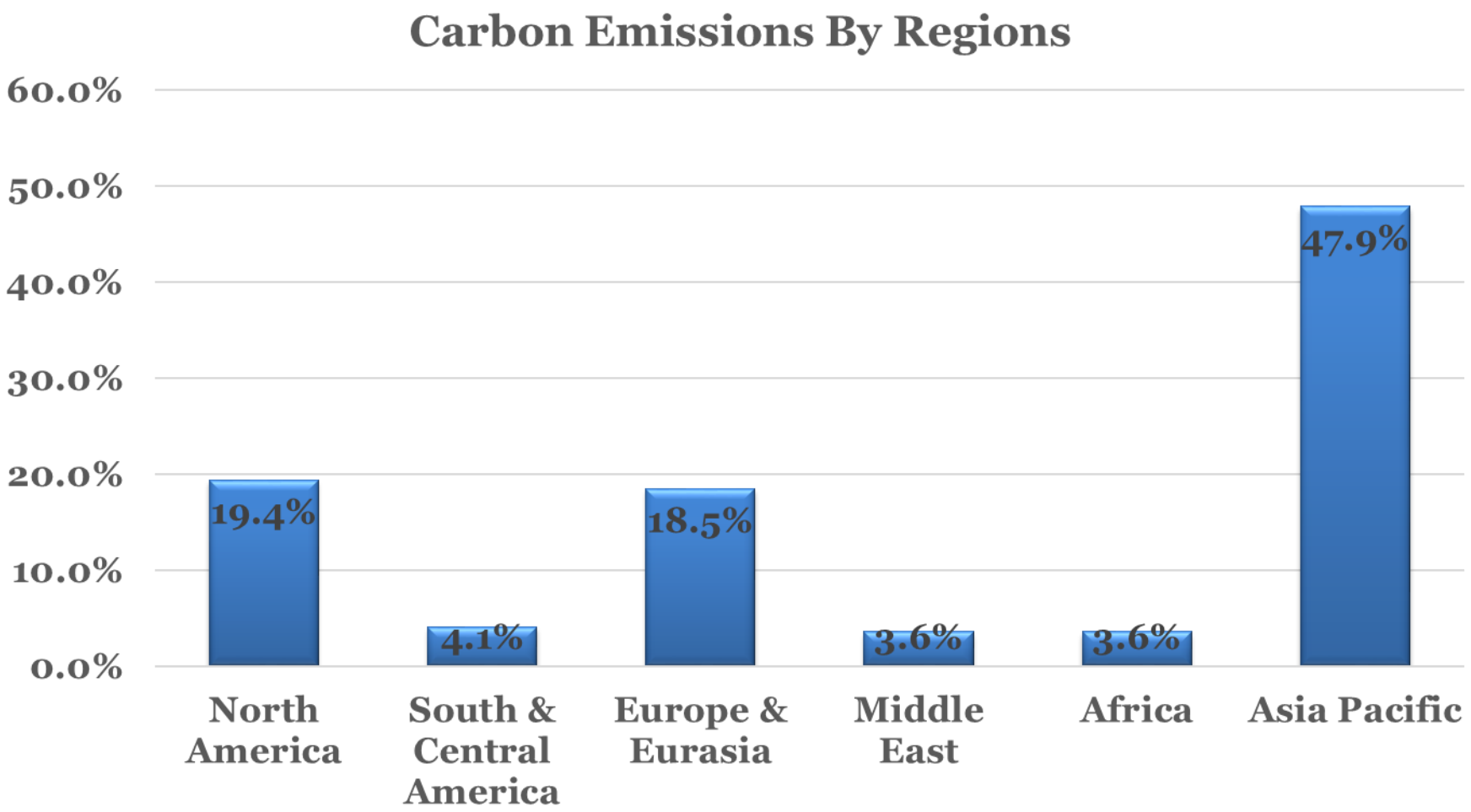
GLOBAL CARBON EMISSIONS (MILLION TONNES CARBON OXIDE)



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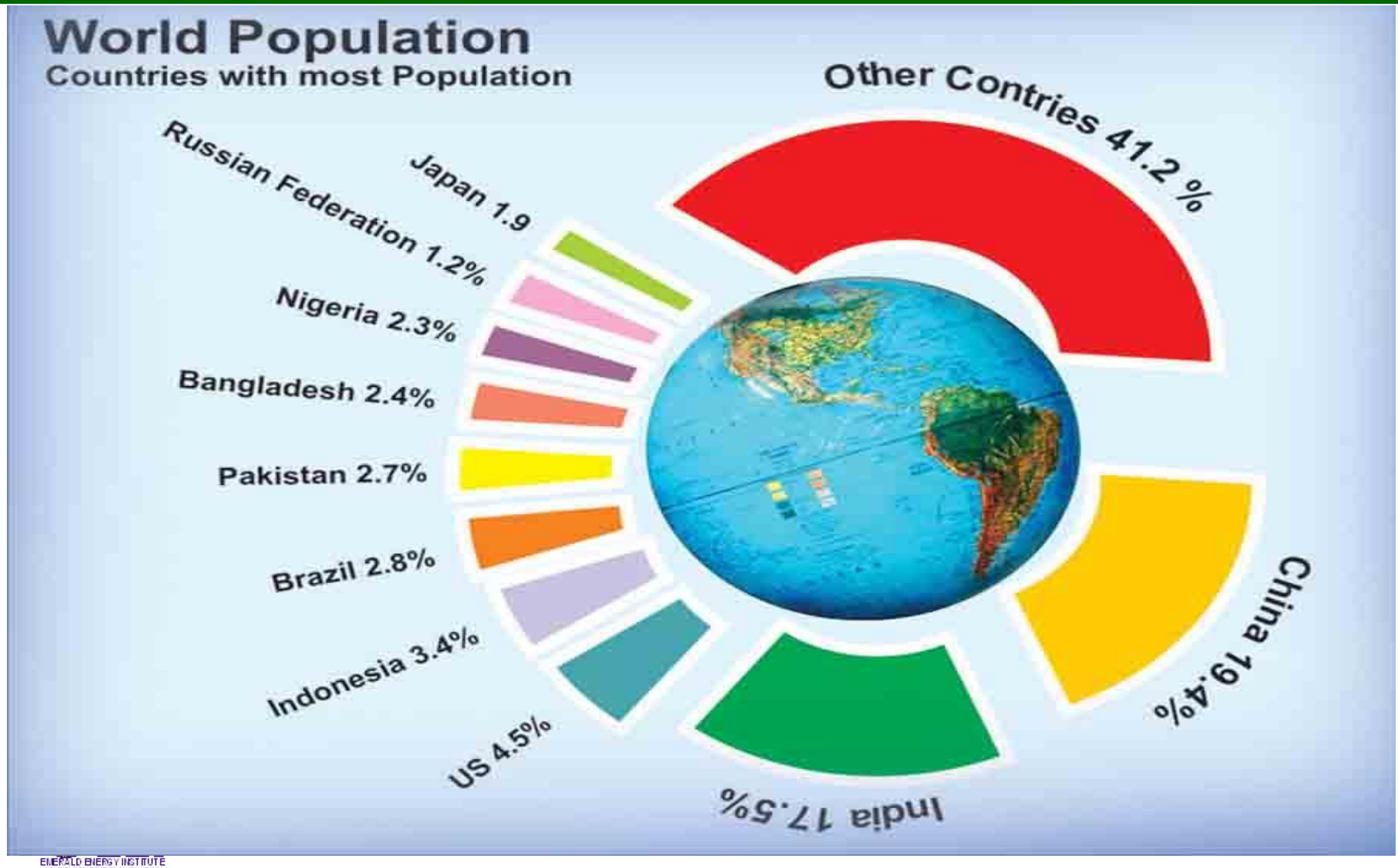
FUNDAMENTAL ENERGY SECURITY CHALLENGES FOR NIGERIA

- Dependence on petroleum, especially natural gas, yet there has been no workable natural gas policy framework over the years
- Treatment of energy resources as a source of revenue rather than as a source of power for economic development
- Weak and instability in energy policy and regulatory institutions to implement laudable power and petroleum sector reform, define standards, and design implement policy incentives
- Energy diversification agenda premised on energy sector reforms seems destined to fail for lack of policy coherence, political willpower and transparency in energy sector governance
- From a short-term energy security perspective, the ability to respond to supply-demand balance is low due to aging and poor maintenance of power generation plants, transmission and distribution infrastructures
- Lack of timely investments to upgrade infrastructure necessary to supply durable energy services for economic development affects long-term energy security goals

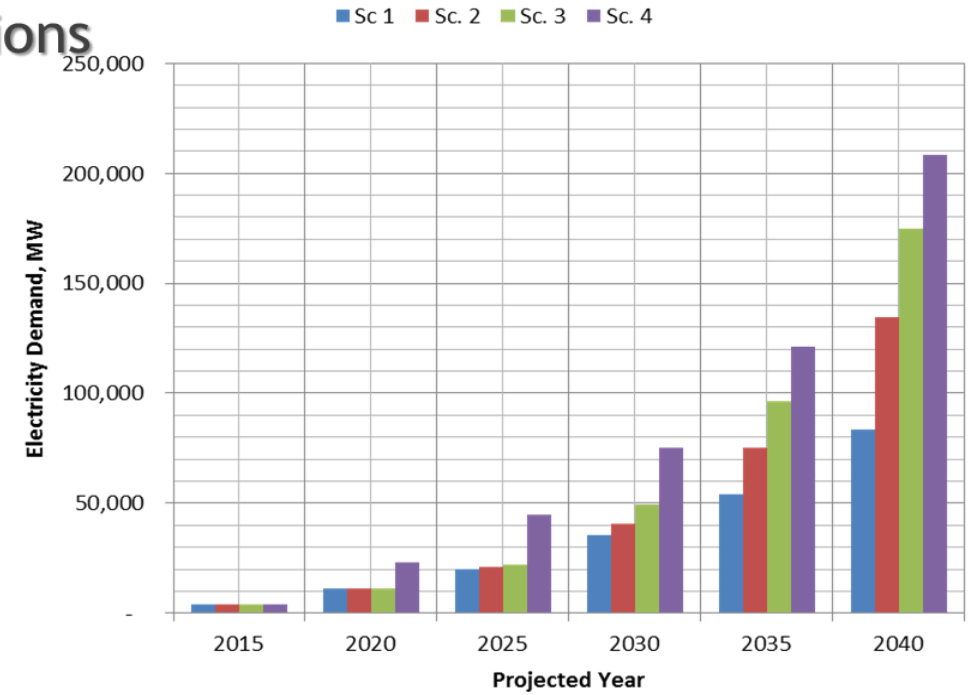
FUNDAMENTAL ENERGY SECURITY CHALLENGES FOR NIGERIA--Population



FUNDAMENTAL ENERGY SECURITY CHALLENGES FOR NIGERIA—Energy Demand

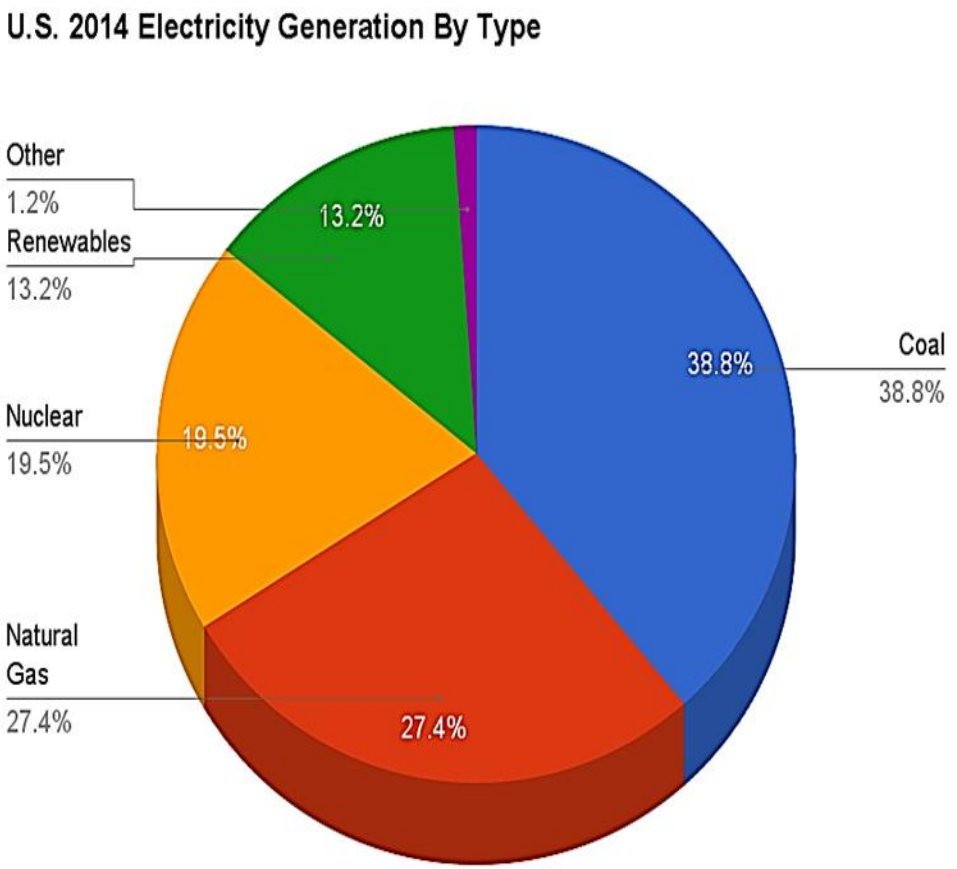
Electricity Demand Projections

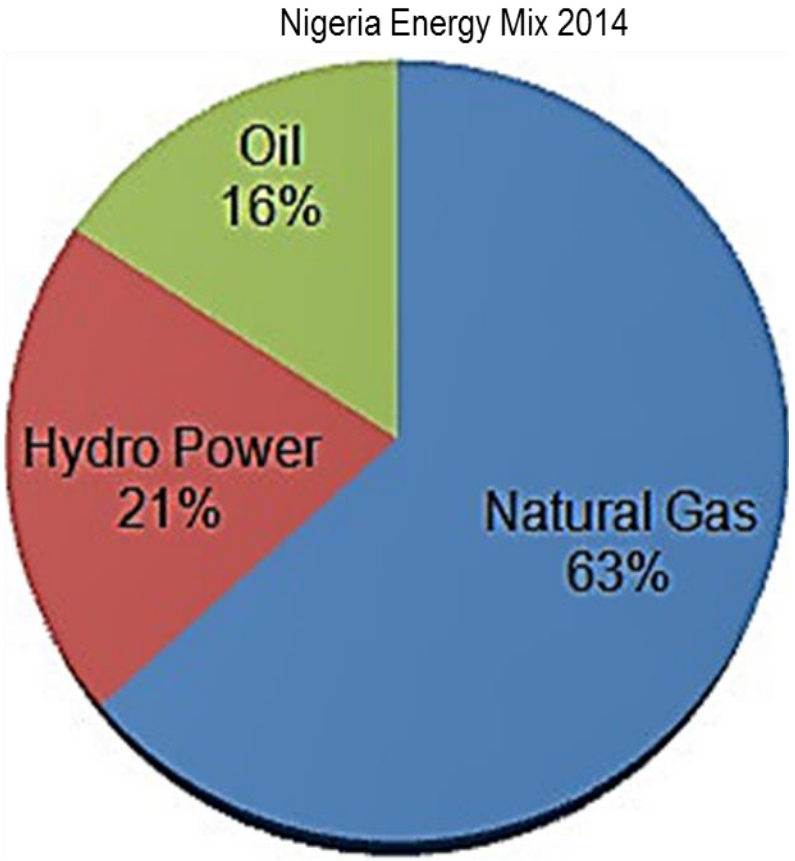
- 4-Scenario Approach
- GDP based
  - 7% growth – Scenario 1
  - 10% growth – Scenario 2
  - 11.5% growth – Scenario 3
  - 13% growth – Scenario 4



Source: Iledare & Onwuka, 2015

FUNDAMENTAL ENERGY SECURITY CHALLENGES FOR NIGERIA—Energy Mix





Onwuka & Iledare (2015)

ENERGY SECURITY PROSPECTS IN NIGERIA: Resource Potential is High

- Fossil energy resources and reserves potential is high
- Estimated potential of non-fossil fuel energy resources is of large quantity
- Potential for high return on investment in energy technologies that ensure energy efficiency is high
- Youthful workforce waiting to be properly developed is an asset in waiting for the energy
- Diversification of energy resources and domestication of energy resource use have gripped the nation.
- Following the world trend towards energy sustainability is expected to bring the require investments

ENERGY SECURITY PROSPECTS IN NIGERIA: Fossil Fuel Potential

S/N	Resource Type	Reserves		Production	Domestic Utilization (Natural Units)
		Natural Units	Energy Units (Btoe)		
1	Crude Oil	37.1 billion barrels	5.06	2.35 million barrels/day	450,000 barrels/day
2	Natural Gas	180.5 Trillion SCF	4.54	50.1 billion SCM/day	3.4 billion SCF/day
3	Coal and Lignite	2.175 billion tonnes	1.92	(insignificant)	(insignificant)
4	Tar Sands	31 billion barrels of equivalent	4.22		
5	Nuclear Element	Not yet qualified			

Onwuka (2016)

ENERGY SECURITY PROSPECTS IN NIGERIA: Non Fossil Fuel Resources mostly Untapped

S/N	Resource Type		Reserves			Production	Domestic Utilization (Natural Units)
			Natural Units	Energy Units (Btoe)			
1	Hydropower Large		11,250 MW	0.8 (over 38 yrs)		1938 MW (167.4 million MWh/day)	"
2	Small Hydropower		3,500 MW	0.25 (over 38 yrs)		30 MW (2.6 million MWh/day)	2.6 million MWh/day
3	Solar Radiation		3.5 - 7.0 KWh/m2/day (485.1 million MWh/day using 0.1% Nigeria land area)	15.0 (38 years and 0.1% Nigeria land area)		Excess of 240 KWp of solar PV or 0.01 million MWh/day	Excess of 0.01 million MWph/day of solar PV
4	Wind		(2.4) m/s at 10m height	8.14 (4m/s@ 70m height ϕ20m windmill, 0.1% land		"	"
5	Biomass	Fuel Wood	11 million hectares of forest and woodland	Excess of 1.2m tonnes/day	"	0.120 million tonnes/day	0.120 million tonnes/day
		Animal waste	211 million assorted animals		"	0.781 million tonnes of waste/day	Not Available
		Energy Drop & Agric Residue	72 hectares of Agric Land		"	0.256 million tonnes of assorted crops/day	Not Available

Onwuka (2016)

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CONCLUDING REMARKS

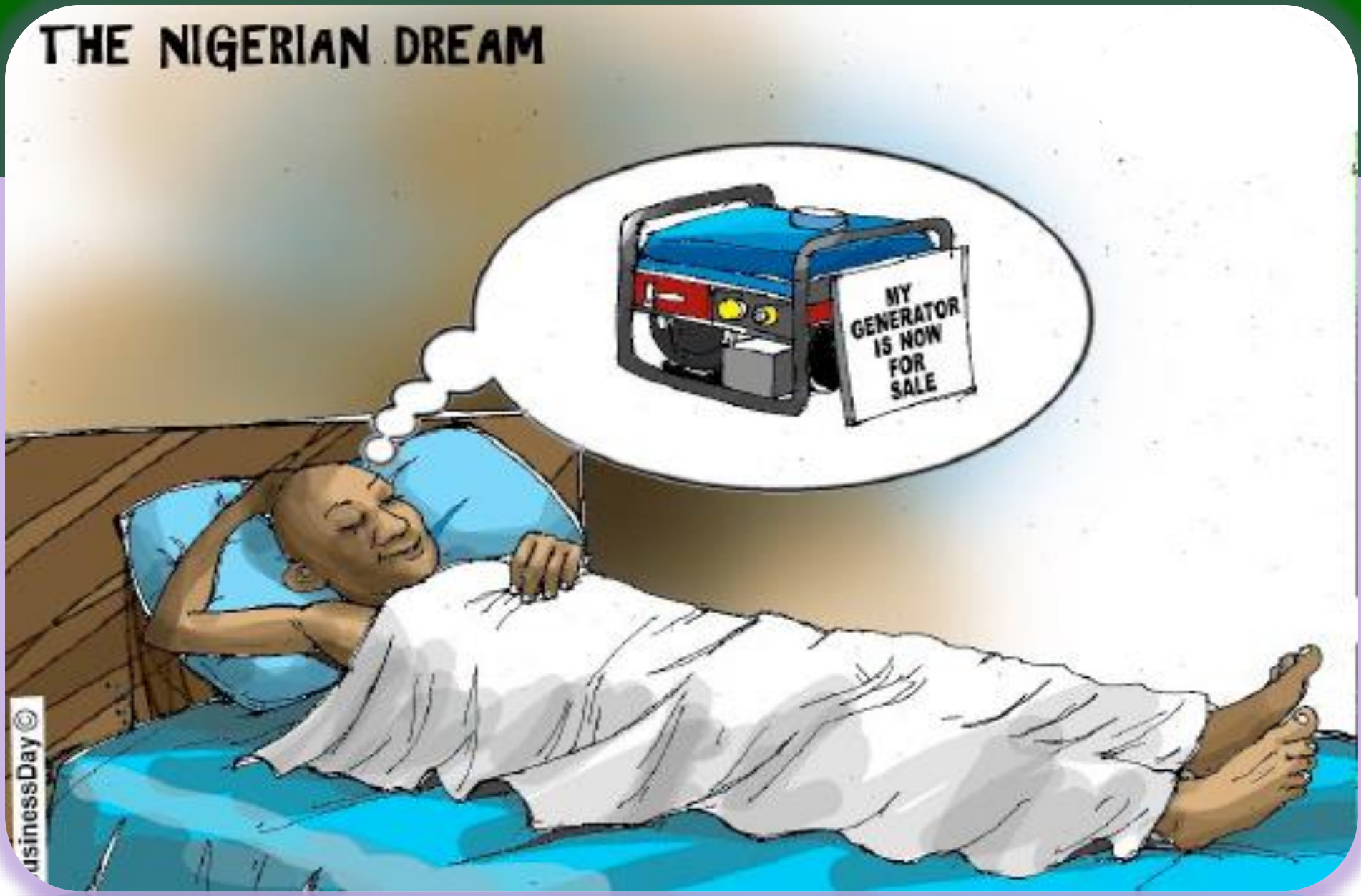
- It is important for Nigeria to adopt global strategy for primary energy resource supply mix in the pursuit of energy security, keeping the following in perspective:
  - Diversification of its energy supply mix as an emerging economies is imperative for sustainable economic development.
  - Substitution of high carbon emission for energy to low carbon emission energy inevitable, but must be done pragmatically.
  - Energy conservation policy and investment strategy to promote energy technologies , which ensure energy efficiency must be in the mix

CONCLUDING REMARKS

- Transparency in governance, political & policy stability, and energy sector institutional reform and restructuring are imperative for attaining energy security potential
  - Petroleum industry reform process has created too much investment uncertainty in the energy sector
  - Governance structure in most of the energy sector institutions is amorphous, confusing and overlapping, leading to regulatory capture and inefficiency
  - Relevant workforce very handicapped to make bold decisions because of undue political interference and/or perhaps nepotism. This must be avoided!

CONCLUDING REMARKS

- Pragmatic public policy with due consideration to implement regional energy resource comparative advantage is essential along with carrot and stick policy approach when appropriate
  - Dedicated energy supply mix for end-users and regions
  - Regional energy demand and supply balance rather then centralization strategy is the way forward
  - State energy regulatory agencies working along wih federal institutions to create appropriate incentives to promote regional comparative advantages
  - Enforcement of the rules of law with appropriate sanctions and rewards within the context of sanctity of contractual agreements.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