

Floating Gas to Power (FGTP) Plants: Proposed Policy Framework for Nigeria

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ABSTRACT: Floating Gas to Power (FGTP) has been identified as a frontier concept for stranded gas field development. Instead of exporting gas onshore, the gas is used offshore for generating electricity as an end product. Offshore to Onshore electric power transmission is usually by marine or subsea cabling. The electricity is eventually distributed into a large utility power grid. Recent literature has showed the potential economic viability of the FGTP option in the Offshore Nigeria space, whilst demonstrating that FGTP viability will be strongly impacted by levers controlled by Nigerian government policy. The main objective of this paper was to broadly identify, evaluate and recommend the necessary government policy directions which would allow FGTP projects to contribute to macroeconomic growth through valorization of hitherto stranded gas resources offshore Nigeria. The paper examined the Nigerian Gas Master Plan, the Power Master plan and the Petroleum Investment Bill (PIB), amongst other extant government policies and regulations to clarify the extent to which the policies and frameworks may have to be amended in order to accommodate the FGTP within the range of gas monetization options recognized in the Nigerian gas and Power policy space. The study surmises that the implementation of FGTP as an economically viable investment option offshore Nigeria would necessitate deliberate legislation, as well as economic ring fencing with a sufficiently strong legal and policy framework. Such measures would support the growth of the nascent gas monetization option as well as strengthen foreign investor confidence in the longevity of policy formulations pertaining to FGTP offshore Nigeria. Regarding the power industry element: It was also found that the sustainable offtake of FGTP generated electricity strongly depends on the formation and implementation of National Power policies will allow a robust and modern national power grid to function, and allow for efficient and effective recovery of investor's funds. Finally, this work highlights the attractiveness of the FGTP option in the Offshore Nigeria space: it could prove an economical and environmentally friendly option for simultaneously solving the energy generation and monetization of stranded gas reserves challenges. If properly harnessed, it could potentially generate huge revenue for the government, resolve the epileptic power supply problem in Nigeria and create numerous employment opportunities.

KEYWORDS - Gas to Power, Electricity, FGTP, Nigeria, Offshore, Policy

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I. INTRODUCTION

In recent years, gas has seen a massive rise in Nigerian domestic consumption, given the country's large growing middle-class population and significant gas reserves. Also, the country is steadily moving away from oil and exploring ways of replacing gas in energy and transport with petroleum consumption. The gas transformation is also supported by the fact that large oil reserves are in decline. The Oil industry in Nigeria is estimated to witness a production decline of approximately 7.93% during the forecast period of 2018 – 2025 [1]. Furthermore, gas production has become an important focus of the oil & gas companies who have responded with heavy investment in gas-to-power projects in the region, [2].

Almost two-thirds of the Nigerian population do not have access to electricity. It was estimated that Nigeria needs about 13GW of electricity daily in 2013 [1]. However, the current installed capacity is only about 50% of that. When one takes into consideration the transmission and distribution efficiency, this capacity falls to about 35%. A significant amount of Nigeria's gas reserves has been slated for onshore gas to power projects, but no plans or policy have been established for offshore stranded gas which is defined as gas accumulations that are uneconomic due to size or distance from market. The volumes of stranded gas offshore Nigeria are in the region of 8Tcf. [2]. Floating Gas to Power (FGTP) has been identified as a frontier concept for stranded gas field development. Instead of converting dry gas to LNG (FLNG Concept), the gas is used offshore for

generating electricity as an end product. Offshore to Onshore electric power transmission is usually by marine or subsea cabling. The electricity is eventually distributed into a large utility power grid.

In the following sections, we will be broadly identifying, evaluating, and recommending the necessary government policy directions, which would allow FGTP projects to contribute to macroeconomic growth through the valorization of hitherto stranded gas resources offshore Nigeria.

II. MATERIALS AND METHODS

2.1 Approach

The FGTP gas monetization option was evaluated analytically. The impact of FGTP implementation was considered vis-a-vis the current provisions of the Nigerian Gas Master Plan, the Power Master plan and the Petroleum Investment Bill (PIB), amongst other extant government policies and regulations. The paper sought to examine these policies to clarify the extent to which policy frameworks may have to be amended in order to accommodate the FGTP as an economically viable option within the range of gas monetization options recognized in the Nigerian gas and Power policy space.

2.2 Data Sources

2.1.1 Petroleum Policy

Petroleum policy forms the basis for the exploitation of a country's petroleum resources. It should point the way, and how quickly, the nation wishes to exploit resources, build resource knowledge, and manage the sector [3]. In this section, we would be going through some of the policies that the Nigerian government has put in place over the years and their economic implications.

2.1.1.1 Existing Petroleum Policies

2.1.1.1.1 The Oil Pipelines Act 1956

The Oil Pipelines Act 1956 governs the processes of licensing of gas pipelines for construction, operation, and maintenance. This means that the Act regulates the transportation of gas through pipelines from one location to another. It also provides rules for the operations of the gas pipeline from construction to transport, maintenance, and gas delivery to the consumer at the end of the pipeline. As such, the Act governs several aspects of the Domestic Gas Supply Obligation (DGSO), especially the transport of natural gas to power plants through gas pipelines. However, there was no significant separate Gas policy.

2.1.1.1.2 Petroleum Act of 1969

The Petroleum Act of 1969 can be considered as Nigeria's primary oil industry statute defining 'Petroleum' as comprising natural gas. The Act is necessary and basic as it explicitly outlines the modalities for regulating petroleum activities such as exploration, prospecting, and mining of petroleum, including natural gas [4]. For example, interested industry operators, as the case may be, make an application for an Oil Exploration License, Oil Prospecting License, and Oil Mining Lease to the Minister of Petroleum Resources who is empowered to grant it upon satisfaction of the requirements under the Act.

2.1.1.1.3 The Petroleum (Drilling and Production) Regulations 1969

The Petroleum Drilling and Production Regulations are subsidiary laws drawn up under the Petroleum Act and further regulate in detail the exploration of natural gas and manufacturing operations [5]. In the Regulation, for instance, a prospecting licensee shall, within five days of commencement of production, submit to ministry its feasibility study, program or proposal for the use of associated or non-associated gas. This requirement was one of the first regulations focusing on the management and use of natural gas in the country, as it recognized and attempted to focus on the prospects for natural gas utilization, for example in power production and the petrochemical sectors.

2.1.1.1.4 The 1999 Constitution

The constitution of Nigeria ensures ownership and control of natural oil and Gas in Nigeria's Federal Government. This provision implies rights of ownership and control is within federal jurisdiction alone. The FGN had to, therefore, make different laws for the control and control of the oil industry. However, the constitution vested so much power of control into the Federal Government such that there was no meaningful involvement in the industry at lower levels of government. There was also no clear growth pathway for the gas industry as gas was still treated as an addendum to Oil [6].

2.1.1.1.5 Petroleum Industry Bill (PIB), 2008

The Petroleum Industry Bill has been proposed to regulate Nigeria's entire oil industry. However, there were a series of amendments and the latest versions of 2012 are still under discussion. The first draft of the PIB

was submitted to the Nigerian National Assembly in 2008 with the natural gas market categorized as different from the oil market, the PIB has specialized in natural gas regulation. The PIB's goals for the natural gas sector and in particular DGSO include, among others, establishing a favorable petroleum business environment; optimizing the supply of household gas; setting up a progressive fiscal framework for investors; establishing commercially based oil and gas companies; deregulating and liberalizing downstream, and creating efficient or effective regulatory bodies. [7][8][9]

2.2.1 Gas Policy

A gas policy should articulate the government's vision and establish goals, strategies, and a plan of implementation to establish an appropriate institutional, legal, regulatory and commercial gas sector framework to remove the obstacles to investment and sector development for the utilization of natural gas in a country [10]. Until recently, gas was not treated as a separate commodity from oil. In this section, we would be going through some of the gas policies that the Nigerian government have put in place in recent years and their economic implications

2.2.1.1 Existing Gas Policies

2.2.1.1.1 National Gas Master Plan (NGMP), 2008

NGMP is an effective Nigerian natural gas resource monetization, development, and utilization, addressing infrastructure, costs, and supply issues. The Federal Government of Nigeria (FGN) has drawn up this strategy in 2008. The main objective of the project was to make it a major player in the export market and to ensure energy security for Nigeria by creating a fully liberalized market in the shortest possible time. The aim was thus to achieve this goal by having a strong, scalable, and fully connected gas infrastructure supporting the domestic, regional, and global markets. The goal of NGMP to guarantee Nigeria's long-term gas safety through the managed use of resources led to the need to sustain a portfolio of strategic gasses with available and affordable delivery in a manner that ensures sustainable development. The NGMP is therefore considered a guide for the successful commercial exploitation and management of the gas sector in Nigeria. Three major components were incorporated in the NGMP to achieve the defined NGMP objectives: The Domestic Gas Supply Obligation, the Gas Pricing Framework and the Gas Infrastructure Blueprint. [9] [11] [12].

2.2.1.1.2 Petroleum Industry Bill, 2008

The indications that the PIB is expected to improve the optimization of gas supply for power generation and industrial development in the country when adopted in law are clearly stated by the stated objectives. Therefore, the specific sections of the draft law are intended to determine, monitor, and direct the activities of the gas industry to achieve the targets set. Under the PIB, the Upstream Petroleum Inspectorate (UPI) allocates the DGSO to gas producers according to an estimated need for the derived domestic gas market due to volumes of gas production and proven gas reserves and failures to meet DGSO, the licenses of gas producers may be suspended or revoked. [7] [8] [9]

2.2.1.1.3 National Gas Policy (NGP), 2017.

The NGP was designed in 2017 as a robust policy guide document that builds on the policy goals of the Federal Government for the gas sector as presented in the 7 Big Wins initiative. The main elements of the 2017 national gas policy are:

1. Governance (laws and rules of procedure)
 - a. The unique independent regulatory body for petroleum;
 - b. Stress on compliance with petroleum safety;
 - c. Complete legal upstream separation from the midstream;
 - d. The full legal separation between ownership of gas infrastructure and gas trading operations;
 - e. Introduction of the appropriate code for the gas network;
 - f. Prices
 - g. A fiscal framework that recognizes gas as a stand-alone commodity and industry separate from oil.
2. Structure of the industry:
 - a. Joint participation between government and the private sector, with a clear separation of roles;
 - b. Restructuring NGC into separate marketing companies for transportation and gas;
 - c. Strategic partnerships, with the NGPTC, to support operations;
 - d. Greater participation in international marketing of government-owned equity gas;
 - e. The movement to competition in the wholesale market;
 - f. Domestic gas supply obligations implementation;
 - g. The gas aggregation policy review as well as the role of the Nigerian Gas Aggregation Company.

3. Gas Resources Development
 - a. Enable an environment that promotes gas-specific exploration;
 - b. Promote the exploration and development of new inland and offshore gas supply sources;
 - c. Development of portfolio management methodologies to prioritize the development of low-cost gas;
 - d. Clarify PSC gas conditions;
 - e. Achieve gas flare-out using mature flare reduction technologies in projects for gas use;
 - f. Prepare a plan for managing gas resources.
4. Infrastructure
 - a. Identify the key gas infrastructure and carry out it;
 - b. Liberalize access to gas transmission and processing infrastructure in offshore and onshore areas.
5. Gas Markets for Construction
 - a. Continue exports of gas in line with the development of national gas markets;
 - b. Identify and encourage development projects on the domestic gas market;
 - c. Gaining greater value from downstream international LNG markets;
 - d. To follow an approach to projects and market opportunities instead of a central national model;
 - e. Identify and develop clusters for gas-based industrialization, infrastructure, and gas;
 - f. Develop and implement a program for gas for development to promote gas for smaller projects;
 - g. Ensure fast LPG market growth, including an evaluation of NPMC's effectiveness as a market leader
6. National Human Resources Development
 - a. Developing and implementing Nigerian content legislation;
 - b. Capacity building for institutions;
 - c. Present a culture of maintenance and safety.
7. Action Plan and Roadmap
 - a. Short-term action plan (months)
 - b. Medium-term (1-2 years) implementation plan
 - c. Long-term (over two years) Implementation plan

2.3.1 Power Policy

Power policy is the way a given government has agreed to tackle energy creation issues like energy production, distribution, and consumption. Power policy attributes may include legislation, international treaties, investment incentives, energy conservation guidelines, taxation, and other public policy techniques [13]. Some recent power policies of the FGN will be discussed below.

2.3.1.1 Existing Power Policies

2.3.1.1.1 The National Electric Power Policy 2001 (NEPP)

In 2001, the NEPP outlined some key objectives: (1) to ensure efficient, safe, affordable and cost-reflective generation, transmission, distribution and marketing throughout the country. (2) to ensure that private investment in the energy sector comes from Nigeria and the other countries. (3) to develop a transparent and efficient regulatory framework for the electricity industry.

The Federal Government of Nigeria (FGN) has to some extent been able to achieve some of the goals of the NEPP, as the Electric Power Sector Reform Act of 2005 (EPSR Act) implements the proposals and is now the platform of the Nigerian power sector operations legal and regulatory environment.[14] If these objectives can be achieved, it will help facilitate investments in FGTP as a gas monetization option as there will be developed power markets and infrastructure for the projects to leverage on.

2.3.1.1.2 The Energy Policy of Nigeria 2003

In 2003, FGN accepted that a strong energy policy affecting various energy resources and utilities, particularly the oil and gas industry, played an important role in the economy of the country. The Nigerian energy policy always makes it the country's task to make steady and reliable electricity available to the country, at the economic rate, for its economic, industrial, and social activities. The policies and objectives outlined in the strategy: (1) the rehabilitation of existing power stations to obtain optimal power from the installed power; (2) Complete ongoing projects designed to meet national demand by the National Electric Power Authority (NEPA); (3) strengthening the transmission and delivery networks necessary to enhance consumer demand.

The FGN has, of course, made visible efforts regarding the policies, goals, and strategies outlined above. These initiatives include liberalizing electricity, the implementation of the EPSR Law in 2005, the establishment, if not within record time, of an independent regulatory authority, Nigerian Electricity Regulatory Committee (NERC), and the implementation of further power projects [15]. However, despite these, before the set goals can be achieved, there seems still a long way to go especially as it will relate to FGTP. These efforts must be continued as well as efforts to provide a legal framework that will provide businesspeople with adequate incentives to secure adequate returns on investment in the energy sector. This will help to generate stations to achieve higher productivity. [16].

2.3.1.1.3 The Electric Power Sector Reform Act 2005

The Electricity Sector Reform Act (EPSR) 2005 seeks the establishment of the NERC as the new electricity generation, transmission, and distribution agency for several legal entities (corporations) to take over the assets and liabilities of the old regulation agencies. The EPSR Act is also to provide companies that take over the national Electricity Power Authority's functions, assets, liabilities, and employees; develop competitive markets in electricity, establish the Nigeria Electricity Regulatory Commission and regulate electricity generation, transmission, delivery, and supply and enforce matters such as performance standards. [17] [18] [19]

2.3.1.1.4 Roadmap for the Power Sector Reform, 2010 (Revised in 2013)

The Roadmap for the Reform of the power sector was issued by the FGN in August 2010, indicating that it aimed to speed up the reforms of the power sector by removing barriers to investing in the private sector, clarifying the strategy of the Government to remove successor companies from the PHCN and to reform the gas-to-power sector. The roadmap is a set of policy plans to provide a more reliable electricity sector that guarantees stable electricity supplies to households and businesses in Nigeria. In essence, the Roadmap does not introduce new policies but establishes strategies to speed up action to reach the aim of the NEPP as set out in the EPSR Act and the primary aim is to create a private power supply industry [20].

The roadmap has shown that significant gas industry reforms are expected to have a direct and positive impact on the energy sector, particularly in reforming fuel-to-power issues. This shows in large part the importance of the efficient operation of the gas industry because it has a significant effect on the electricity sector. To achieve the aim, the DGSO must be nurtured as one of the policies that were formulated to enhance domestic gas growth. The roadmap has prioritized the potential of natural gas to make the most of Nigeria's energy generation and supply scheme. As such, there are deliberate efforts to encourage investors to make full use of the resources. The robust roadmap attempted to address the problems of fuel-to-power, generation, transmission, and distribution in the electricity sector, to ensure optimal productivity for all electricity channels. [21].

2.3.1.1.5 Presidential Power Initiative, 2020

The Power Initiative (PPI) is an upgrade and modernization program on power infrastructure agreed with the German Government in Nigeria and Siemens AG. Under the PPI, the Federal Government will invest in infrastructure upgrades, in distribution substations, transformers, protection devices, smart meters, transmission lines, etc., on behalf of other Electricity Distribution Companies shareholders. The PPI funding will be secured utilizing German Euler Hermes, which will be provided to other shareholders in Discos as convertible loan in concessions (up to 3-year moratorium and a 12-year repayment at concessional rates). President Buhari has approved funding releases to start the pre-engineering and financing concession workstreams for the first part of Phase 1 of the PPI. The PPI hopes to:

- a. Enhances national energy supply, leading to job creation, investor confidence, costs, and ease of business and economic growth.
- b. Provides thousands of young Nigerians with training and capacity building
- c. Will give Nigerian engineering companies an economic opportunity, which will serve as local suppliers for manpower and equipment.
- d. Will stimulate/encourage additional energy sector investment inflows.

The PPI's ultimate objective is to upgrade the power supply from approximately 5 GW to 25 GW in Nigeria over three phases. [22].

III. RESULTS AND DISCUSSION

3.1 Economic Implications of existing Petroleum, Gas and Power Policies

3.1.1 Economic implication of existing petroleum policies

The oil policies in Nigeria until date have reflected the fundamental goals of Nigeria's membership in the Organization of Petroleum Exporting Countries (OPEC). Some of OPEC's main goals are: (1) The coordination, unification, and definition of the best means of safeguarding individually and collectively

the petroleum policies of the member states; (2) To devise ways and means to stabilize international petroleum prices to remove harmful and unnecessary fluctuations; (3) Ensure steady oil income and efficient, economic and regular supplies of oil to the oil-producing countries. [23].

Based on the various policies developed in the past, the petroleum industry has been designed to have a substantial impact on the country. Both foreign reserves and government revenues have been enormously supported by the petroleum industry. The government share of crude oil income was reported to have been approximately 70% of its revenue from the crude oil transactions as a result of different Joint Ventures agreements with international petroleum producers [9]. Other notable production-related petroleum policies of the Federal Government have also had economic implications including the introduction of non-price incentives to prospective oil explorers and granting of Investment tax credits.

Under these incentives, the costs of unsuccessful wells were tax-deductible to encourage further exploration drilling [24]. Tangible costs of items for successful exploration wells were capitalized. All exploration drilling costs were to be expensed or tax-deductible. Also, the accounting period in which the asset has first been used, the companies obtaining any asset used for petroleum projects had investment tax credits on such assets. This has undoubtedly promoted investments into the upstream sector. The Government of Nigeria has established certain consumer-related policies, including fuel subsidies, in addition to the production-related oil policies. The policy objective here is to encourage private domestic petroleum consumption [24][8]. To ensure uninterrupted distribution of such goods and an efficient transport network, this policy requires that the Federal Government pays a certain portion of the marginal costs of production of the petroleum products. It recognizes that the transport system has an important distributive role in a developing economy. Lower unit costs for oil products improved the movement of persons and products, thereby encouraging economic activities.

3.1.2 Economic implication of existing gas policies

A revised gas-based policy was expected to increase the foreign exchange revenues of Nigeria, which currently mainly depends on crude oil exports. Similarly, it was expected to dramatically reduce the incessant epileptic power supply that is mainly due to a decrease in gas supplies for power generators. This ensures that electricity is at least constant and encourages Generating companies to generate more power for the grid leading to economic growth. However, none of the gas policies designed so far as managed to achieve these goals due to its mixture of poor implementation and weak execution strategy. The gas policies were also expected to improve investments in fertilizers, gas-based transport, LPG adoption as cooking fuel. If the implementation can be worked upon, these goals can still be achieved causing an economic boom in transportation, agriculture among others [25]

3.1.3 Economic implication of existing power policies

The ability of a country to conduct economic development is a key indicator of energy policy performance. Economic development is strongly linked to electricity access, which in turn is dictated by national energy policy, particularly for developing countries such as Nigeria. Research such as the one-way causality. [26] has shown that the consumption of energy and economic growth in Nigeria has been unilaterally caused by the energy resources available and by the power generation capacity (supply). In Nigeria, the government owns and operates the energy infrastructure. As a result, market forces have not dictated energy price – which is a key part of fiscal incentives to encourage private sector participation [27]. The following national energy price regulators have been set up in Nigeria to encourage private-sector involvement and direct the nation towards the economic pricing of electricity and fuel in Nigeria; The NERC and the Prices and Regulatory Agency for Petroleum Products (PPRA). Nigerian energy policy currently seeks to exploit its energy resources further, privately financed from the domestic and international sectors [26].

One of the reasons why the power sector has not served the Nigerians for the last three decades was the absence of a cost-reflective tariff. S.76, EPSR Act, 2005 mandates the fully efficient recovery of costs. The NERC has also drafted the Multi-Year Tariff Order (MYTO), a multi-year tariff system providing consumer rights to sound electric services, transparent billing, and a reasonable return on investment. With the current fiscal policies in place, rapid improvements of the power sector are unlikely, thereby stunting economic growth [9][14]. For any meaningful growth to be achieved, the government should completely deregulate the sector from the generation to the distribution end.

3.2 Proposed Policy Framework for FGTP Projects

3.1.1 Petroleum Policy Adjustments

The nation has relied heavily on petroleum revenues to provide a budget allocation for 90% of foreign exchange income, 80% of government revenue, and 60% of government fiscal receipts despite its small contribution to GDP. The result is an unbalanced economy. The PIGB is seen as a paradigm shift from the

reliance on petroleum revenue to the hydrocarbon as an input to drive the Nigerian economy, despite perhaps its imperfection [29]. The existing proposition in the bill when it finally passed, will allow for the following:

- A transition to creating value rather than depending on sales of oil and gas for collecting revenue.
- Set up governance and institutional structures with clearly defined roles for efficient sector management.
- Single point collection/management authority and economic populism avoidance.
- Improving the role of the market system in economic efficiency creation in the sector.
- Diversification of revenue and resources for sustainable economic growth.
- Removal of the discretionary award of natural assets that have been an obstacle to access to the domestic oil and gas sector for years.
- Strategic investment in refineries for the increased national and non-continued importation of petroleum products, as it is prone to price volatility, exacerbated by geopolitical problems, in international commodity markets.
- End price control and subsidies in the petroleum and gas industry as these lead to the distortion of market effects.
- Minimize the bureaucracy footprint causing the increased cost of Nigeria's gas and oil production.

This appropriate mix of monetary policies and market-based solutions should underpin all efforts to deliver the country in the new era of energy, improve the business environment, and enhance investor confidence [25]. Thus, for FGTP to be an economically viable option within the range of gas monetization options recognized in the Nigerian gas and Power policy space, very little changes need to be made to the latest Petroleum Industry Bill as it has provided plenty of room for FGTP to be a viable gas monetization strategy.

3.1.2 Gas Policy Adjustments

The National Gas Policy of 2017, which is the latest proposed policy for gas utilization shows plenty of promise for the effective monetization of gas using the FGTP option. However, some specific policy adjustments to the gas policy are needed. Some of them include:

1. Consideration of Condensate/NGL swap for Electricity for Project financing

In lieu of scarce foreign exchange holdings for the FGTP projects, Innovative financing involving the 100% swap of recovered NGL and condensates value as repayment to the investors, in exchange for the generated electricity which will be transported into the national grid. Economic studies should be performed on to confirm the viability of this innovative project financing proposition.

2. Investment in Enhanced infrastructure for gas and power

For power to be available to all Nigerians; accessible, and affordable, a goal in conjunction with energy security will be the construction and upgrade of massive gas and power infrastructure. Even if generation increases exponentially, the downstream effect to the final consumer may not be noticed due to gross inefficiencies in the transmission and distribution chain. Therefore, for FGTP to be viable, there must be specific policies on infrastructure that will be required to move the generated electricity from the FGTP platforms to the final consumer.

3. Stability and security of investment

Having referred to the need to expand the infrastructure base of the Nigerian gas and power sectors, it is also clear that huge foreign investment inflows are needed to satisfy these requirements. As the development of FGTP is very capital-intensive, potential investors will need certainty in business returns. It is essential to correct electricity tariffs to ensure guaranteed investment, and this will simply reflect costs. Without this guarantee of investment, investors will be reluctant to invest in the earmarked FGTP projects.

3.1.3 Power Policy Adjustments

The latest Power policies have to some extent defined very strategic goals that will be of significant benefits to FGTP implementation. However, the ongoing shale gas development boom which is causing a fall in gas and LNG prices alongside the sharply increasing trend of adoption of electric cars means that Nigeria needs to pivot its power policy rapidly towards the quick adoption of FGTP to bridge the power deficit and ensure that the electricity deficit doesn't grow even further. Some of the needed policy adjustments include:

1. Attract energy sector investment

- Perform an inventory of power assets and auditing to identify priority value chain investment needs as well as replacement or repair financing.
- Resolve long-term government liabilities in the electricity industry and create fiscal rules for future debt payments.
- Increase capital allocations, including an assessment of its budget performance, for the Transmission Company of Nigeria (TCN).

2. Solve gas-to-electric value chain barriers
 - Launch a federal coordination mechanism for the provision, production, transmission, and distribution of gas.
 - Implement current payment default penalties throughout the value chain.
3. Integration of renewable energy
 - Complete construction of the 14 solar plants planned.
 - To facilitate the integration of intermittent sources, investment in new grid infrastructure.
 - Integrate mini grids in Disco networks to provide electricity to underserved areas.
4. Improve revenue recovery for Disco viability
 - The Multi-Year Tariff Order and Financing Plans of Gencos, TCN, and Discos are synchronized to the tariff schedule.
 - Use data analysis to assign available power more effectively.
 - To ensure the accurate calculation of electricity delivery costs and tariff adjustments, conduct an independent evaluation of the power industry value chain.
5. Understand the request to prioritize
 - Study customer profile energy demand and the stranded load refusal capacity to ensure data-driven design and reduction of technical, trade, and collect losses.
6. Others
 - Ensure the deployment and capacity of all planned / possible power plants.
 - Revision of the grid increase and reduce inefficiencies/losses and failures.
 - Set a locational master plan for expansion of capacities that will produce power from remote areas using a predominant source of renewable energy.
 - To encourage operators in these (remote, off-grid) areas, a location-specific price regime should be adopted.
 - Presentation of distribution companies' demand-side utility management.
 - Security agencies should curb electricity supply vandalization.

3.1.4 Synergy Between Petroleum, Power and Gas Policies

To comply with the power reform plans, the FGN is also encouraged to stimulate synergized private sector investment in the petroleum, gas and power/energy sectors of the economy, these synergized policies should include measures to make sure:

1. The challenges of infrastructure are dealt with.
2. Consumer entry costs are minimized.
3. Encourage additional players from industries like transportation, agriculture, manufacturing, and so on to enter the market.
4. Free unregulated prices are maintained, and price guaranteed.
5. Improved fiscal environment to ensure that domestic producers can compete favorably.

3.3 Impacts of Proposed FGTP Policy Framework

3.3.1 Macro and Micro Economic Impact

Several researchers have studied extensively the impact on petroleum price shocks on an economy on both the macro and micro levels. Generally, it has been noted that countries with petroleum policies set with a significant level of economic reliance and governmental interference on Oil like Nigeria suffer huge economic consequences at the micro and macro level due to pro-cyclical nature of oil prices. [30][31][32][33]. The proposed adjustments in policies will ensure that the gas industry is more market-driven, reduce the reliance of the economy on Oil prices, improve the micro-economies of companies in sectors like Agriculture, Manufacturing, etc. that expected to be the biggest gainers from the proposed adjustments. In summary, an improvement in the microeconomics of industries like power, agriculture, transportation, manufacturing, and so on causing positive ripple effects to the country's economy on a macro level is expected.

3.3.2 Fiscal and Monetary Policy Impact

The biggest impact the proposed policies adjustments will have on the country's fiscal and monetary policy is the reduction in the level of government spending and actions needed to keep the economy growing as this growth stimulus will be provided organically by the ripple effects of an expanding power sector driven by FGTP as a gas utilization option. With the proposed policy adjustments implemented, this will be a reality.

3.3.3 Foreign Policy Impact

Historically, Petroleum has been used as an instrument of coercion in foreign policies using embargoes and import restrictions for political reasons or to promote or promote a country's interest [34]. While

Nigeria has rarely been on the receiving ends of such coercion due to our relatively good standing among the rest of the world, the proposed FGTP Policy Framework could make us take advantage of Gas to Power as an offensive instrument of coercion, especially on the regional and continental stage. While instrument of coercion is usually offensive tools, FGTP can act as a deterrent on the regional and continental level as successful FGTP projects on the national level will further expand the gas markets both nationally and internationally, ensuring that Nigeria can pull much more weight in the international domain, especially in the West African region.

3.3.4 Defense Policy Impact

Research has shown that there is a positive correlation between economic strength and defense spending of a nation [35][34]. Currently, the Nigerian Defense Policy objectives were formulated and subjoined to the foreign policy as follows;

- Establishing credible armed forces.
- Development of a strong industrial base.
- Formulating strategic contingency plans.
- Effective intelligence network.
- A functional national reserve/mobilization scheme and
- Formulation of a collective security system.

The proposed FGTP policy framework, if enacted as recommended, will ensure that Nigeria experiences an economic boom which will undoubtedly have a long-lasting positive effect on our defense policy.

IV. CONCLUSION

The study found that the implementation of FGTP as an economically viable investment option offshore Nigeria would necessitate deliberate legislation, as well as economic ring fencing with a sufficiently strong legal framework. These measures would support the growth of FGTP as a nascent gas monetization option as well as strengthen foreign investor confidence in the longevity of policy formulations regarding FGTP offshore Nigeria. Regarding the power industry element: It was surmised that the sustainable offtake of FGTP generated electricity strongly depends on the formation and implementation of National Power policies will allow a robust and modern national power grid to function and allow for efficient and effective recovery of investor's funds. Implementing an FGTP friendly policy as outlined in this work thus allows Nigeria needs to repivot its policy rapidly towards rapidly closing its electricity deficit. In addition, the paper proposes that in lieu of scarce foreign exchange holdings for the FGTP projects, Innovative financing involving the 100% swap of recovered NGL and condensates value as repayment to the investors, in exchange for the generated electricity which will be transported into the national grid. Finally, this work highlights the attractiveness of the FGTP option in the Offshore Nigeria space: it could prove an economical and environmentally friendly option for energy generation and monetization of stranded gas reserves.

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