RAFFLES ENERGIES LIMITED

ENERGY MIX APPROACH TO INDUSTRIALIZATION IN THE EASTERN PART OF NIGERIA

PAPER DELIVERED AT THE 35TH AGM OF MANUFACTURERS ASSOCIATION OF NIGERIA

BY

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AT

NIKE LAKE RESORT HOTEL, ENUGU

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Greetings

- Chairman of the occasion
- Your Excellencies
- Traditional Chiefs
- Chairman and members of MAN
- Distinguished Technocrats and Politicians
- Members of the Press,
- Ladies & gentlemen
- My presentation titled Energy Mix Approach To Industrialization In The Eastern Part Of Nigeria seems very timely in view of what is happening to ndi Igbo's investment across the country. Nigeria belongs to all us Nigerians yes but charity must start at home and now that Charity left home, it is high time Charity returned home to ana Igbo.

1.0

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Energy Mix

- The "energy mix approach to industrialization" refers to the strategic use and integration of various energy sources to support industrial development.
- This approach recognizes that a diverse set of energy resources can be harnessed to meet the growing energy demands of industrial processes
- Basically – the Renewables (solar, wind, hydro, etc) and the Non Renewables (fossil fuels – Crude Oil, Natural gas, Coal etc)

3.0 Considerations to The Energy Mix Approach To Industrialization

- **Energy Efficiency**: Improving energy efficiency within industrial processes is a crucial component of the energy mix approach. This involves adopting technologies and practices that minimize energy waste and enhance overall system efficiency.
- **Integration of Smart Technologies**: Smart technologies, including Internet of Things (IoT) devices and data analytics, can optimize energy use in industrial settings. Real-time monitoring and control systems enable better decision-making for energy management.
- **Policy and Regulatory Frameworks:** Governments and regulatory bodies play a significant role in shaping the energy mix. Policies that incentivize the use of cleaner energy sources and penalize high carbon-emitting practices can drive industrial adoption of sustainable energy solutions.
- **Research and Development**: Continued investment in research and development is essential to discover and improve technologies that contribute to a more diverse and sustainable energy mix. This includes advancements in energy storage, renewable energy generation, and energy-efficient industrial processes.
- **Public-Private Partnerships**: Collaboration between governments, private sector entities, associations like MAN, and research institutions can foster innovation and accelerate the adoption of sustainable energy practices in industries.
- **Grid Integration**: Ensuring the seamless integration of different energy sources into the existing energy grid is crucial. This involves developing smart grid technologies to handle the intermittent nature of some renewable sources and balance energy supply and demand.
- **Capacity Building and Education**: Training programs and educational initiatives can help industrial stakeholders understand the benefits of the energy mix approach and encourage the adoption of sustainable practices.

By adopting an energy mix approach to industrialization, societies can balance the need for economic growth with environmental sustainability, contributing to a more resilient and responsible industrial sector.

Energy Demand and Supply Dynamics in Nigeria

Energy Demand:

40,000 MW needed to sustain the basic needs of the population & ensure a stable electricity supply

Reasons:

- Growing Population and Urbanization: Nigeria has a rapidly growing population and increasing urbanization. This demographic trend contributes to rising energy demand, especially in urban areas where industrial and commercial activities are concentrated.
- Industrial and Commercial Sectors: The industrial and commercial sectors are significant contributors to energy demand. Industries such as manufacturing, mining, and services require a reliable and substantial energy supply for their operations.
- Residential Energy Demand: Residential energy demand is also on the rise, driven by population growth, increased electrification, and a growing middle class. The use of energy for cooking, lighting, and other household activities contributes to this demand.
- Transportation Sector: The transportation sector, which heavily relies on fossil fuels, is a notable contributor to energy demand. The majority of vehicles in Nigeria are powered by petrol and diesel.

Energy Demand and Supply Dynamics Cont'd

Energy Supply:

85% of power generated & supplied in Nigeria is from fossil fuel, 14% is from hydro and 1% from Renewables sources.

The current generating capacity of the country's national grid is approximately 14,000 MW

7,000 MW - Transmission capacity by the transmission companies because the grid cannot take as much

Suboptimal Generation & Distribution of Electricity in Nigeria

- Vandalism of Equipment. Not only pipelines are vandalized, electricity gen plants and equipment are vandalized in Nigeria. Solution. These are human beings, our relations, our supporters. All hands must be on deck to stop vandalism
- Distribution capacity (Transformers): Lack of proper maintenance of transformers, (obsolete transformers). Solution: Buy more transformers and inculcate maintenance culture
- Transmission capacity: National Capacity 14,000 mw, Transmission capacity 7,000mw because the grid cannot take as much. Solution: Expand the line and make it double circuit radial instead of the single circuit currently in operation.
- Insufficient investment in power. Eastern state govts have all the powers now to increase investment
- Poor Management: When mgt is based on who you know, ethnicity or religion, mediocrity is the output: Solution: recruitment to be merit based
- Corruption: Has entered into our blood. Buying refurbished equipment in the name of brand-new ones. Solution: Empower anti corruption agencies, name and shame the corrupt ones

2.0

Natural Gas

- Natural gas is the earth's cleanest fossil fuel and is colorless and odorless in its natural state
- Used mainly for generating power in houses and industries
- According to NNPC, Nigeria has 202 trillion cubic feet (tcf) of untapped proven gas reserves. The estimated recoverable gas is 139.4 tcf.
- Nigeria is the largest gas proven reserve holder in Africa
- 9th largest proven gas reserves in the world
- 12th in the world in gas production
- 38th in the world in gas consumption
- Proven reserves equivalent to 306.3 times of annual consumption. We have about 306 years of gas left (at current consumption levels and excluding unproven reserves)

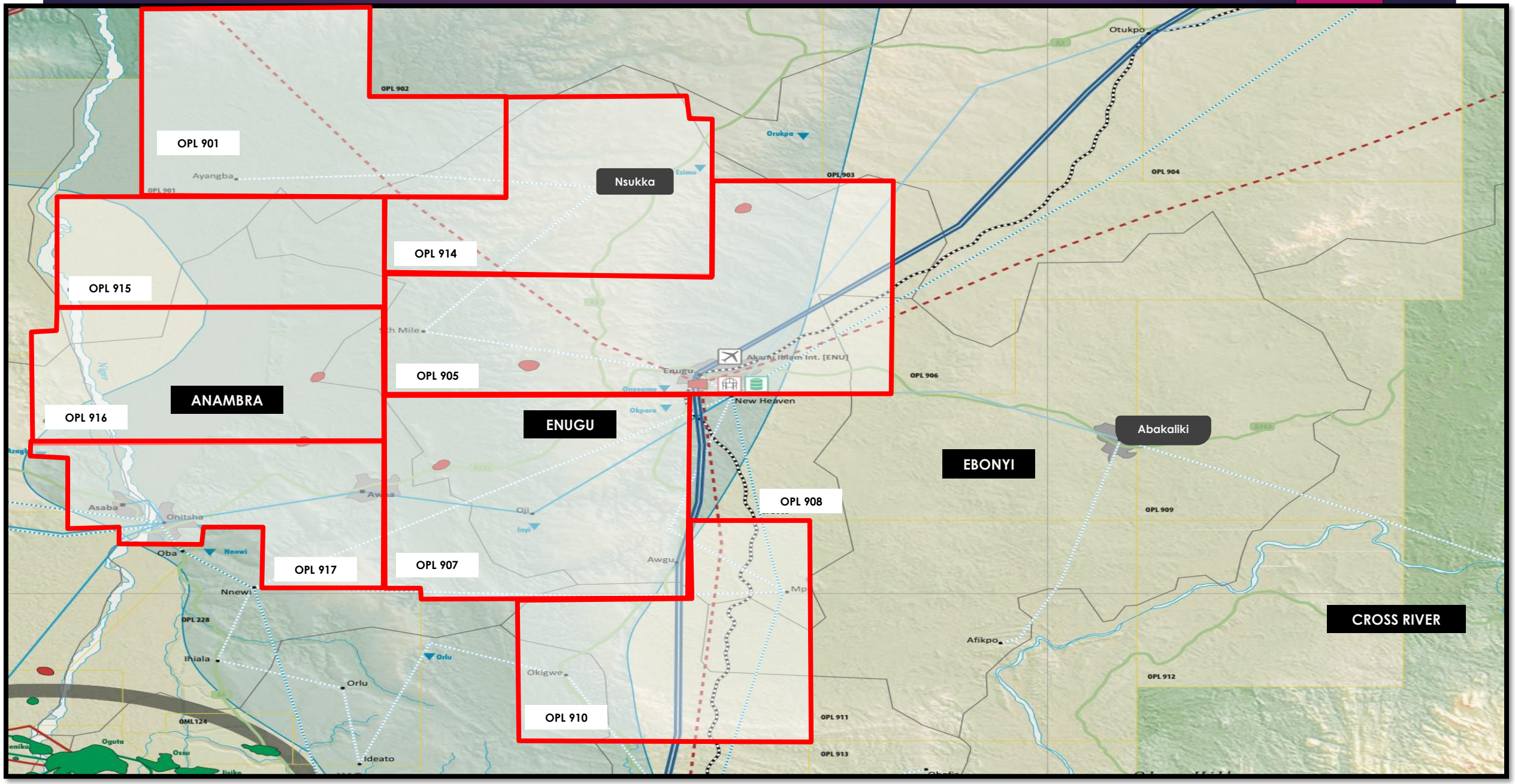
ENUGU, ANAMBRA & EBONYI STATES BY BLOCKS

ANAMBRA	ENUGU	EBONYI
OPL 915 (1 – 3 TCF)	**OPL 905** (1 – 4 TCF)	**OPL 906**
OPL 916 (1 – 3 TCF)	**OPL 914** (0.7 – 2.5 TCF)	**OPL 909**
OPL 917 (1 – 3 TCF)	**OPL 907** (1 – 4 TCF)	**OPL 912**
	OPL 908 (Overlaps Enugu & Ebonyi)	

Anambra Basin Gas Discovery Blocks Summary

BLOCK	OPERATOR	RESOURCES	STATUS
OPL 905	GTPL	**Ihandiagu;** Proven 311 BCF Upsides 1.5 TCF **Amansiodo;** 2 TCF Upsides 1 TCF	Ihandiagu is Completed and Tested with Christmas Tree ready for production
OPL 915	Orient	**Anambra River;** 0.5-1 TCF Contingent + Prospective Resources	Anambra River is Completed and Tested
OPL 916	Orient	**Alo;** 3 -4 TCF Contingent + Prospective Resources	Undeveloped
OPL 907	Global Energy	**Akukwa;** 1 TCF Contingent + Prospective Resources	Undeveloped
OPL 917	Global Energy	**Igbariam;** 1.2 Prospective Resources	Undeveloped

GAS RESERVES IN ENUGU, ANAMBRA & EBONYI



3.0 Coal

- Coal has historically been a significant energy source for industrialization, and it has played a crucial role in powering various industrial processes. However, the use of coal has raised environmental concerns due to its high carbon content, which contributes to greenhouse gas emissions and air pollution
- While coal has historically been a major energy source for industrialization, its use is decreasing in many parts of the world due to environmental, economic, and social considerations. The global trend is moving towards cleaner and more sustainable energy options to balance industrial development with environmental responsibility
- The production of coal started in Nigeria in 1902 in Enugu where it was first discovered. Coal mines are also found in Kogi and Benue State.
- Nigeria has a coal reserve of 379,194,640 tons. She is ranked 44th in position of the world's total reserve of 1,139,471 million tons (MMst); with proven reserves equivalent to 1,961.4 times its annual consumption. This implies Nigeria has about 1,961 years of Coal left at current consumption levels and excluding unproven reserves. (Coal Reserves by Country - Worldometer". www.worldometers.info. Retrieved 1 April 2022).

Coal to Gas

- Gasification of coal is a process in which coal is partially oxidated by air, oxygen, steam or carbon dioxide under controlled conditions to produce a fuel gas
- Coal gasification is the process of producing syngas—a mixture consisting primarily of carbon monoxide (CO), hydrogen (H_2), carbon dioxide (CO_2), methane (CH_4), and water vapour (H_2O)—from coal and water, air and/or oxygen
- Historically, coal was gasified to produce coal gas, also known as "town gas". Coal gas is combustible and was used for heating and municipal lighting, before the advent of large-scale extraction of natural gas from oil wells.
- In current practice, large-scale coal gasification installations are primarily for electricity generation (both in conventional thermal power stations and molten carbonate fuel cell power stations), or for production of chemical feedstocks. The hydrogen obtained from coal gasification can be used for various purposes such as making ammonia, powering a hydrogen economy, or upgrading fossil fuels.
- Natural gas from coal gasification can be cooled until it liquifies for use as a fuel in the transport sector.

Why we need to convert to gas as bridging fuel

- 75% of global CO_2 emissions in the power generation sector are caused by coal power plants. No surprise, they are one of the largest emitters of greenhouse gases.
- We all know we are heading towards a carbon-free future. Likewise, it's clear that we cannot build a new energy system from scratch.
- Therefore, we need to repurpose as much of our existing infrastructure as possible to enable a fast transition towards a new energy system – while reducing CO_2 emissions at the same time.
- Building these bridges towards the future is called 'Brownfield Transformation', compared to new construction – 'greenfield´ – projects.
- Converting the steam power plant to a highly efficient combined cycle power plant (CCPP) by reusing infrastructure, site permits and local personnel. Not only is this approach faster and more sustainable; it also saves up to 30% of Capex compared to a greenfield solution.

Energy mix approach to Industrialization by Prof Billy Okoye, 2023

Energy Mix – a necessity or an imposition

- The energy mix, which involves using a combination of different energy sources such as fossil fuels, renewables, and nuclear, is not inherently a necessity or imposition. It is a strategic choice made by governments and societies based on various factors.

- Governments often aim for a diverse energy mix to enhance energy security, mitigate environmental impacts, and ensure a stable and reliable energy supply. The choice of energy sources can be influenced by factors like resource availability, economic considerations, environmental concerns, and geopolitical considerations.

- In some cases, external pressures, policies, or international agreements may influence a country's energy mix to align with global sustainability goals. However, the decision to adopt a particular energy mix ultimately depends on a combination of national priorities, technological feasibility, and socio-economic considerations

Recommendations for leveraging on energy Resources to accelerate industrial development and economic wellbeing

1. Galvanize critical infrastructure (gas distribution lines, railway, Dryport, mini grids for electricity distribution, etc) to existing industrial clusters. Work with NNPC on the i. Trans Nigeria Gas 36inch Pipeline project Phase 1 will go from Obigbo to Umuahia to Enugu to Ajaokuta. ii. The Kunle pipeline from Benin to Onitsha to Awka/Nnewi
2. Focused upstream development for gas resource within the east towards supporting energy demands within this area. Provide all the incentives for i. Enugu the OPL 905, 914, 907 ii. Anambra OPL 915, 916, 917 & iii. Ebonyi OPL 906,909, 912 iv. OPL 908 Enugu & Ebonyi
3. Coal to gas conversion project
4. Mini solar farms towards supporting light energy commercial clusters
5. Need for interstate integrated power grids towards encouraging energy trades across eastern states. The new electricity act allows States to pass their own power regulations
6. Facilitation and promotion of a PPP strategy towards attracting necessary financing for eastern related energy projects
7. Galvanizing a collective security strategy in the East
8. Encouraging the emergency of virtual gas solutions (Mini LNG/CNG) in the south east for early gas supply

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Energy Demand and Supply Dynamics

Supply:

The current capacity of the country's national grid is approximately 14,000 MW

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85% of power generated in Nigeria is from fossil fuel, 14% is from hydro and 1% from Renewables solar.

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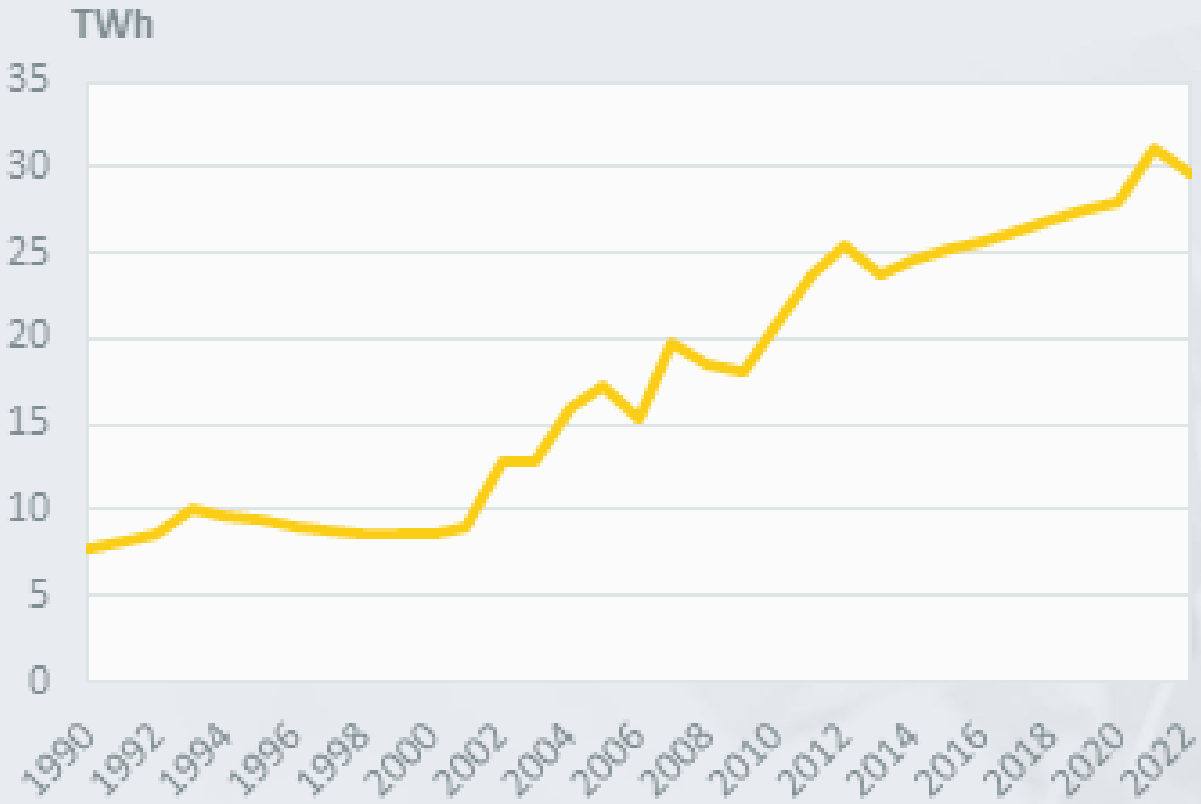
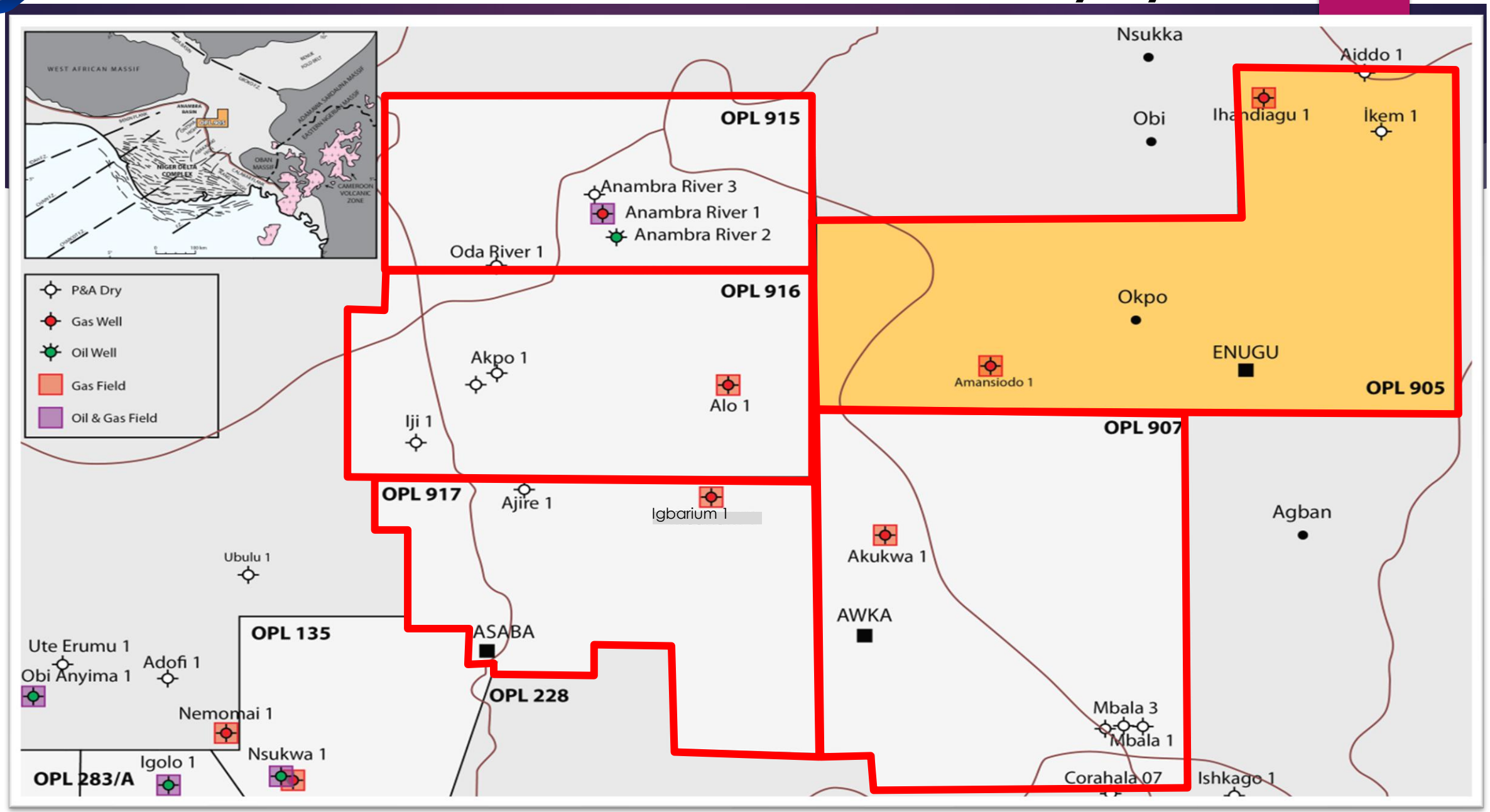
- Oil and Gas Dominance: Nigeria is a major oil-producing country, and oil and gas dominate its energy supply. The country heavily depends on oil for export revenue and domestic energy needs. Natural gas is also a significant source of energy.
- Challenges in Power Generation: Nigeria faces challenges in power generation, leading to a gap between demand and supply. Issues such as inadequate infrastructure, insufficient investment, and technical challenges have hindered the development of a reliable and efficient power generation system.
- Electricity Access: Despite being an oil-rich nation, a substantial portion of the population in Nigeria still lacks access to reliable electricity. Efforts have been made to improve electrification rates, but challenges such as infrastructure deficiencies and financial constraints persist.
- Renewable Energy Development: Nigeria has been exploring the potential of renewable energy sources, including solar and wind, to diversify its energy mix and enhance energy security. However, the share of renewables in the overall energy mix remains relatively small.
- Power Sector Reforms: The Nigerian government has implemented various power sector reforms to address the challenges in the electricity sector. These reforms aim to attract private investment, improve infrastructure, and enhance the efficiency of power generation and distribution.
- Rural Electrification Initiatives: Efforts have been made to extend electricity access to rural areas through rural electrification initiatives, including off-grid and mini-grid projects.

ELECTRICITY CONSUMPTION (Terawatt-hour (TWh)



https://www.enerdata.net/estore/energy-market/nigeria/

Anambra Basin Proven Gas Discovery By Blocks



Coal for industrialization in South east

Here are some key points to consider regarding the use of coal as an energy source for industrialization:

1. **Historical Significance:** Coal has a long history of use in industrialization, particularly during the Industrial Revolution. It has been a reliable and abundant source of energy for processes such as steam power generation, heating, and the production of iron and steel.

2. **Abundance and Reliability:** Coal reserves are abundant in many parts of the world, providing a stable and reliable source of energy. This has made coal attractive for countries seeking to secure a consistent energy supply for industrial development.

3. **Energy Intensity:** Coal is known for its high energy density, making it suitable for applications that require a significant amount of heat, such as metal smelting and power generation. This characteristic has made coal a preferred choice for certain energy-intensive industries.

4. **Environmental Concerns:** The combustion of coal releases carbon dioxide (CO_2), sulfur dioxide (SO_2), and other pollutants into the atmosphere. These emissions contribute to air pollution, acid rain, and climate change. As a result, there is a global push to reduce reliance on coal and transition to cleaner energy sources.

5. **Technological Advancements:** Technologies such as carbon capture and storage (CCS) aim to mitigate the environmental impact of coal use by capturing CO_2 emissions before they are released into the atmosphere. While these technologies are still under development, they hold potential for reducing the carbon footprint of coal-based industries.

6. **Transition to Cleaner Alternatives:** Many countries are actively transitioning away from coal in favor of cleaner energy sources, such as natural gas, renewables (solar, wind, hydro), and nuclear power. This transition is often driven by environmental and climate change considerations.

7. **Economic Considerations:** The economic viability of coal as an energy source is influenced by factors such as the cost of extraction, transportation, and environmental compliance. In some cases, the declining cost of renewable energy alternatives has made them more economically competitive.

8. **Social Impacts:** The mining and burning of coal can have significant social impacts, including health concerns for communities near coal mines or power plants. Issues such as respiratory problems and water pollution are associated with coal-related activities.

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