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The Legal and Institutional Framework for Renewable Energy Infrastructure Development in Nigeria: Assessing the Challenges and Strategies

Solomon Akhetuamhen Agbonhulu, PhD,[1] & Aniefiok Etuk Andrew Okposin, PhD.[2]

[1]Senior Lecturer, Faculty of Law, University of Benin, Benin City, Nigeria. Corresponding author. Email: solomon.agbonhulu@uniben.edu

[2]Lecturer, Faculty of Law, University of Benin, Benin City, Nigeria. Email: aniefiok.okposin@uniben.edu

Abstract:
A well-established legal and institutional framework is essential for stability, predictability, protection of rights, dispute resolution, international cooperation, favourable business environment, innovation and ultimate economic growth. This paper interrogates various policies, legal regulations and regulatory bodies that constitute the country's legal and institutional infrastructure on renewable energy, including the Energy Commission Act (ECA) Cap E10 LFN 2004, the Petroleum Industry Act 2021, the Electricity Act 2023, National Renewable Energy and Energy Efficiency Policy (NREEEP) 2015, the Federal Ministry of Power (FMP), Energy Commission of Nigeria (ECN), Nigerian Electricity Regulatory Commission (NERC), Rural Electrification Agency (REA) and National Hydroelectric Power Producing Areas Commission (N-HYPPADEC) and so on. The paper uses the doctrinal methodology to assess these legal and institutional frameworks. The study finds that the landscape is challenged by overlapping institutional and regulatory regimes and inadequate sectoral budgetary allocations. As a way of redress, the paper recommends among other things, the establishment of effective and efficient policy frameworks, an independent and specific legislative framework, reduction of the number of regulatory bodies, adequate budget allocation and specialized banks.

Keywords: Legal and institutional framework, infrastructure, renewable energy, development.

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1. INTRODUCTION

Renewable energy is a clean, accessible, reliable, and relatively affordable energy resource currently being used globally for sustainable development. The energy resource unlike fossil fuel is natural, self-replenishing and has low or zero carbon foot print (Okposin, 2019). Renewable energy average percentage to the world global energy mix has grown from 29% in 2020, to about 45% in 2022 (Fernandez, 2023). Paraguay is currently generating 100% of its electricity from renewable energy resource (IRENA, 2023), while China contributes 31% of the global 45% renewable electricity (World Data 2023).

The bedrock for the development of renewable energy is a well-structured legal and institutional framework. Legal and institutional frameworks are essential for stability, predictability, protection of rights, dispute resolution, international cooperation, favourable business environment, innovation and ultimately, economic growth (North, 1990). A robust legal and institutional framework encourages investments, economic growth; promotes sustainable development and environmental protection as well as government accountability and transparency (United Nations, 2015). The countries that have shown giant strides in the development of renewable energy have this bedrock in place. In Paraguay, for example, the major institutional infrastructure for renewable energy development is the Administracio'n Nacional de Electicidad (ANDE). ANDE supplies electricity to more than 99% of the population in addition to supporting economic development. ANDE is being assisted by the local industries that produce ethanol and biodiesel to about 7% of road transport users.

Paraguay's second institutional infrastructure is the Vice-Ministry of Mines and Energy of the Ministry of Public Works and Communications (VMME-MOPC). VMME-MOPC implements the country's energy policy and follows up on the Renewable Readiness Assessment (RRA). VMME-MOPC reports help in making necessary adjustment and promotion of the optimal exploitation of Paraguay's endowed renewable resources. The reports also help to incorporate renewable technologies into the energy system in the most efficient way (Durksen, 2021). Paraguay's legal framework includes the Energy Agenda 2019-2030, which focuses on the key pillars for enhancing energy security through the use of renewables, encouraging renewable powered electrification and promoting sustainable mobility. Others are the International Renewable Energy Agency (IRENA), which through its periodic reports, identifies implementation gaps and deploys renewables to cover such gaps. Furthermore, various international climate commitments adopted by the government in its fight against climate change like the Paris Agreement are also included in Paraguay's legal regime.

In China also, this bedrock is in place. Its 2005 Renewable Energy Law, and Renewable Energy Law (Amendments) 2009, serve as the legal framework. The 2005

Renewable Energy Law sets out clearly four mechanisms to promote the growth of renewable energy supply: a national renewable energy target; a mandatory connection and purchase policy; a feed-in tariff system; and a cost sharing mechanism, including a special fund for renewable energy development.

The 2009 (Amendment) law covers gaps in the 2005 law. For example, imposing a duty on the grid companies to purchase a fixed share of their power generation from renewable energy sources and penalizing them if they failed; channeling surcharges from consumers to the Renewable Energy Development Fund, and allowing the central government to perform oversight functions on provincial, municipal and autonomous regions. All of these were absent in the 2005 law. China also has a well-structured institutional framework to coordinate and implement the laws. They include, the National Energy Administration (NEA), Ministry of Science and Technology (MOST) as well as the China National Renewable Energy Centre (CNREC). There is no surprise therefore, that China contributes about 30% of the global renewable energy electricity (Zhang & He, 2013).

Nigeria has significant renewable energy resources both in the Southern and Northern parts of the country that can boost its energy output from its current 5, 105 megawatts of electricity to over 8,000MW in 2024, if the potentials are harnessed into the national grid (Adayi, 2024). Nigeria's electricity capacity mainly from hydro and gas-fired thermal plants is around 12,522MW. The hydro plants provide about 2,062MW; gas-fired plants about 11,972MW, while solar, wind and other sources such as diesel and heavy fuel oil (HFO) constitute the other 2,350MW (USAID, 2021). The country aims to increase the share of the renewable energy in its power mix to 36% (IRENA, 2019). However, this target can be realized only where there is a well-structured legal and institutional framework for renewable energy development.

Nigeria has formulated, enacted and inaugurated the following legal, policy and institutional frameworks for the development of renewable energy: Energy Commission of Nigeria Act (ECNA) Cap. E10 LFN 2004, National Energy Policy (NEP) 2003, National Economic Empowerment Development Strategy (NEEDS), Nigerian Biofuel Policy and Incentives (NBPI) 2007, Captive Energy Generation Regulation (CEGR) 2008, National Renewable Energy and Energy Efficiency Policy (NREEEP) 2015, Petroleum Industry Act 2021 and the Electricity Act, 2023. While the institutional framework infrastructures include, the Energy Commission of Nigeria (ECN), the Federal Ministry of Power (FMP), National Electricity Regulatory Commission (NERC), National Integrated Electricity Policy and Strategic Implementation Plan (INEPSIP), National Power Training Institute of Nigeria (NAPTIN), Nigerian Electricity Bulk Trading PLC (NBET), Independent System Operator (ISO), Standard Organization of Nigeria (SON), National Hydroelectric Power Producing Areas Development Commission (N-HYPPADEC), Rural Electrification

Agency (REA), and Nigerian National Petroleum Company Limited (NNPCL). However, despite the various legal and institutional frameworks, Nigeria's renewable energy contribution to the energy mix of the country as at 2022 was 16.4% of the total electricity capacity in Nigeria (Statista, 2023).

The paper uses the doctrinal methodology to assess the legal and institutional framework on renewable energy. It investigates the challenges in these regimes. Furthermore, it undertakes a brief comparative analysis of the renewable energy structure of some developed countries so as to draw lessons to address the challenges faced by the frameworks in Nigeria. To do this effectively, the paper will be discussed under the following sub-heads: introduction, Renewable Energy: Legal and Institutional Framework Infrastructure in Nigeria, Challenges of the Nigerian Renewable Energy Infrastructure and Strategies for Redress, Recommendations and Conclusion.

2. NIGERIA'S LEGAL, INSTITUTIONAL FRAMEWORKS AND INFRASTRUCTURE FOR RENEWABLE ENERGY

This section discusses the structures, whether legal, institutional or infrastructural, which have been initiated in Nigeria for the development of renewable energy. The analysis highlights the key policies, legal and regulatory frameworks as well as the institutions regulating the renewable energy sub-sector, and their impact towards the development of renewable energy in the country. To make it clearer, the paper classifies them into two: first, the legal framework; and second, the institutional framework.

2.1 LEGAL FRAMEWORK

Nigeria's legal regimes include both policies and laws. Although it is admitted that it may not be possible in this work to treat all the policies and legislative frameworks for renewable energy development in detail, an attempt will be made to cover the essential points in the laws and regulatory policies.

2.1.1 National Energy Policy (NEP) 2003

The National Energy Policy (NEP) is the first comprehensive energy policy in the country. Before this time the government only had separate policy documents for different energy sub-sectors, for example, electricity, oil, gas and solid minerals, without renewable energy (Sesan, 2008 & Okposin, 2019). NEP is the first attempt to recognize renewable energy as a type of energy source in Nigeria (Emodi & Ebele, 2016; Okposin, 2019). The Policy was developed by the Energy Commission of Nigeria (ECN), a body saddled with the coordination of activities within the energy sector. The policy document identifies the viable quantities of renewable energy resources in the country to include

biomass, wind, solar, hydro and hydrogen. The policy mapped out plans for exploitation for the sustainable development of the country. Although NEP heralded a new dawn towards the match to a cleaner and sustainable energy source for the country, it failed to address specifically the means to harness them; their periodic targets towards the overall energy mix of the country or percentage contribution to it. NEP is unlike the Energy Agenda 2019-2030 of Paraguay or the Energy Law 2005 of China, that contained definite periodic targets towards increasing the percentage contribution of renewable energy to the countries' overall energy mix. Despite these short comings, NEP created awareness of the importance of renewable energy towards sustainable energy resource development.

2.1.2 National Economic Empowerment and Development Strategy (NEEDS) 2004

The National Economic Empowerment and Development Strategy (NEEDS) was developed by the National Planning Commission (NPC) in 2004 to alleviate poverty in the country. The objectives of NEEDS include the exploitation of natural resources to satisfy the economic needs of the country; privatization of government infrastructure; and encouraging the increased contribution of renewable energy to the national energy mix (Emordi & Ebele, 2016). The renewable energy agency and technologies were to be funded under the National Power Sector Reform Act 2005 (which was repealed by the Electricity Act 2023).

Regrettably, NEEDS did not focus on renewable energy as a vital energy required to achieve the country's sustainable development in line with global trend and failed to identify renewable energy as a major roadmap to linking the rural communities with sustainable power for their economic activities bearing in mind the cost of grid connection to these areas. Its importance in the renewable energy framework infrastructure of Nigeria is the awareness created on the role of renewable energy, as a vital energy source, particularly in the rural Communities.

2.1.3 Renewable Energy Master Plan (REMP) 2005

The Renewable Energy Master Plan (REMP) defined a practical road-map to a sustainable future of the country by providing plans for the exploitation of the renewable energy resources of Nigeria. The REMP was developed by the Energy Commission of Nigeria (ECN), in collaboration with the United Nations Development Program (UNDP) (Emordi & Ebele, 2016). REMP expresses Nigeria's vision and sets out a roadmap for increasing the role of renewable energy in achieving sustainable development. REMP is anchored on the values, principles and targets contained in the National Economic Empowerment and Development Strategy (NEEDS), National Energy Policy, National Policy on Integrated Rural Development, the Millennium Development Goals (MDGs)

and various international treaties which aim to reduce poverty and reverse global environmental change (Emordi & Ebele, 2016).

REMP also provides strategies for execution, collaboration and funding agencies to assist as well as timelines to accomplish them, divided into, short term (2006-2009), medium term (2010-2015) and long term (2016-2030). REMP was expected to ensure a guided implementation of NEP. However, REMP was not detailed enough to properly articulate the mandates and targets for each of the development periods, and also lacks specific directives on the realization of the targets.

2.1.4 Energy Commission Act (ECA) Cap E10, LFN 2004

The Energy Commission of Nigeria; one of the institutions for the development of renewable energy in the country was established by the Energy Commission Act. The Act provides for energy development, funding, research and preparation of master plans and policies for energy exploitation, utilization, project execution, incentives and recommendations to government (Okposin, 2019). However, rather than focusing on renewable energy development, the ECA makes only a few provisions for renewable energy development with no specific or definite provision on the percentage contribution of renewable energy to the country's energy mix. A proposed amendment to the ECA aimed to introduce significant provisions for renewable energy was not passed by the National Assembly.

2.1.5 Renewable Electricity Policy Guidelines (REPG) 2006

The REPG was developed by the Federal Ministry of Power and Steel in December 2006, to direct government's vision, policies and objectives for promoting renewable energy (Okposin, 2019). The policy drew inspiration from NEEDS 2004 and MDGs 2000, on the importance of electricity services in achieving socio-economic development in the country, and meeting targets outlined both in NEEDS and MDGs. The major reason for adopting REPG was to scale up access to electricity through increased share of renewable electric power in the country's energy mix. However, the REPG suffered the same fate like previous policies introduced by the governments the Government as it lacked definite and specific targets for timelines for the percentage contribution of renewable energy to the overall energy mix of the country.

2.1.6 Nigerian Biofuel Policy and Incentives (NBPI) 2007

The National Biofuel Policy and Incentives (NBPI) 2007 was initiated by the Nigerian National Petroleum Corporation (NNPC). The aim was to develop and promote the domestic ethanol fuel industry through the utilization of agricultural products. Additionally, the NBPI aimed to reduce Nigeria's over-dependence on oil and gas; and to establish a strong link between the downstream petroleum industry and agricultural

activities (Galadima et al., 2011; Okposin, 2019). The NBPI were geared towards the production of biofuels from local feedstock, thereby creating additional tax revenue, provision of jobs, reduction of poverty and boosting development of even rural areas. (Okposin, 2019). NBPI aimed at affording Nigerians accessible, affordable, reliable and clean energy with attendance environmental and economic sustainability. The policy was geared towards the reduction of fossil fuel related GHGs in the transport sector. However, due to lack of appropriate legal framework to anchor it, it failed.

2.1.7 Captive Energy Generation Regulation (CEGR) 2008

The CEGR is a policy issued by the Nigerian Electricity Regulatory Commission (NERC) pursuant to the repealed Electric Power Sector Reform Act (EPSPR) 2005. The EPSPR has been replaced by the recently enacted Electricity Act 2023. Accordingly, it will be more appropriate to discuss captive energy generation under the Electricity Act 2023. Under the Electricity Act 2023, the NERC is now the body empowered to initiate policies on small scale energy generation for both private and commercial purposes. The paper will elaborate on this when discussing the 2023 Act and the specific functions of the NERC.

2.1.8 National Renewable Energy and Energy Efficiency Policy (NREEEP) 2015

The NREEEP Policy was approved by the Nigerian Federal Executive Council (FEC) in April 2015 (Okposin, 2019). It is the first comprehensive national policy on renewable energy and energy Efficiency in Nigeria. The Policy was initiated by the Federal Ministry of Power (FMP) in 2014 but approved in 2015 (Emordi & Ebele, 2016). The Policy makes provision for renewable energy development including supply, utilization, pricing, financing, standards, energy efficiency, conservation, research, training, gender and environmental issues as well as planning and policy implementation (NREEEP, 2015). The Policy sets targets of percentage contribution of some renewable energy sources to the energy mix of the country: hydropower-10% and solar 3% by 2020. However, there was no target set for biomass and wind resources. Yet, even the targets set for hydropower and solar resources were not realized (World Energy Outlook, 2020).

NREEEP provides for incentive regimes to boost renewable energy development. However, the provisions do not only appear vague but also lacked a binding law to make them enforceable. Another major challenge of the policy was the failure to set up the National Renewable Energy Action Plan (NREAP) and the National Energy Efficiency Action (NEEAP) provided for under the policy for the implementation of its provisions. These two programs were supposed to have been set up between 6 and 12 months of the approval of the policy (NREEEP, 2015).

2.1.9 Petroleum Industry Act (PIA) 2021

The Petroleum Industry Act (PIA) 2021 provides improved regulations and incentives for gas investment with tax holidays of up to 10 years and expansion of incentives to cover midstream gas operations. The part that interests this work is the provision in section 64 (h), which stipulates that the Nigerian National Petroleum Company limited is to "engage in the business of renewables and other energy investments." The development of renewable energy resources was expected to have been carried out in competition with private investors. However, the PIA failed to enact provisions for transition from fossil fuel to clean renewable energy in line with global demand, and campaign against fossil fuels in an era when decarbonization is a global necessity. The tax regime and incentives contained in PIA were subjected to the discretion of the Ministry of Finance. Thus, if the Executive Director of the Commission is not disposed to the development of renewable resources, he may exercise his discretion against the grant of incentives or reliefs which are considered to be necessary to boost development. This remains a major weakness of the PIA.

2.1.10 Electricity Act, 2023

The Electricity Act 2023 repeals the Electric Power Sector Act 2005 (EPSRA) and aims to consolidate the laws relating to electricity across the entire value chain of the Nigerian power sector, including the integration of renewable energy into Nigeria's energy mix. In addition, the Act aims to encourage state government participation in the power sector and increase private sector investment. The Act unified the legal and institutional framework for the Nigerian power sector; provides guidance on the operation of the electricity market and seeks to stimulate policy measures to attract investment across the Nigerian electricity value chain for the development of a competitive electricity market in Nigeria (Electricity Act, 2023). Some of the key provisions are:

(a) Creation of State Electricity Markets.

The Act makes provision for States within the federation to license electricity generation, transmission, and distribution in all their territories. This allowed States to establish state electricity boards to oversee and provide guidance on electricity operation within the state, which was not possible before now.

(b) Incorporation and licensing of Independent Systems Operator (ISO).

The Act mandates the Transmission Company of Nigeria (TCN) to incorporate an entity to be licensed as an ISO to perform the market and system operation functions previously performed by the TCN. In addition, the TCN is required to transfer all assets and liabilities relating to its market and system operation functions to the ISO after incorporation and licensing while retaining its transmission license and all transmission

assets and liabilities. The Nigerian Electricity Regulatory Commission (NERC) is expected to draw up a plan and timeline for the transition process.

(c) Creation of Integrated National Electricity Policy and Strategic Implementation (INEPSIP), the Act establishes INEPSIP to perform the following functions:

(i) Develop the electric power sector based on optimal utilization of resources of coal, natural gas, nuclear and renewable energy (solar, wind, hydro, hydrogen etc.);
(ii) Develop generation of captive stand-alone electricity for rural areas;
(iii) Develop Rural electrification and bulk purchase of power for local distribution;
(iv) Engage in public private partnership for provision of access to electricity to all areas;
(v) Provide subsidies to stimulate renewable energy development. (Electricity Act, section 3, 2023).

(d) Creation of National Power Training Institute of Nigeria (NAPTIN) -for the purpose of manpower training and coordination of manpower training activities. (section 6 (e) Electricity Act 2023),

(e) Establishment of Nigerian Electricity Bulk Trading NBET) PLC-as a trading licensee holding a bulk purchase and resale license for bulk procurement and bulk sale of electricity and ancillary services (S.6 (f) electricity Act 2023).

These asides, the Act emphasize the development and utilization of renewable energy sources and the creation of an enabling environment to attract investments in renewable energy, in order to increase the contribution of renewable energy to the overall energy mix of Nigeria. The NERC is by the Act expected to award licenses of mini-grid concessions to renewable energy companies for the exclusive generation and distribution of electricity to certain geographical locations. In addition, the Commission is expected to provide regulations relating to the activities and pricing of renewable energy in Nigeria.

The Act also mandates the Ministry of Finance to introduce tax incentives that may be necessary for the promotion and facilitation of generation and consumption of electricity from renewable energy sources. However, despite the remarkable provisions toward the development of renewable energy, the Act is not renewable energy specific. Secondly, there is no specific directive to the power companies on specific target of renewable energy generation with timeline followed by penalty on default like the Renewable Energy Law (Amendment Act) 2009 of China. In China the Generation Companies are not only mandated to buy renewable energy generated, but has a specific quota it's expected to buy with a penalty on default, this is what is required in our system to boost renewable energy development. Thirdly, the Ministry of Finance is given

discretion to create incentives and not directed on the type(s) of incentives to create and for what renewable resource and duration like is the case in China and Paraguay.

Before examining the challenges in these legal frameworks, it is pertinent to look at the institutional framework so that the challenges could be assessed holistically.

2.2 INSTITUTIONAL INFRASTRUCTURE

2.2.1 Federal Ministry of Power (FMP)

The Ministry is an administrative arm of the Federal Government responsible for policy formulation and provision of general direction to other power sector agencies. The specific functions of the Ministry as it relates to renewable energy include:

1) Proposing policy options and recommendations to the Federal Government concerning legislation, policy and investment on renewable electricity;
2) Monitoring and evaluation of implementation and performance of the policy within governmental agencies and in the electricity market;
3) Establishing, monitoring and evaluating the performance of renewable electricity policy on increasing the access to electricity in rural areas;
4) Facilitating the close coordination of renewable electricity activities among agencies of the Federal Government;
5) Ensuring that Nigeria's renewable electricity policy is consistent with national obligations in regional and international organizations; and liaising with the National Assembly on matters relating to renewable electricity production and use (Federal Ministry of Power and Steel, 2006).

The Ministry efforts in developing renewable energy can be summarized in some key projects that have impacted the sector, some of which includes:

a) The repair works on unit 2 of Shiroro Hydropower plant in 2012, resulting in recovery of 150MW;
b) Hydropower station preventive maintenance of 2G2 at Jebba in 2012 to ensure availability of 96.4 MW
c) Rehabilitation works on 1G5 & 1G12 units at Kainji to recover 220 MW capacities by December 2014;
d) Zunguru 700MW in Niger State;
e) Mambilla 3, 050MW project in Taraba State;
f) Guarara 11, 360MW project in Niger State;
g) Guarara 1, 30MW project in Niger State;
h) Itisi, 40MW project in Kaduna State;
i) Kashimbilla, 40MW project in Taraba State (FMP 2016).

The major challenge of the Ministry is the delivery of stable power to Nigerians. The challenge appears insurmountable due to over concentration of efforts on the non-

renewable energy sources and definite and specific legal framework to anchor the renewable energy development.

2.2.2 Energy Commission of Nigeria (ECN)

The Commission has the major functions of gathering and dissemination of information on government's policy on energy development and to advise the government on issues of energy development, funding, research, preparation of master's plan, formulation of policies for energy development, exploitation, utilization, project execution, financing and incentives (Energy Commission Act, 2011). The Commission though does not have a specific and definite mandate for renewable energy development, as the Act creating it only makes scanty references to renewable energy, nevertheless, it formulated policy guidelines and programs on renewable energy development. Some of its effort in developing renewable energy includes:

(a) Creating centre for Energy Research and Development at the Obafemi Awolowo University, Ile-Ife, Osun State.
(b) Creating centre for Energy Research and Training, Ahmadu Bello University, Zaria, Kaduna State.
(c) Establishing national centre for energy research and development, University of Nigeria, Nsukka, Enugu State.
(d) Inaugurating research centre at Usman-Fodio University, Sokoto, Sokoto State.
(e) Creating Energy Commission of Nigeria centre at the University of Benin, Benin City (Ladan, 2009).

These Centres have been able to deploy renewable energy resources in some areas, and has given a boost to the renewable energy infrastructures in the country. Some projects from the centers include:

(i) 2 Tone capacity Rice Solar Dryers at Agbani, Enugu State.
(ii) 2 Tone capacity Forage Solar Drier at the National Agricultural Production Research Institute, Ahmadu Bello University, Zaria, Kaduna State (The dryer can actually be used to process Agricultural products such as rice, maize, pepper, tomatoes, cocoa, tea and coffee.
(iii) 1000 Solar water heater for providing hot water in hotels and hospitals for bathing and washing at the Maternity Ward of Usman Dan-Fodio University Teaching Hospital, Sokoto, Sokoto State.
(iv) 7.2 KVA Solar PV pumps at Kwalkwalama in Sokoto.
(v) 2.8 KWP Solar PV Plant at the Centre for Mentally-ill Destitute at Itumbuzo in Abia State.
(vi) 5.00KWP Solar PV Plant at Comprehensive Health Centre in Laje, Ondo State.
(vii) Solar Thermal Chick Brooding with capacity for 100 chicks built at Nsukka, Enugu State.

(viii) 20m^3 Biodgester at Ifelodun Cooperative Farm, Agege, Lagos State.
(ix) 10m^3 Biogas Plant at Achara, Enugu State.
(x) 30m^3 Biogas Plant at Zaria Prison, Kaduna State.
(xi) 5KWP Wind Power Plant at Sayya Gidan Gada, Sokoto State (used for village electrification for 30 households (Ladan, 2009).

It appears that the core functions of the ECN have been taken over by the Nigerian Electricity Regulatory Commission (NERC) under the Electricity Act, 2023, who now has the responsibility of licensing the operators of the generation, distribution, transmission and trading value chain of the power sector. The NERC is empowered under the Electricity Act, 2023 to regulate and monitor the power sector as a whole (The Electricity Act, 2023). However, there is no express provision of the Electricity Act 2023 repealing the ECN and so they are still part of the renewable energy chain in the Nigerian power sector.

2.2.3 Nigerian Electricity Regulatory Commission (NERC)

The Nigerian Electricity Regulatory Commission (NERC) is an independent regulator formed in 2005 under the defunct Electric Power Sector Reform Act 2005 (repealed). The functions have now been transferred and expanded under the Electricity Act 2023, to undertake technical and economic regulation of the Nigerian Electricity Supply Industry. The Commission is to, among others license operators, determine operating codes and standards, establish customer rights and obligations and set cost reflective industry tariffs. The Commission has its headquarters in Abuja, and currently has presence in most states of the country through its Forum offices which functions as the first level of escalation for customer complaints that are not resolved by the electricity distribution companies (DisCos) (Electricity Act, 2023).

Section 34 of the Electricity Act 2023 provides for the functions and powers of the NERC. For the purposes of this work, section 34 (1) (i) is of importance as it explicitly empowers the commission to promote the development and utilization of renewable energy services and increase the contribution of renewable energy to Nigeria's energy mix. To achieve this mandate, the NERC has issued directive to distribution companies (DisCos) to procure at least 10% of their contracted energy from embedded generation sources with half coming from renewable sources by April 1, 2025. Under this mandate, each Disco is required to procure a specified amount of energy from embedded generation sources, with a portion mandated to be sourced from renewable energy (Oladipo, 2024). For instance, the Abuja Disco is expected to procure at least 61.1 MW from embedded generation sources, out of which 31 MW must be sourced from renewable energy sources. This mandate appears similar to the 2009 Energy Law of China where grid companies are required to purchase a set quota of renewable power, as a proportion of their total power purchased. The difference is that the China's Law has a penalty in default.

Furthermore, section 80 of the Electricity Act 2023 makes the obligation to generate electricity from the renewable energy sources by the NERC and the Independent System Operators (ISO) a continuous one. Furthermore, section 80 (2) directs the NERC to promote renewable sources of solar, wind, small hydro, biomass and other renewable sources through its license administration. Another remarkable feature in the Electricity Act, 2023 is the establishment of the National Hydroelectric Power Producing Areas Development Commission N-HYPPADEC) to enhance the exploitation and utilization of the renewable energy source of hydropower and to maximize its percentage contribution to the country's energy mix. NERC was necessitated by gross inefficiency in the sector and to catch up with the rapid technological development and trends in the management of electricity sectors of other countries (ldris et al., 2013). The NERC mandates under the Electricity Act 2023 appears commendable in terms of provisions, it is hoped that the implementation will not make the NERC inefficient as it was under the repealed EPSRA Act 2005.

2.2.4 Integrated National Electricity Policy and Strategic Implementation Plan (INEPSIP)

The INEPSIP is provided for under section 3 of the Electricity Act 2023 to perform among others the following functions:

(a) To coordinate, plan and implement electricity development projects including renewable energy across Nigeria;
(b) Engagement of stakeholders including federal governments, state, private sector operators as well as consumers;
(c) Develop long –term strategy (15-20 years) for the development of the electricity sector in accordance with national goals;
(d) Identify projects for development within the value chain;
(e) Put in place funding and financing arrangements for projects, including public-private partnership;
(f) Engage in Monitoring and Evaluation process to track progress and ensure accountability; and
(g) Ensure cohesive approach to electricity development among sectoral agencies.

The Institution is relatively new, but looking at its functions, it will play a vital role towards the development of the Nigerian power sector in general and the renewable subsector in particular.

2.2.5 National Power Training Institute of Nigeria (NAPTIN)

The NAPTIN is also institutional infrastructure established by the Electricity Act 2023, particularly, section 6 (e) of the Act. NAPTIN was originally established in 2009 to

provide training and capacity development for the Nigerian power sector. Under the 2023 Act, the functions have been expanded as follows:

(1) To enhance the capacity and skills of power sector personnel;
(2) Promotes research and development in the power sector;
(3) Foster collaboration and knowledge sharing in the power sector;
(4) Support the development of a skilled and competent workforce for the power sector.

By empowering NAPTIN under the 2023 Act, the government aim to address the capacity building and training needs of the power sector, ensuring a skilled and competent workforce to drive the sector's growth and development. However, the Government should look at specialized programs and international cooperation on renewable energy to boost the sub-sector.

2.2.6 Nigerian Electricity Bulk Trading Plc (NEBT)

The Nigerian Electricity Bulk Trading Plc (NEBT) is a key institutional infrastructure in the Nigerian electricity sector, playing a crucial role in the country's power market. NEBT was established originally in 2010 as a bulk trader and market operator to facilitate the wholesale trading of electricity in Nigeria. The responsibilities of the NEBT include purchases of electricity from generation companies; selling electricity to distribution companies; managing the electricity market, clearing process and settling electricity trading transactions.

On renewable energy development, NEBT is responsible for procuring renewable energy from independent power producers (IPP) and feeding it into the national grid. Furthermore, NEBT issues Renewable Energy Certificates (RECs) to renewable energy generators, which can be traded on the electricity market, providing an additional revenue stream for renewable energy producers. Also, NEBT facilitates the connection of renewable energy sources to the national grid, ensuring that clean energy is integrated into the electricity supply. By so doing NEBT, helps to increase electricity availability and reliability, reduce market volatility, encourage private sector investment and improve the overall efficiency of the electricity market (Electricity Act, s. 6 (f) 2023).

2.2.7 Independent System Operator (ISO)

The ISO, a crucial entity under the Electricity Act 2023 is established under section 7(3) and section 15 of the Act to among other things be responsible for the management of the transmission system and ensuring the reliable operation of the electricity grid. ISO is independent of any market participant or interest group, ensuring impartial decision-making in the management of the transmission system. By establishing the ISO, the government aims to ensure a reliable, efficient, and competitive electricity market that will promote economic growth and development of the country, including renewable energy.

2.2.8 Rural Electrification Agency (REA)

The Rural Electrification Agency (REA) was established under the repealed EPSR Act 2005, now succeeded by the Electricity Act 2023. The objectives of the Agency are provided for in section 128 of the Electricity Act 2023 to include among others, provision of framework to support:

(i) The development and utilization of renewable energy sources and an enabling environment to attract investment in rural;
(ii) The promotion for the productive use of renewable energy;
(iii) Diversification of supplies to safeguard energy sources;
(iv) Improved access to electricity through the use of various rural electrification and renewable energy technology sources;
(v) Public education for rural electrification and renewable energy production and consumption; and
(vi) The deployment of bio-energy technology for rural electrification.

The functions of the Agency as provided for in section 129 of the Electricity Act include the following:

(a) Promotion of universal access to affordable and sustainable electricity to improve the quality of life and economic opportunities for rural, unserved and underserved communities;
(b) Provision of access to reliable electric power supply to the rural dwellers in a way that will allow for reasonable return on investment through tariffs that will not only be economical but supportive of the average rural customer;
(c) Efficient and effective management of the Rural Electrification Fund in accordance with the operational guidelines approved by the Board;
(d) Promotion of exploitation and utilization of renewable energy sources in accordance with the regulations issued by the Commission and relevant Ministries, departments and agencies responsible for the development of renewable energy sources;
(e) Provision of learning opportunities to desirous individuals, communities and students interested in rural electrification business ventures;
(f) Promotion of low-cost options in rural electrification projects that apply for subsidy grants towards start-up cost;
(g) Advocacy and facilitation for tax incentives, investment capital allowance and low interest loans for local producers of renewable energy products for electrification;
(h) Encouragement of economic growth of rural communities through electrification projects; and
(i) Performance of such other ancillary functions which are necessary and incidental to its objectives and functions under this Act or any other act of the National assembly.

Rural Electrification Agency (REA) has recorded some achievements worth mentioning in this paper including a roundtable seminar between State Governments and DISCOS in February 2024 to chart a new course for collaboration and partnership in the energy sector, provision and facilitation of interconnected mini-grids as a collaborative model for the provision of energy to underserved, facilitation of partnership between States, DISCOS, and private sector to optimize investment opportunities in the energy sector among others.

2.2.9 Standard Organization of Nigeria (SON)

Standard Organization of Nigeria is also one of the relevant regulatory institutions of renewable energy worthy of mention in this work. SON is charged with the primary responsibility of setting and enforcing standards of goods and services in Nigeria. In relation to renewable energy, SON responsibility includes ensuring and enforcing quality standards of solar PV modules, inverters, batteries, solar cookers, improved woodstoves, biogas digesters etc. (A.S. Sambo, 2010). However, the standards of these goods are set in conjunction with relevant bodies like the Energy Commission of Nigeria, Nigeria Society of engineers, NERC, etc. (Sambo, 2016). We observed however, that the inefficiency of this regulatory body opened door for the flooding of Nigeria's market with sub-standard goods. This is a great challenge to efficient renewable technologies infrastructures deployment in the country.

2.2.10 Nigerian National Petroleum Company Limited (NNPC LTD)

Nigerian National Petroleum Company Limited (NNPC Limited) is a company directed under section 53 of the PIA 2021, to be incorporated within six months of the commencement of the Act by the Minister of Petroleum. The company was actually transformed as a merger from its former identities; Nigerian National Petroleum Corporation (NNPC), Nigerian National Oil Corporation (NNOC) and the Federal Ministry of Petroleum Resources into a limited liability Company, NNPC limited on July 1, 2022. Among the objectives of the NNPC limited as provided under section 64 (g) of the PIA 2021 is to 'engage in the business of renewable and other energy investments. NNPC limited efforts toward realizing this objectives include, establishment of renewable energy division to oversee its renewable energy initiatives; planning to develop solar power projects in states like Kano, Katsina and Nasarawa with a total capacity of 1000MW (Guardian, 2021); expression of interest in developing biofuels from agricultural waste and forestry residues; partnership with some international companies to explore renewable energy opportunities, including solar, wind, and hydro power ((Vanguard, 2022) and plan to develop an energy transition aims to reduce Nigeria's carbon footprint to cleaner energy sources (NNPC, 2022). These initiatives if properly harnessed will increase the percentage contribution of renewable energy to the country's energy mix.

2.2.11 National Hydroelectric Power Producing Areas Development Commission (N-HYPPADEC)

National Hydroelectric Power Producing Areas Development Commission (N-HYPPADEC) was established under section 82 of the Electric Power Act 2023 to among others formulate policies and guidelines for the development of hydroelectric power, which is a renewable source of energy within the Northern States of Benue, Kebbi, Kogi, Niger, Kwara, Plateau, Gombe, Kaduna, Nasarawa and Taraba. Although by section 84 (3) (k) it was to include any other State where hydroelectric power is generated.

Other functions of the Commission include:

(1) Conception, planning and implementation of projects and programs for the development of hydroelectric power within the producing areas;
(2) To carry out a survey within the producing areas to ascertain measures which are necessary to promotes its physical development;
(3) Prepare schemes designed to promote the physical developments of the hydroelectric power producing areas by the Federal Government;
(4) Identify factors inhibiting the development of the hydroelectric power producing areas and assist States in the formulation and implementation of policies to ensure sound and efficient management of the resources of the hydroelectric power producing areas;
(5) Assess and report on any project being funded or carried out in the hydroelectric power producing areas and ensure that funds released for such project are properly utilized.
(6) To tackle ecological problems that arise from overloading of dams in the hydroelectric power producing areas and advise Federal and State Governments on the prevention and control of floods and environmental hazards;
(7) Execute such other work and functions that are required for the development of hydroelectric or as may be directed by the president.

The Headquarters of N-HYPPADEC is to be situated in Minna, Niger State. By focusing on renewable energy development, N-HYPPADEC contributes to Nigeria's energy transition, reduces dependence on fossil fuels, and promotes sustainable development. Although by the functions outlined in the Electricity Act 2023, N-HYPPADEC looks very promising, time will tell whether the good intentions of its establishment will yield the expected dividends. We recommend that its mandate should be extended to include other renewable resources.

3. CHALLENGES OF THE LEGAL AND INSTITUTIONAL FRAMEWORK INFRASTRUCTURES FOR RENEWABLE ENERGY DEVELOPMENT IN NIGERIA AND STRATEGIES FOR REDRESS

The development of renewable energy in Nigeria has not been steady, increasing and progressive in terms of its percentage contribution to the total energy mix of the country despite the numerous legal and institutional infrastructures existing currently. This is unlike the developed clime of China, Paraguay and Brazil where these legal and institutional infrastructures have been pivotal for their renewable energy development. Renewable energy development in Nigeria is bedeviled with challenges ranging from overlapping policies, non-specific and definitive legislative framework, unwieldy regulatory bodies, and lack of definitive and specific incentives regime. Others include inadequate budgetary allocation and lack of special bank(s) to fund the sector.

3.1 Overlapping Policies

The various policies, guidelines and or programs are too many, repetitive, wordy and conflicting in territorial boundaries to make for effectiveness. For instance, there are eleven of such policies, guidelines or programs currently:

(i) National Energy Policy (NEP) 2003;
(ii) National Economic Empowerment and Development Strategy (NEEDS) 2004;
(iii) Renewable Energy Master Plan (REMP) 2005;
(iv) Renewable Electricity Policy guidelines (REPG) 2006;
(v) Nigerian Biofuel Policy and Incentives (NBPI) 2007;
(vi) Captive Energy Generation Regulation (CEGR) 2008;
(vii) National Renewable Energy and Energy Efficiency Policy (NREEEP) 2015;
(viii) Integrated National Electricity Policy and Strategic Plan (INEPSIP);
(ix) National Power Training Institute of Nigeria (NAPTIN);
(x) Nigerian Electricity Bulk Trading Plc (NBET); and
(xi) Independent System Operator (ISO).

As rightly argued by Onwubuaariri (2015), these overlapping and repetitive policies in many areas create uncertainty and confusion to both the regulator and regulated. The policy will make more meaning and become more effective if consolidated in a concise National Energy Policy of Nigeria (NEPN) and then provisions relating to specific renewable energy sources dealt with within sections of the policy (Onwubuaariri, 2015). The inconsistency policies issued by successive administration makes an investment landmine and appear to hinder the development of renewable energy in the country. Despite the eleven policies, Nigeria's current renewable energy contribution to its electricity capacity is about 21% as against China with fewer policies of 30% to its energy mix currently and 80% by 2050 (IRENA, 2020; NEA's 2020).

3.2 Lack of Renewable Energy Specific or Definite Legislation

The Nigeria's legislative framework support for renewable energy development is the energy Commission of Nigeria (ECN) Act 2004 and the Electricity Act 2023. Under the ECN, the major function as underscored by section 5 of the Act is the strategic planning and coordination of national policies in the field of energy in all its ramifications. The ECN Act confers monopoly on policy making in relation to energy exploitation and distribution on the commission without any specific provision on the exploitation and utilization of renewable energy, Ladan viewed the absence of appropriate legal framework as a major hindrance on the development of renewable energy in the country (Ladan, 2009). One would have thought, the newly enacted Electricity Act 2023, would remedy this legislative framework challenge. However, the Act only list renewable energy promotion and development among the functions of the Nigerian Electricity Regulatory Commission (Electricity Act, 2023). This is unlike the 2005 Renewable Energy Law and the Renewable Energy Law (Amendments) 2009 of China, which laws spelt out the role of renewable energy and periodic percentage contribution to its energy mix. To increase its percentage contribution of renewable energy on its energy mix, Nigeria needs to put in place an effective renewable energy specific legislation in place not as an ancillary or addendum to other legislative framework, but as an independent specific and definite legislation on renewable energy development for Nigeria as is the case in China.

3.3 Unwieldy Regulatory Bodies

There are too many regulatory institutions with overlapping mandates and responsibilities in the Nigeria's renewable energy infrastructural development process that is rather hindering than enhancing the development of renewable energy in the country. Currently, we have eleven of such bodies. These situations also result in conflict and disagreement in jurisdictional boundaries. The regulatory bodies currently include:

(a) The Federal Ministry of Power (FMP);
(b) Energy Commission of Nigeria;
(c) Nigerian Electricity Regulatory Commission (NERC);
(d) Rural Electrification Agency (REA);
(e) Standard Organization of Nigeria (SON);
(f) The Nigerian National Petroleum Company Limited (NNPC Ltd.);
(g) The National Hydroelectric Power Producing Areas (N-HYPPADEC).
(h) Integrated National Electricity Policy and Strategic Implementation Plan (INEPSIP).
(i) National Power Training Institute of Nigeria (NAPTIN).
(j) Nigerian Electricity Bulk Trading Plc (NEBT) and
(k) Independent System Operator (ISO).

While the Federal Ministry of Power (FMP) headed by a Minister, issues general policy directions to NERC on matters concerning electricity and overall system planning

and coordination of the sector, including the promotion and development of renewable energy (Electricity Act, 2023). The ECN has the function of the strategic planning of energy and guidelines for utilization of renewable energy. However, there is no linkage of the ECN with NERC and the FMP under the Electricity Act 2023. This absence of nexus poses doubts on the relevancy of ECN as the 'coordinator of the energy sector' (Oniemola, 2016). We submit that one or two of these institutions would have been sufficient for Nigeria with the necessary powers and mandates given to them to develop renewable energy for the country.

In Paraguay, Administracio'n Nacional de Electricidad (ANDE) is the institution that carried out large investment in infrastructure enabling electricity coverage for more than 99% of the population. It does this with the assistance of Vice-Ministry of Mines and Energy of the Ministry of Public Works and Communications (VMME-MOPC) (Durksen, 2021). In China also, the National Energy Administration (NEA) is responsible for overall energy policy, planning, and regulation and assisted by Provincial and local governments, which also play important roles in promoting renewable energy development in their respective regions. (China Energy Transition, 2020). Nigeria needs to take lessons from these countries and adjust its regulatory bodies accordingly for effective and efficient coordination and regulation of the renewable infrastructures in the country.

3.4 Lack of Definitive and Specific Incentives Regime

The incentives regime to encourage and boost the development of renewable energy infrastructures in Nigeria under the current policy and legislative frameworks are grossly inadequate and couched in general terms. The policy framework with incentives is the National Renewable Energy and Energy Efficiency Policy (NREEEP) 2015, while the legislative framework with incentives is the Electricity Act 2023. Under the NREEEP 2015, paragraph 2.7.2, sets out the following incentives:

> Providing fiscal incentives, subsidies to alleviate upfront costs, tax and duty exemptions for prospective investors in the renewable energy sub-sector; and Providing grants to local governments and communities to support renewable energy planning and implementation projects.

These are the major incentives provided under the NREEEP 2015: all general in terms without being specific or definitive. When you compared this to what is obtainable in China, one sees a clear difference. For instance:

(i) Solar has additional incentives for roof top solar, solar heating, and concentrated solar power (CSP).
(ii) Wind has incentives for offshore wind, wind-solar hybrids, and wind power forecasting.
(iii) Hydro has incentives for pumped hydro storage and small hydroelectric projects.

3.5 Inadequate Budgetary Allocation to the Renewable Energy Sub-sector

Under the 2024 Nigeria Budget the sum of N336.878 billion for capital projects for the entire power sector. Out of this N1.25 billion was budgeted for the solar energy projects, a three-in-one solar lights for selected rural communities in Kogi State, and another N1.25 billion for the installation of three-in-one solar light in selected communities of Lagos, while N1billion was allocated for the construction of an all-in-one solar light at Nikoka/Dunukofia/Anaocha Federal Constituency of Anambra State. Furthermore, N66.623 billion was allocated for Nigeria Electrification Project (NEP). This project is tied to a loan from the African Development Bank (AFDB) and another N15.311 billion for a project tied to a loan from the World Bank. The cumulative sum for renewable sub-sector is just a paltry N84.334 billion. A report has stated that Nigeria needs to invest $100 billion annually in its power sector for any meaningful positive impact (Punch Newspaper (July), 2024). In contrast, China invested an estimated $890 billion in clean energy sectors in 2023. (Ellis, 2024). Nigeria needs to increase its investment on the renewable sub-sector for any meaningful impact and to boost renewable energy development in the country.

3.6 Lack of Special Bank(s) for Renewable Energy Investment

Nigeria does not have special bank(s) that assist investors on renewable energy infrastructures development. Renewable energy infrastructures are costly and investors in the sector require facilities that can be spread up to ten years and beyond. Unfortunately, most of our commercial banks hardly support such: they are interested in ventures that will bring quick returns. Special banks set up with renewable energy infrastructures in mind are therefore, inevitable in this respect.

Presently, only few banks have ventured to support renewable energy development in Nigeria, they include, Bank of Industry (BOI), Central Bank of Nigeria (by way of intervention), Union Bank of Nigeria with partnership with Universal Green Energy Access Programme, and African Development Bank (AfDB). However, countries that have made giant strides in the development of renewable energy have a designated bank(s) that promotes investment in the sector. In Brazil, Banco Nacional de Desenvolvimento Economico Social (BNDES), National Bank for Economic and Social Development, a state-owned development bank provides financing for various sectors, including renewable energy. It offers loans, credit lines, and other financial instruments to support project in wind, solar, hydro, biomass and biofuels. BNDES also provides financing for energy efficiency projects and sustainable infrastructure development.

In China, there are several banks and financial institutions that support renewable energy development. They include:

(1) China Development Bank (CDB)-provides financing for renewable energy projects, including wind, solar, hydro, and biomass.
(2) Industrial and Commercial bank of China (ICBC)-offers green finance products and services,including loans and bonds for renewable energy projects.
(3) Bank of China (BOC)-provides financing for renewable energy projects and has a dedicated green finance team.
(4) Agricultural Bank of China (ABC)-supports rural renewable energy projects, including biomass and solar.
(5) China Construction Bank (CCB)-offers green finance products and services, including loans and bonds for renewable energy projects.
(6) Green Finance Committee of China (CFC)-established by the People's Bank of China to promote green finance and support renewable energy development.
(7) China Clean Development Mechanism Fund (CCDMF)-supports renewable energy projects and sustainable development initiatives (Renewable Energy financing in China by IRENA 2022).

4. RECOMMENDATIONS

Nigeria is naturally blessed with abundant of the renewable energy resources across its divide: significant sunlight for solar power, rivers for hydro, wind for wind power, forests with timber for biomass etc., all that is required is the political will and effective legal and institutional infrastructures to drive development in the renewable energy sub-sector, to achieve this we recommend the following:

1. Effective and efficient institutional framework that is not unwieldy, pattern after either the China or Paraguay model. The present institutional infrastructures can be reduced to either one or two.
2. Definite and specific legislative Framework-Nigeria needs a stand-alone renewable energy legal infrastructure that is renewable energy specific not just ancillary of any legislative framework. Lessons can be drawn also from China Renewable energy law of 2005 and the 2009 amendment.
3. Streamlining the Regulatory Bodies- the current regulatory bodies on renewable energy in Nigeria is unwieldy and is rather hindering than enhancing the sector. One or two like what is obtainable in Paraguay could be of help.
4. Robust Incentives that are definitive and specific just like what is obtainable in China. Where it relates to tax holiday 15 to 20 years should be considered as investment in renewable energy infrastructures does not bring quick returns on capital.
5. Adequate Budgetary allocation to the Renewable Energy Sector-Nigeria needs to draw lesson from China and Brazil in this respect.

6. Establishment of specialize Bank(s) for Renewable Energy-Nigeria need to draw lesson from Brazil and China that have specialized Banks that support and focus on renewable energy or make policy directing designated banks to give priority to funding renewable energy with legislative back up.

5. CONCLUSION

Nigeria's abundance renewable energy resources may remain dormant or grossly exploited, except with the putting in place of efficient and effective legal and institutional infrastructures to boost its development. The recommended measures when applied will bring a boost to the renewable energy development in the country with positive impact on the socio-economic as well as environmental sustainability.

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