Implications of Energy Transition on Undeveloped Oil and Gas Assets in Nigeria

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ABSTRACT

Energy transition is a global shift from fossil fuels (coal, oil and gas) and other non-renewable energy sources to renewable (hydro, solar, geothermal energy, and wind) and sustainable energy alternatives, involving a fundamental change in the way energy is produced, distributed, and consumed in order to mitigate climate change, wherefore, aiming to achieve the world's sustainable development goal (SDG 7). Researching on the implications of energy transition on undeveloped oil and gas assets in Nigeria; a brief history on energy transition and its key drivers, hydrocarbon reserves and global energy transition trends, importance of fossil fuel in the world and to Nigeria, petroleum exploration and exploitation in Nigeria were reviewed. These studies divulge that a significant number of countries still consumes fossil fuel in their energy mix, while a few have attained a notable percentage of transition into renewable energy sources. Although, the Nigeria's energy mix is yet to harness most of her fossil fuel reserves, where these reserves are estimated to be 37,000 billion barrels of crude oil, and 5,800 million cubic feet of gas, spanning a period of about 60 and 88 years respectively. Thus, the implications of energy transition on undeveloped oil and gas assets in Nigeria includes but not limited to: abandonment of infrastructures, stranded reserves, loss of revenue and economic crisis, on a lighter note may include, energy diversification and sustainability, decrease of economic susceptibility to fluctuations in global oil price. For a smooth transition into renewable energy era, Nigeria should at this phase invest more in exploration and exploitation of her undeveloped hydrocarbon reserves, which will serve as pivot for her transit and diversification, thereby preventing economic shamble during her transition phase.

Keywords: Transition, Undeveloped assets, Reserve, Fossil fuels, Exploration, Exploitation, Energy transition.

INTRODUCTION

Energy transition entails a shift in the use of fossil fuel in our energy supply systems (O'Connor PA 2010). It is the shift from non-renewable fossil-base system of energy supply and consumption to renewable low carbon energy system. Energy transition is the process of downshifting fossil fuels and re-developing whole systems to operate on low carbon energy sources (Tian *et al,* 2022). Transition in energy supply and consumption, seeks to eradicate the use of hydrocarbon fuels (fossil fuel), replacing them with non-carbon generating energy resources (renewable fuel). Each energy transition designates a significant change from an energy system related to resources, system structure, scale, economics, end use behavior and energy policy (Grübler, 1991). A prime example is the change from a pre-industrial system relying on traditional biomass and muscle power to an industrial system characterized by pervasive mechanization, steam power and the use of coal. After the 1973 oil crisis, the term “Energy Transition” was coined by politicians and media, which was popularized by US President Jimmy Carter in his 1977 Address on the Nation on Energy, calling to “look back into history to understand our energy problem”. The term was later globalized after the 1979 second oil shock, during the 1981 United Nations in Nairobi on new and renewable sources of energy. From the 1990s, debates on energy transition have increasingly taken climate change mitigation into account. Since the adoption of the COP21 (21st Conference of Parties) Paris Agreement in 2015, all 196 participating parties have agreed to reach carbon neutrality by mid-century. Parties to the agreement committed "to limit global warming to "well below 2 °C, preferably 1.5 °C compared to pre-industrial levels". This requires a rapid energy transition with a downshift of fossil fuel production to stay within the carbon emissions budget. In this context, the term 'energy transition' encompasses a reorientation of energy policy, this could imply a shift from centralized to distributed generation. It also includes attempts to replace over production and avoidable energy consumption with energy-saving measures and increased efficiency.

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History of Energy Transition

The historic approaches to past energy transitions are shaped by two main discourses. One argues that humankind experienced several energy transitions in its past, while the other suggests the term "energy additions" as better reflecting the changes in global energy supply in the last three centuries. The first discourse was most broadly described by Smil (2017); it underlines the change in the energy mix of countries and the global economy. By looking at data in percentages of the primary energy source used in a given context, it paints a picture of the world's energy systems as having changed significantly over time, going from biomass to coal, to oil, and now a mix of mostly coal, oil and natural gas. Until the 1950s, the economic mechanism behind energy systems was local rather than global. The second discourse was most broadly described by Jean-Baptiste Fressoz. It emphasizes that the term "energy transition" was first used by politicians, not historians, to describe a goal to achieve in the future – not as a concept to analyze past trends. When looking at the sheer amount of energy being used by humankind, the picture is one of an ever-increasing energy consumption that is met by an ever-increasing consumption of all the main energy sources available to humankind. For instance, the increased use of coal in the 19th century indeed did not replace wood consumption, but came on top of increased wood consumption. Another example is the deployment of passenger cars in the 20th century. This evolution triggered an increase in both oil consumption (to drive the car) and coal consumption (to make the steel needed for the car). In other words, according to this approach, humankind never performed a single energy transition in its history but performed several energy additions.

The need for large amounts of firewood in early industrial processes in combination with prohibitive costs for overland transportation led to a scarcity of accessible wood. When Britain had to resort to coal after largely having run out of wood, the resulting fuel crisis triggered a chain of events that two centuries later culminated in the Industrial Revolution. Similarly, increased use of peat and coal were vital elements paving the way for the Dutch Golden Age, roughly spanning the entire 17th century. Another example where resource depletion triggered technological innovation and a shift to new energy sources was in 19th Century whaling and how whale oil eventually became replaced by kerosene and other petroleum-derived products.

Coal and the First Energy Transition

In the 16th and 17th centuries, the prices of firewood and charcoal skyrocketed due to shortages, which was driven by increased consumption from both households and industries as economies grew and became more sophisticated. Consequently, industrializing economies like the UK needed a new but cheaper source of energy, they turned to coal, marking the beginning of the first major energy transition. As coal use and production increased, the cost of producing it fell due to economies of scale. Advancement and adaptation in technology brought about new ways to use coal. The steam engine; one of the major technologies behind the Industrial Revolution – was heavily reliant on coal, and homeowners used coal to heat their homes and cook food, this is evident in the growth of coal's share of the global energy mix, up from 1.7% in 1800 to 47.2% in 1900. Table 1.1 shows ratio between coal and traditional grow from 1800-1940.

Rise of Oil and Gas

Before the mass production of automobiles, oil was mainly used for lamps. Oil demand from internal combustion engine vehicles started climbing after the introduction of assembly lines, which took off after World War II as vehicle purchases soared.

Similarly, the invention of the Bunsen burner opened up new opportunities to use natural gas in households. As pipelines came into place, gas became a major source of energy for home heating, cooking, water heaters, and other appliances. Coal lost the home heating market to gas and electricity, and the transportation market to oil. Despite this, it became the world's most important source of electricity generation and still accounts for over one-third of global electricity production today. Table 1.2 shows the growth ratio between coal, oil and gas from the year 1950-2000.

Transition to Renewable Energy

Renewable energy sources are at the center of the ongoing energy transition. As countries ramp up their efforts to curb emissions, solar and wind energy capacities are expanding globally.

In the decade between 2000 and 2010, the share of renewables increased by just 1.1%. But the growth is speeding up—between 2010 and 2020, this figure stood at 3.5%. Furthermore, the current energy transition is unprecedented in both scale and speed, with climate goals requiring net-zero emissions by 2050, which essentially means a complete fade-out of fossil fuels in less than 30 years and an inevitable rapid increase in renewable energy generation. Table 1.3 shows the growth ratio between traditional biomass, renewable, fossil fuel and nuclear from 2000-2020.

In table 1, it is observed that every couple of decades coal's contribution to the energy mix increased as a result of advance technology (steam engine), and by 1940, coal made up about 50.7% of the total energy mix, which more than 50% of the world's energy.

In table 2, the world's energy mix as from 1950 diversified, introducing oil and gas into the energy mix. By the year 2000, oil and gas dominated the energy mix contributing

Table 1: Growth ratio between Coal and Traditional Energy Mix for interval of two decades (1800-1940). Source: Visual Capitalist. https://www.weforum.org/agenda/2022/04/visualizing-the-history-of-energy-transitions/

Year	Traditional Biomass % of Energy Mix	Coal % Energy Mix
1800	98.3%	1.7%
1820	97.6%	2.4%
1840	95.1%	4.9%
1860	86.8%	13.3%
1880	73.0%	26.7%
1900	50.4%	47.2%
1920	38.4%	54.4%
1940	31.6%	50.7%

Table 2: Grow ratio of Coal, Oil and Natural Gas Energy Mix for interval of a decade (1950-2000). Source: Visual Capitalist. https://www.weforum.org/agenda/2022/04/visualizing-the-history-of-energy-transitions/

Year	Coal % of Energy Mix	Oil % of Energy Mix	Natural Gas % of Energy Mix
1950	44.2%	19.1%	7.3%
1960	37.0%	26.6%	10.7%
1970	25.7%	40.2%	14.5%
1980	23.8%	40.6%	16.3%
1990	24.4%	35.5%	18.4%
2000	22.5%	35.1%	19.7%

more than 50% of the total world energy mix (with oil making 35.1% and gas 19.7%), while coal consumption dropped and accounted for less than 50% to the energy mix

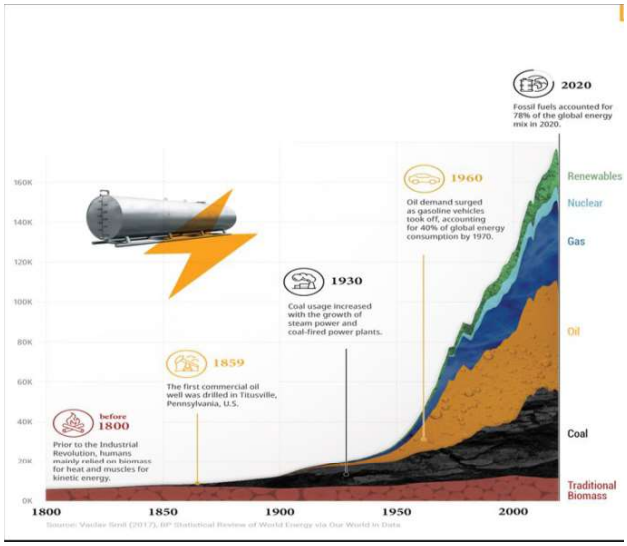

Figure 1: World Energy Transition trend. Modified after Vaclav Smil (2017). Source: Visual Capitalist.

Key Drivers of Energy Transition

In the history of energy transition, some driving factors have been identified as pioneers to the clamor for change in energy mix. Some of these drivers includes but not limited to:

Table 3: Growth ratio of Traditional Biomass, Renewable, Fossil fuel and Nuclear Energy Mix for an interval of five years (2000-2020).
Source: Visual Capitalist https://www.weforum.org/agenda/2022/04/visualizing-the-history-of-energy-transitions/

Year	Traditional Biomass % of Energy Mix	Renewables % of Energy Mix	Fossil Fuels % of Energy Mix	Nuclear % of Energy Mix
2000	10.2%	6.6%	77.3%	5.9%
2005	8.7%	6.5%	79.4%	5.4%
2010	7.7%	7.7%	79.9%	4.7%
2015	6.9%	9.2%	79.9%	4.0%
2020	6.7%	11.2%	78.0%	4.0%

From table 3 above, fossil fuel (coal, oil and gas) contributed 78% to the world's energy mix by 2020 which is more than 50% of the total energy mix. But noteworthy is the growth rate of renewable energy which contributed 11.2% to the world energy mix, surpassing traditional biomass (6.7%) and nuclear energy (4%).

However, history shows that simply adding generation capacity is not enough to facilitate an energy transition. Coal required mines, canals, and railroads; oil required wells, pipelines, and refineries; electricity required generators and an intricate grid.

Similarly, a complete shift to low-carbon sources requires massive investments in natural resources, infrastructure, and grid storage, along with changes in our energy consumption habits. Energy transition trend from 1800-2020 figure 1.1 shows

1. Reduction of Greenhouse Gases Emission: the main greenhouse gases include carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs) and ozone which traps heat from the sun, preventing them from been radiated out of the earth, therefore causing global warming. These gases are gotten mainly from fossil fuel mining and consumption, therefore to mitigate global warming and climate change is to reduce the combustion of fossil fuels, thereby reducing the present of greenhouse gases in the atmosphere.

2. Increase in energy demand: over time, demand for energy keeps increasing due to increasing population of the world. Expensive or scarcity in energy supply have the potential to inflict suffering and economic hardship, where much population of the world have little energy to meet

basic human needs. Couple with the increasing population are the monetary costs of energy, environmental impacts of energy supply (environmental problems which are growing and already a dominant contributor to local, regional, and global concern; including air pollution, water pollution, ocean pollution, and climate change), and the sociopolitical risks of energy supply. These factors pioneer the call for energy transition, but predominant among them is the increase in world energy use since 1850, the growth of world population in this period was responsible for 52% of the energy growth, while growth in per capita energy use was responsible for 48%. In the late 1980s, population growth was still accounting for a third of energy growth in the world (Holdren, 1991).

3. Increasing accessibility to cleaner energy and improvements in energy storage: cleaner energy sources such as hydro, geothermal, solar, wind and innovative technologies like electric vehicles (EV), greening aviation, hydrogen fuel cells, carbon neutrality and energy storage have facilitated the clamor for energy transition.

MATERIALS AND METHODS

Data were collected mainly by reviewing literature materials, analyzing tables and statistical charts, from published papers, journals, newspapers and several reports from national and international energy agencies. These provided information for the narratives on global energy transition trends, its triggering factors, the worlds hydrocarbon reserves, fossil fuel dominance despite the steady growth of renewable energy.

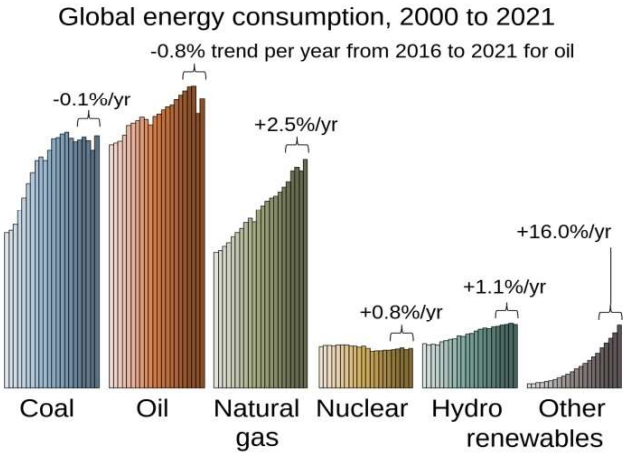

Figure 2: Global Energy Consumption from 2000 to 2021. Each bar represents a year.
SOURCE: Wikipedia https://en.m.wikipedia.org/wiki/File:Global_Energy_Consumption.svg

RESULTS AND INTERPRETATION

Global Energy Outlook

Energy transition has been around for a couple of decades and have overtime attracted the contributions of noble scholars. Modern society is highly dependent on the use of energy resources, and energy has even been called the lifeblood of technological and economic development (Chow *et al.,* 2003). The current global energy system is dominated by fossil fuels and suffers from environmental problems caused by increasing greenhouse gas emissions, air pollution at local and regional level as well as energy security issues, while at the same time 3 billion people still lack access to modern energy services (GEA, 2012). Energy is the only universal currency: one of its many forms must be transformed to get anything done. Universal manifestations of these transformations range from the enormous rotations of galaxies to thermonuclear reactions in stars (Smil, 2017). US President Jimmy Carter in his 'The Moral Equivalent of War' speech on April 18, 1977 foresaw the renewed use of coal and solar power, where he cited historical energy changes from wood to coal then oil. He foresaw the renewed use of coal and solar power – "Our consumption of oil would keep going up every year, our cars would continue to be too large and inefficient, three-quarters of them would continue to carry only one person—the driver—while our public transportation system continues to decline". The global energy system is dominated by the use of fossil fuels. This system suffers from several problems, such as different environmental issues, while the long-term energy security is sometimes questioned. As an alternative to this situation, a transition to a global energy system based on renewable energy technologies, to a large extent solar and wind energy, is commonly proposed (Davidsson, 2015). Transition in energy supply and usage have contributed to the world's economic growth in several ways; transitions from locally-supplied wood, water and wind energies to globally supplied fossil and nuclear fuels has induced growth in end-use demand through the rapid expansion of engineering research, education and standardization (Krumdieck, 2020).

Energy transition is a global change in the supply and use of fuel, with over 196 participating parties across the globe. Many countries of the world are transiting into clearer energy source, yet still consumes a significant quantity of fossil fuel in her energy mix. Globally, China, U.S.A, India, Russia, Japan is known for their high consumption of energy, with China as the largest consumer of primary energy in the world, using some 157.65 exajoules in 2021, where majority of primary energy fuels are still derived from fossil fuels such as oil and coal (Aizarani, 2023). Since 2009, the renewables share in total energy consumption has grown to 15.9 percent. Overall, global primary energy consumption has increased over the last decade, it is expected to experience

the largest growth in emerging economies (Aizarani, 2023). Coping with global energy problems will require great investment in improving the efficiency of energy and in reducing the environmental impacts of contemporary energy technologies, financing a transition over the next several decades to a set of more sustainable (but probably also more expensive) energy sources. The difficulty of implementing these measures will be greatest by far in the developing countries, not least because of their high rates of population growth and the attendant extra pressures on economic and managerial resources (Holdren, 1991).

Energy Transition and Sustainable Development Goal

In 2015, United Nations General Assembly established seventeen (17) Sustainable Development Goal, of which energy transition is the seventh Sustainable Development Goal (SDG 7 or Global Goal 7). SDG7 aims to "ensure access to affordable, reliable, sustainable and modern energy", since access to energy is an important pillar for the wellbeing of humans as well as for economic development and poverty alleviation. With the fascinating agenda, SDG7 also encounters challenges such as policy framing, infrastructure, restructuring power systems, energy supply, energy efficiency, and energy security are all challenges in the energy transition (Jayachandran et al, 2022). The integration of 100% renewable energy encounters issues such as power balance, inverter, stability, protection, black start (the ability of generation to restart parts of the power system to recover from a blackout, these also includes isolated power stations being started individually and gradually reconnected to one another to form an interconnected system again) and unintentional islanding (Jayachandran et al, 2022). Fig 2.1 shows energy consumption globally, from 2000-2021.

Hydrocarbon Reserves

Proven oil reserves are those quantities of petroleum which, by analysis of geological and engineering data, can be estimated, with a high degree of confidence, to be commercially recoverable from a given date forward from known reservoirs and under current economic conditions. The world's proven oil reserves increased from 1,735 billion barrels (bbl) to a total of 1,757 billion barrels (bbl), similarly, global proven natural gas reserves rose from 7,297 trillion cubic feet (tcf) to 7,456 tcf in 2022 (Xu and Bell-Hammer, 2022).

According to current estimates, 80.4% (1,241.82 billion barrels) of the world's proven oil reserves are located in OPEC Member Countries, with the bulk of OPEC oil reserves in the Middle East, amounting to 67.1% of the OPEC total (OPEC, 2022). Countries with highest reserves according to OPEC Annual Statistical Bulletin 2022 includes Venezuela (303.47 bb), Saudi Arabia (267.19 bbl), Iran (208.60 bbl), Iraq (145.02 bbl), United Arab Emirates (111.00 bbl), Kuwait (101.50 bbl), Lybia (48.36 bbl), Nigeria (37.05 bbl) and Equatoria Guinea (1.10 bbl). Canada's hydrocarbon reserve ranks third after Iran with a total of 170.00 bbl in the global oil reserve ranking, Russia is at the ninth (9th) position on the world's reserve ranking list with a total of 80.00 bbl, United States and China ranks 11th and 14th position with a total of 44.00 bbl and 26.00 bbl respectively (US-EIA, 2023).

More than 90% of the worlds coal reserves are located in eleven (11) countries, with United State taking the lead at a total of 250.02 million tonnes, accounting for about 24% of the world's coal reserves, Russia and Austraila rank second and third at a total of 162.166 and 150.227 million tonnes, accounting for 15% and 14% of the world's proven coal reserves respectively (BP Statistical Review of World Energy 2021 | 70th edition). Representation of the worlds coal reserve is shown in Fig. 3.

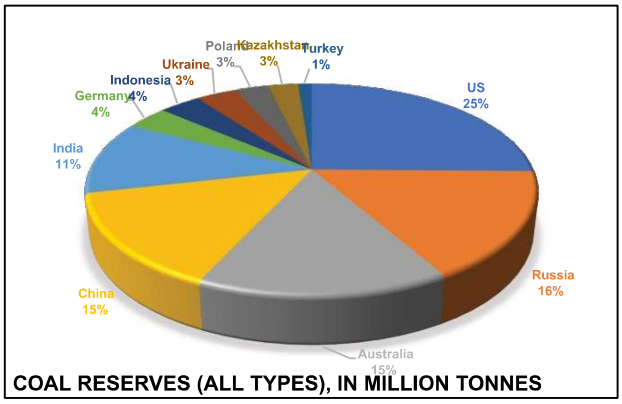

Figure 3: World coal reserve. Source: BP Statistical Review of World Energy 2021 | 70th edition.

Nigeria's Hydrocarbon Reserves

Nigeria's hydrocarbon reserves rank 10th position in OPEC and 12th in the world's reserve ranking at a total of 37.05 bbl (OPEC, 2022). It is estimated to span a period of sixty (60) years. Some of the oil fields hosting Nigeria's oil reserve includes: **Bonga oil field** producing both natural gas and oil, estimated oil in place 1,470,000 mbl (million barrels). **Agbami oil field**, having an estimated oil in place to be 900 mbl (of petroleum liquids; crude oil, condensate, and natural gas liquids). **Akpo oil field:** is a gas and condensate field, with estimated oil production at 175,000 mbl per dayand 320 million cubic feet per day. **Bonny Oil Field:** has a daily capacity of 1.25 million barrels per day. **Oloibiri oil field:** has an estimated oil in place to be 40.94 million barrels, and peak oil production of 5,100 barrels per day.

According to Bureau of Public Enterprise (BPE), proven coal reserves in Nigeria is at 639 million metric tonnes, while the inferred reserves are about 2.75billion metric

tonnes in more than 22 coalfields spread over 13 States in Nigeria.

Hydrocarbon Exploration and Exploitation in Nigeria

The history of exploration and production of crude oil in Nigeria dates back to 1903 when the Nigerian Bitumen Corporation conducted exploratory survey. In 2000, oil and gas exports accounted for more than 98% of export earnings and about 83% of federal government revenue, as well as generating more than 14% of its GDP. It also provides 95% of foreign exchange earnings, and about 65% of government budgetary revenues (World Bank, 2004). Statistics as at February 2021 shows that the Nigerian oil sector accounts for about 9% of the entire GDP of the nation. Nigeria is one of the largest oil producers in the world, with a daily production that exceeded two million barrels per day in 2020, and decreased to 1.14 million barrels per day in 2021 during the first three months (the lowest value recorded in the last years), however, due to the lower demand related to the COVID-19 pandemic, oil production and export dropped (Sasu, 2023). Nigeria has the world's 10th largest gas reserves but ranks only 17th in production – demonstrating untapped potential (Adekoya, 2020). Figure 4 shows oil production in Nigeria from 1998 to 2022.

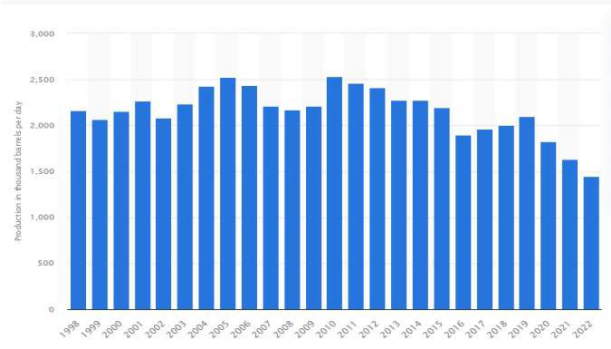

Figure 4: Oil production in Nigeria from 1998 to 2022. Production in thousand per day. Source: Statista, by Sasu, (2023)

Fossil Fuel Dominance in Energy mix

Despite the emergence of renewable energy and the trend of energy transition, fossil fuel is dominant in the world's energy mix, catering for about 80% of the world's energy demands. Besides the ability of fossil fuels to readily carter for the worlds large and increasing energy demands in homes and industrial sectors (to power larger plants and generate electricity), its relevance cannot be over emphasized in the world's economy, in agricultural sector (from combusting them directly on the farm in machinery and vehicles, to using electricity and heat for processes on the farm such as drying grain or growing tomatoes in glasshouses, to the production of fertilizers and then to processing and production of farm products-food). The use of fossil fuel can be seen in transportation sector, pharmaceutical industries, petrochemical industries (production of plastics, fake rubber, tires, paints, lacquers, adhesives, explosives, Styrofoam, resins, rubbers, lubricants, dyes, synthetic fibers, coatings, building materials, and embalming bodies), fabrics and textile industries.

Nigeria's Response to Global Energy Transition

In Nigeria, there is no coherent legal framework for renewable energy adoption. However, over the years, the Nigerian Government has enacted polices, plans and regulations that seek to encourage the drive towards renewable energy, such as the 2009 Draft Renewable Electricity Policy, Renewable Energy Master Plan (2012), the National Energy Policy (2013) and the Draft National Energy Master Plan (NEMP) (2014), among others. This policy failed in ways to steer the Nigerian energy industry in the desired direction (Emmanuel and Ifeoluwa, 2022).

However, in compliance to Conference of Paris (COP) Act, in August 2022, Nigeria launched her Energy Transition Plan (ETP) to become carbon neutral by 2060. To deliver Sustainable Development Goal seven (SDG7) targeted at tackling energy poverty and climate change, the Nigeria ETP, was designed to focus on power, cooking, oil & gas, transport and industry sectors (THISDAYLIVE, 2023). During the process of achieving carbon neutrality, Nigeria plans to harness natural gas as its source of cleaner energy, while developing other renewable energy source. Although the ETP centers on providing energy for development, industrialization and economic growth, it also still has objectives to eradicate poverty, bringing modern energy to lamplight, and manage the expected long term job loss in the oil sector due to global energy transition and decarbonization. The plan is said to be able to create about 340,000 jobs by 2030 and over 840,000 jobs by 2060. The ETP recognized the role of natural gas in form of LPG in facilitating clean cooking in the nation, it also envisioned vibrant industries powered by low carbon emitting technologies, the use of electric vehicles with sufficient and clean energy in every day livelihood (THISDAYLIVE, 2023). The plan also recognized certain challenges to the aforementioned objectives, these challenges include; high cost of transiting into renewables energy mix (about 1.9 trillion US dollars), lack of funds, access to sustainable electricity supply, poor sensitization of the public of energy transition (THIS DAY, 2023). Fig 5 represents the Nigeria energy transition plan, and table 4 give a concise explanation of the transition plan.

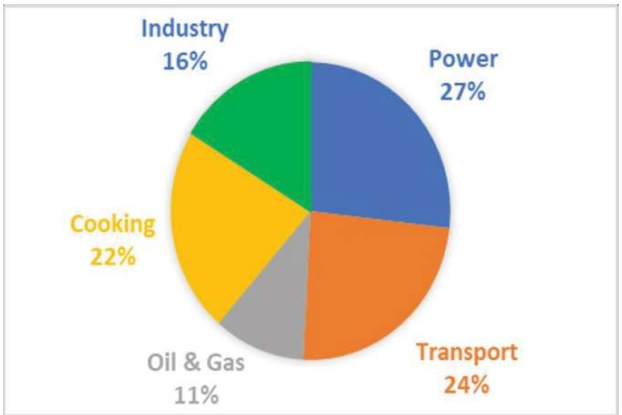

Figure 5: Nigeria's Energy Transition Plan.
SOURCE: The Energy for Growth Hub.
https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.energyforgrowth.org%2Fmemo%2Fmaking-nigerias-energy-transition-plan-a-reality%2F&psig=AOvVaw0sdvnAao06HyPI8B0wb62A&ust=1687299875320000&source=images&cd=vfe&ved=0CBMQjhxqFwoTCKDlyf-v0P8CFQAAAAAdAAAAABAE

Table 4: Five critical energy sectors captured in the Nigeria Energy Transition Plan.
Source: Premium Time, by Oluwatola (2022)

Energy Sector	Current Emissions	2030 Goal	2060 Goal
Cooking	22% emissions mostly from firewood cooking (175 million Nigerians)	Replace 75% firewood Move 50% to LPG	100% electric and biogas cooking
Oil and Gas	11% of emissions from fugitives, production and flaring	100% reduction in flaring	95% reduction in fugitives using CCS
Power	27% emissions mostly from diesel generators	Universal access to electricity. Replace diesel generators with 6.3 GW off-grid and 42GW on grid capacity	250GW of PV and 112GWh of storage to reduce oil and gas to baseload power only
Transport	24% emissions	10% biofuel blends	100% Evs (Electric Vehicles)
Industry	16% emissions mostly from making cement, ammonia and industrial heat	20% clinker substitute in cement production 33% hydrogen in ammonia production	50% clinker for cement 100% hydrogen for ammonia Heating: Low temp: 100% electricity High temp: 100% hydrogen

Implications of Energy Transition on Undeveloped Oil and Gas Assets In Nigeria

Energy transition in Nigeria cannot be effortlessly attained, since her economy is greatly reliant on crude oil marketing and the cost of implementing her Energy Transition Plan is in trillions of US dollars. The effects of energy transition on undeveloped oil and gas assets in Nigeria are of grievous consequences and are intertwined with her economy.

- It is generally known that gas is a transition commodity from fossil fuel energy to renewable energy. Nigeria is known for her rich gas reserve (currently at 206.53 trillion cubic feet, according to Nigerian Upstream Petroleum Regulatory Commission-NUPRC), yet it's potential is under tapped even with the current transition phase.

- The implications of energy transition on undeveloped oil and gas assets in Nigeria is evident in the loss and devalue of untapped hydrocarbon reserves.

- Transiting to renewables without developing hydrocarbon reserves will handicap and abandon oil and gas assets such as pipelines, refineries, oil farms, tankers and other vessels, rendering them insignificant as need for exploration and exploitation becomes unnecessary as a result of low demand and consumption of fossil fuel.

- The intertwin of Nigeria's economy and global fossil fuel price implies that energy transition will not only devalue and cause loss of assets, it will affect its economy.

RECOMMENDATION AND CONCLUSION

Recommendation

- Energy transition is a current global trend and Nigeria is not left out of it. A prudent response to the global call for change in use of fossil fuel is to make haste slowly, imbibing a mix energy system amidst other measures such as;

- Explore and develop reserves to its full potentials under the existing technology to prevent loss of revenue.
- Implementation of the Petroleum Industrial Act (PIA) and fiscal policies to encourage foreign investment in the Nigeria oil and gas sector.
- Reopening of closed gas wells and harnessing the full potentials of gas reserves which will cater for the transition phase.
- Rehabilitation of the Nigerian refineries and depots to support local processing of crude oil that will promote export of both crude oil and its products, thereby improving the value of oil and gas industry.
- Fund robust revolutionary exploration and exploitation of solid mineral reserves (metals such as Aluminum, Chromium, Cobalt, Copper, Lithium) that are essential for energy transition.
- Adequate waste management (CCUS) and regulation of exploration and exploitation processes of hydrocarbon, down to consumption of fossil fuel products will help mitigate its environmental impacts.

CONCLUSION

Energy transition is a global trend which seeks to accomplish sustainable development goal seven, driven by a clamor to rescue the human environment from climate change and global warming at the same time providing sustainable and cleaner energy supply to the ever-increasing demand of energy as a result of increase in human population. Global energy system is a mix of both fossil fuel and renewables, where fossil fuel dominates the energy mix and accounts for about 50% of the energy mix in many advanced and developing countries of the world, and its relevance is evident in our daily consumables. The laid down polices and incentives in response to the energy transition are commendable, but will have great financial implications. Developing gas reserves within Nigeria, alongside other fossil fuel assets together with the implementation of the PIA and necessary fiscal policies will not only support and cater for the transition to renewable energy and installation of renewable plants, it will allow for the maximization to full potential of the undeveloped oil and gas assets in Nigeria.

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