

Chapter One

Introduction

1.1 Background to the Study

Energy is one of the most important drivers for development, and a powerful engine that drives the social and economic change in any country or region. Most dictionaries define energy as the capacity to do work, that is, the strength and vitality needed for sustained physical or mental capacity.¹ The necessity of energy can never be over-emphasized in the contemporary world; it is indeed fundamental to the fulfillment of basic individual and community needs in modern society. Lighting and heating a house, running a factory, lighting a street, keeping a hospital open and operational, provision of potable water, etc, all require energy.²

These services are the factors that measure the progress and level of development of a country. This therefore means that the amount of energy consumed by a country at a particular instant of time largely determines the country's economic and social development.³ Fossil fuels are the major source of energy production and foreign exchange in Nigeria today. The excessive emission of greenhouse gases is a result of our great reliance on fossil fuels.⁴ Nigeria as a nation is known to be the energy giant of Africa and despite being endowed with vast natural resources

¹ Olasupo Owoeye, 'Access to Energy in Sub-Saharan Africa: A Human Rights Approach to the Climate Change Benefits of Energy Access' (2016) 18:4 *Environmental Law Review* <<https://www.journals.sagepub.com>> accessed 20 June, 2022

² Anne Maczulak, *Renewable Energy: Sources and Methods Facts on File* (1st edn, Infobase Publishing 2010).

³ M. Akorede & O. Ibrahim, "Current Status and Outlook of Renewable Energy Development in Nigeria" (2017) 36 *Nigerian Journal of Technology (NIJOTECH)*, 196-212

⁴ P.K. Oniemola & Gbenga S, "The Nigerian Bio-fuel Policy and Incentives: A Need to Follow the Brazilian Pathway" (2007)

<https://www.academia.edu/95816841/The_Nigerian_Biofuel_Policy_and_Incentives_2007_A_Need_To_Follow_the_Brazilian_Pathway> accessed 27 May, 2021

and abundance of renewable energy potentials; it is still one of the poorest countries in the world.⁵

Importantly, Nigeria has insufficient access to electricity, and this insufficiency is attributed to a number of factors, including economic constraints, a lack of advanced technologies, a lack of infrastructure, and a lack of research and development capabilities.⁶ For instance, studies have shown that Nigeria has been experiencing electricity challenges over two decades now and there is rarely a day that goes by in Nigeria without an electricity outage, while in some areas, there is no electricity supply at all.⁷ In the past ten years, Nigeria's national energy infrastructure has failed more than 200 times, frequently causing extensive blackouts. Power outages have significant economic and social consequences because they make it difficult for individuals to satisfy their regular business and residential demands. In the space of 48 hours in March 2022, the grid failed twice. Numerous circumstances contribute to this situation, that is, the collapse of the national grid which helps to guide the necessary course of action. They include inadequately skilled workers, a lack of local manufacturing, inadequate utility performance, and theft of grid equipment, bad weather, a lack of gas supply, inadequate financing, and aging grid infrastructure.⁸

In Nigeria, the act of burning of fossil fuel for electricity generation has become the standard practice. The electricity situation in Nigeria has forced different economic organizations to

⁵ International Monetary Fund World Economic Outlook Report: Legacies, Clouds, Uncertainties (October 2014) <<https://www.imf.org/-media/Website/IMF/imported-flagship-issues/external/pubs/ft/weo/2014>> accessed 13 June 2021

⁶ A. Iwayemi, 'Nigeria's Dual Energy Problems: Policy Issues and Challenge' (2019) 53 *International Association for Energy Economics*, 17-21

⁷ G.A. Agbaitoro, 'Is Having a Robust Energy Mix a Panacea for Resolving the Energy Crisis of Nigeria?' (2017) 74 *RELP* 12-13

⁸ N.V. Emodi & O.E. Diemuodeke, "Why Nigeria's Electricity Grid Collapses and How to Shore it Up" (2022) <<https://theconversation.com/why-nigerias-electricity-grid-collapses-and-how-to-shore-it-up-179705>> accessed 14 September, 2022

depend on their own generating plants for electricity supply. This situation is also responsible for high indices of economic inflation in the country. Consequently, a number of businesses have shut down as a result of financial losses because they were unable to keep up with the country's financial implications of producing goods and services. Also, most private homes in Nigeria have their own generating plants to carry out their day-to-day activities including educational institutions, hospitals, and government agencies.

Studies have shown that 60-70 per cent of the Nigerian population have inadequate access to electricity especially with respect to the general electricity blackout and collapse of the national grid we have in different areas today without good reason from the electricity regulatory bodies. In essence, another study shows that 42 percent of Nigeria's population, or 77 million people, do not have the required power to carry out their day-to-day activities.⁹ Electricity in urban areas is 86 percent, compared to just 41.1 percent in rural regions, for an overall population access rate of only 59.3 percent. 10.52 million kilowatts of the total installed capacity originates from fossil fuels, accounting for 80 percent of it, while hydroelectric facilities account for 19 percent of it.¹⁰ From these results, Nigeria's energy industry relies heavily on fossil fuels as a source of energy supply, which has negative effects on the human health and environs. This is one of the major challenges the country is facing and the country has not been able to find permanent solutions that will resolve the problems due to the adaptation of short term, hasty policies and also still undergoing energy projects which are detriment to long term energy policies that will help the nation to achieve sustainable energy and energy efficiency.¹¹ Fossil fuel is also a major source of

⁹ The CIA-World Fact Book (2018-2019) Central Intelligence Agency (CIA) <<https://www.cia.gov/the-world-factbook/countries/nigeria/>> accessed 1 August, 2022

¹⁰ *Ibid.*

¹¹ J. Kennedy-Darling, N. Hoyt, K. Murao & A. Ross, "The Energy Crisis of Nigeria: An Overview and Implications for the Future" (2008)

foreign exchange earnings of the Federal Government of Nigeria, despite being blessed with non-renewable and non-sustainable source of energy; this has led to the emission of greenhouse gases which are unsustainable in Nigeria's power sector.¹²

Even though there has been a modern development in the Nigerian energy industry, there has been rising demands for renewable sources of energy in generating energy globally which are deemed to be more affordable and ecologically friendly compared to the attributes of using fossil fuels, Nigeria is yet to fully take advantage in these renewable energy sources. The advantages of using renewable energy sources to produce electricity are endless; which includes environmentally friendly (being mostly carbon neutral which reduces pollution as well as emission of greenhouse gases), foster the development of new technologies, provides more diversity and improves reliability of electricity supply through the grid, and open up employment opportunities in the energy industry.¹³ Using fossil fuels for generating energy contributes to climate change.¹⁴

If renewable energy can be properly utilized in the energy mix, Nigeria's enormous energy potential may completely address the country's issues with inadequate access to electricity. An effective legal framework that may tackle Nigeria's difficulties with energy instability and insufficient environmental aspects is urgently needed. As a result of ratifying treaties like the Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer¹⁵, the Vienna

<[https://www.scirp.org/\(S\(351jmbntvnsjt1aadkposzje\)\)/reference/ReferencesPapers.aspx?ReferenceID=379168](https://www.scirp.org/(S(351jmbntvnsjt1aadkposzje))/reference/ReferencesPapers.aspx?ReferenceID=379168)> accessed 14 September, 2022

¹² J. Olujobi & M. Olujobi & D. Ufua, "The Legal Regime on Renewable Energy as Alternative Sources of Energy in Nigeria's Power Sector: The Impacts and the Potentials" (2020) 19 *Academy of Strategic Management Journal*, 3

¹³ Oke Yemi, *Nigerian Electricity Law and Regulation* (1st edn LawLords Publications 2013)

¹⁴ C. Okonkwo, F. Edoziuno, A. Adediran, E. Ibitogbe, R. Mahamood & E. Akinlabi, "Renewable Energy in Nigeria: Potentials and Challenges" (2021) 56(3) *Journal of Southwest Jiaotong University* <<https://www.jsju.org/index.php/journal/article/view/924>> accessed 10 June 2021

¹⁵ *Montreal Protocol on Substances that Deplete the Ozone Layer (with annex)*, 1987

Convention for the Protection of the Ozone Layer¹⁶, the International Convention on Oil Pollution Preparedness, Response and Cooperation¹⁷, the United Nations Convention on the Law of the Sea¹⁸ the International Convention for the Prevention of Pollution of the Sea by Oil¹⁹, the United Nations Framework on Climate Change²⁰, the United Nations Charter²¹ and others, Nigeria is further bound by international obligations as all of these treaties set the criteria relating to environmental pollution and healthy living across the country.

It has been suggested that effective legal changes might increase access to power by emphasizing the possibility of breaking the nation up into smaller portions in order to promote accessibility and generation of renewable sources of energy.²² However, before this could be done successfully, some conditions must be met: First, it must be acknowledged that the position of Nigeria ranking as the nation that is abundantly blessed with the largest production of petroleum resources in Africa may function as a deterrent and that, as a result, both legislative and institutional transitions are necessary to allow the adoption of current trends in renewable generation.²³

Secondly, in order to present the Nigerian energy supply industry as one that is feasible and offers the possibility of both long-term and short-term financial success, the legal framework must, among other things, encourage both domestic and foreign investment in the sector. Also, these laws need to create enabling conditions for investments in climate-resilient and nature

¹⁶ *Vienna Convention for the Protection of the Ozone Layer, 1985*

¹⁷ *International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990*

¹⁸ *The United Nations Convention on the Law of the Sea, 1982*

¹⁹ *The International Convention for the Prevention of Pollution from Ships (MARPOL), 1983*

²⁰ *The United Nations Framework Convention on Climate Change, 1992*

²¹ *The United Nations Charter, 1945*

²² I.C. Okara & C.O. Ahiakwo, "Evaluation of Rivers State Promotional Strategies for Virtual Power Plant using 100% Renewable" (2021) 7(1) *International Journal of Energetic Materials*

²³ C.C. Ogbumbada, "Developing an Effective Legal Framework for Renewable Energy Utilization in Nigeria" (2018) 8(3) *Renewable Energy Law and Policy Review* 1-1

positive development including clear reporting and disclosure frameworks and harmonized taxonomies for sustainable investment.²⁴ Any investment in a country depends much on the economic growth that is being achieved, which in turn depends greatly on the type of government in power at any given time since it directly affects the kinds of policies that will be implemented.²⁵

1.2 Statement of the Problem

Nigeria is abundantly blessed with renewable and non-renewable energy resources. Inadequate access to power/electricity is a concern since Nigeria's current legislative system does not effectively support the production, transmission and distribution of renewable energy to enable competition and proper decentralization of the country's electrical sector. These factors include the flawed legal system, poor implementation strategies, environmental issues, and investment roadblocks.

The provisions of the 1999 Constitution in relation to the Electricity Power Sector Reform Act represents the legal inconsistency that exists in the energy sector in Nigerian. The Federal Government and State Governments are allowed to enact laws to increase Nigeria's energy supply under the Constitution which includes enacting the laws governing the construction of power stations, the generation and transmission of electricity throughout state of the federation and from one state. Accordingly, the House of Assembly of each States are given the responsibility of enacting laws governing the construction of power stations in their respective

²⁴ *Ibid.*

²⁵ *Ibid.*

states as well as the generation, transmission, distribution and management of power not adequately provided for under the national electricity grid.²⁶

As a result of the establishment of the EPSRA, an institution was created known as the Nigerian Electricity Regulatory Commission (NERC) as provided in Section 31. This federal government institution appears to have hijacked the authority of the State governments. In other words, it appears that NERC has been given greater authority than was initially reserved for the government of the States, and this has impeded the correct distribution of the Nigeria electricity supply industry, which is expected to improve the industry's administration, growth, and efficiency.²⁷

Studies have shown that there is lack of a legal regime that is intended to address the issue of the restricted infusion of renewable sources of energy into the electricity system in Nigeria in order to support Nigeria's energy mix and off-grid regions. Consequently, a stronger renewable energy and electricity supply regulation that works in harmony with current policies and laws is required. Without effective enforcement measures in place to guarantee its application, the law is nothing more than a written document.²⁸

The environmental problems that follow from the nation's reliance on fossil fuels as its primary sources of energy are another reason why this study is required. Oil spills, air pollution, water pollution, climate change, and damage to plants and animals are just a few of the environmental issues that occur.²⁹ To drive action on this triple crisis (the three main interlinked issues that

²⁶ Paragraph 13 and 14 Part II Second Schedule Constitution of the Federal Republic of Nigeria 1990 (as amended)

²⁷ s31 ESPRA

²⁸ H. Ijaiya & O.T. Joseph, "Rethinking Environmental Law Enforcement in Nigeria" (2014) 5 *Beijing Law Review*, 306 at 308

²⁹ *Ibid.*

humanity currently faces: climate change, pollution and biodiversity loss)³⁰, laws need to do many things at many levels. They need to be clear and effective, inclusive, participatory, rights-based and capable of facilitating a just transition to greener industries. To be honest, there is a big difference between passing a law and implementing it, between passing a law and enforcing it and between passing a law and people complying with it.

For this reason, this research proposes the need for a comprehensive legislative framework and regulatory framework on renewable energy and a legal framework with incentives for the use of renewable energy sources in Nigeria, among other changes.

1.3 Aim and Objectives of the Study

The aim of this research is to compare the Nigerian renewable energy and electricity supply legal framework with the Ghana renewable energy and electricity supply legal framework, with the purpose of distinguishing and finding similarities between them and also laying out the unique identities of each jurisdiction, and how the Ghana renewable energy and electricity supply legal framework may influence the Nigerian renewable energy and electricity supply legal framework to be effectively implemented and consequently proffer a sustainable regime for a better practice/coherent usage of renewable energy sources in Nigeria's energy generation mix. The objectives of this research are to-

1. identify the current energy situation in Nigeria and how overdependence on fossil fuels and its allied products should be of concern in Nigeria especially the negative impact on the environment (climate change) and depletion of resources.

³⁰ United Nations Climate Change: What is the Triple Planetary Crisis? <<https://unfccc.int/blog/what-is-the-triple-planetary-crisis>> accessed 15 August, 2022

2. examine the potentials of renewable energy in Nigeria's electricity generation mix in order to close the gap of Nigerians that does not have access to energy.
3. ascertain if a heavy dependence on renewable energy in Nigeria's electricity generating mix would lead to increased supply equality and energy security.
4. determine the effectiveness of the legal framework governing the Nigerian renewable energy and electricity supply models and recommend modifications that would be essential to the Nigeria's legislative framework in order to facilitate such implementation as compared to the Ghanaian renewable energy and electricity supply models.

1.4 Research Questions

1. How has the overdependence on fossil fuel and its allied products in Nigeria's electricity generation mix contributed to climate change in Nigeria?
2. How would the potentials and benefits of renewable energy in Nigeria's electricity generation mix close the gap of Nigerians that do not have access to energy?
3. How would a great dependence on renewable energy in Nigeria's electricity generation mix lead to increased supply equality and energy security?
4. How has the lack of effective renewable energy and electricity supply legal framework impacted on inadequate energy supply in Nigeria?

1.5 Research Methodology

The research methodology adopted in this study is doctrinal and comparative methodology. The doctrinal methodology includes the use of primary and secondary sources. The primary source includes significant legislations, analysis of judicial (case law) decisions. Secondary source

includes relevant information from leading authorities, edited literatures, journal articles, dictionaries, textbooks, newspapers, magazines, international instruments, reports and the internet. With comparative methodology, two jurisdictions were paired up (the Nigeria and Ghana renewable energy and electricity supply legal framework), with the purpose of distinguishing and finding similarities between them and also laying out the unique identities of each jurisdiction, and how the Ghana renewable energy and electricity supply legal framework may influence the Nigerian renewable energy and electricity supply legal framework to be effectively implemented.

1.6 Scope of the Study

This research work is about the effective implementation of renewable energy legal regime in Nigeria which will serve as a mitigator to climate change and improvement of electricity supply in Nigeria. It provides a clear understanding of the impacts of the utilization of fossil fuels on climate change, sources, benefits and potentials of renewable energy in Nigeria and the laws, policies, guidelines and regulations governing electricity and renewable energy in Nigeria. It also reviews the theories governing renewable energy in Nigeria.

This research focuses on the EPSRA, the main piece of legislation governing the Nigerian electrical sector, as well as other supporting legal and regulatory frameworks such as the National Renewable Energy and Energy Efficiency Policy (NREEEP), the Nigerian Electricity Regulatory Commission Feed-in Tariff Regulation for Renewable Energy Sourced Electricity, and the Nigerian Electricity Regulatory Commission Mini Grid Regulation.

1.7 Significance of the Study

This research seeks to understand the potentials of the usages of renewable energy sources in Nigeria and identify the renewable energy and electricity supply framework and also identify the incoherence in the legal framework. Currently, the utilization of renewable energy sources in Nigeria energy mix is limited to a large extent, even though their potentials are believed to be significant.

Due to the unavailability of legal frameworks, regulations and policies on renewable energy sources in Nigeria, it remains to be fully delved into. The country has consequently placed heavy reliance on fossil fuels. Thus, in order to promote renewable energy technologies in Nigeria, more effective and responsive policies are required that would cater for immediate needs of people as the availability of renewable energy is vital to the provision of low cost, affordable and regular electricity for industrial development employment generation and poverty alleviation in Nigeria.³¹

This research seeks to recommend legal framework changes aimed at transforming the energy sector in Nigeria from excessive reliance on fossil fuel consumption to generation of electricity through renewable sources of energy. This is done after a thorough comparison study of the legal methods used by Ghana's Electricity Models to handle comparable difficulties. The second step is to undertake a contextual analysis to ascertain if the proposed legislative and regulatory reforms are practical in terms of potential for production, transmission, and off-take, hence allowing the creation of renewable energy. International legal analysts, representatives of the

³¹ M. Akorede & O. Ibrahim, "Current Status and Outlook of Renewable Energy Development in Nigeria" (2017) 36 *Nigerian Journal of Technology (NIJOTECH)*, 196-212

energy business, and the ministries of justice, environment, and natural resources of other countries will all be informed of this proposed legal and policy reform.

1.8 Limitations of the Study

The limitations of this research are the lack of exhaustive data on the sources, benefits and potentials of renewable energy, the uniformity of the laws and stringent implementations on the laws, policies, guidelines and regulations governing electricity and renewable energy in Nigeria and the lack of uniformity of the laws and stringent implementations on the laws, policies, guidelines and regulations governing electricity and renewable energy in Nigeria.

1.9 Operational Definition of Terms

1. **Climate Change:** Climate change is defined as the long-term change in in global or regional climate patterns (temperatures and weather patterns).
2. **Climate Change Mitigation:** Climate Change Mitigation refers to attempts to minimize or avoid greenhouse gas emissions. Mitigation might take the form of implementing new technologies and renewable energy sources, improving the energy efficiency of current equipment, or altering management procedures or customer behavior.³²
3. **Renewable Energy:** This comes from resources found in nature that can be regenerated throughout time. Renewable energy can be extracted, generated and/or consumed without any significant negative impact to the environment. It includes energetic process that can be harnessed with little production. In other words, Renewable energy sources replenish themselves naturally without being depleted in the earth; they include bioenergy,

³² United Nations Environment Programme (1972-2022) <<https://www.unep.org/explore-topics/climate-action/what-we-do/mitigation>> accessed 9 June 2021

hydropower, geothermal energy, solar energy, wind energy and ocean (tide and wave) energy.³³

4. **Electricity:** Electricity is a controllable and convenient form of energy used in the applications of heat, light and power.³⁴ Electricity is the flow of electrical charge or electrical power. It is a secondary source of energy, and that implies that we get it by changing over different wellsprings of energy, like coal, gaseous petrol, oil, thermal power and other regular sources, called essential sources. The energy sources we use to make electricity can be renewable or non-renewable, but electricity itself is neither renewable nor non-renewable.³⁵
5. **Electricity Generation:** The first step in the creation of electricity is electricity generation, which involves acquiring electricity from main energy sources. including fossil fuels (oil, gas, and coal), biomass, nuclear power, or alternative renewable energy sources like solar, wind, geothermal, wave, and tidal power.³⁶
6. **Electricity Transmission:** The second phase toward the energy supply framework includes conveying power created by electrical cables across huge distances to the matrix framework to give the fundamental areas. Devices like transformers are used in this process.³⁷

³³ P. Owusu & S. Sarkodie, 'A Review of Renewable Energy Sources, Sustainability Issues and Climate Change Mitigation' *Civil and Environmental Cogent Engineering* (2016) (3):1167990 <https://www.researchgate.net/publication/299616498_A_Review_of_Renewable_Energy_Sources_Sustainability_Issues_and_Climate_Change_Mitigation> accessed 6 May 2021

³⁴ *Ibid.*

³⁵ Definition of Energy <<https://ei.lehigh.edu/learners/energy/readings/electricity.pdf>> accessed 6 May 2021.

³⁶ *Ibid.*

³⁷ *Ibid.*

7. **Electricity Distribution:** Distribution is the third step in the chain of supply of energy across the nation and it entails getting electricity from the transmission system to the final consumers.³⁸
8. **Electricity Supply Industry:** The electricity supply industry is the power sector that controls the regulatory and institutional frameworks of electricity generation, transmission and sale.³⁹
9. **Fossil Fuels:** Fossil fuel consists of a class of hydrocarbon⁴⁰ (such as coal, petroleum, oil shale, bitumen, tar sands or natural gas) formed within the earth crust that can be used as a source of energy.⁴¹

1.10 Structure of the Study

This research is divided into five chapters. Chapter one entails the background to the study, statement of the problem, aim and objectives of the study, research questions, research methodology, scope of the study, significance of the study, limitations of the study, operational definition of terms and structure of the study. Chapter two furnishes the review of related literatures, conceptual framework and the theories relating to renewable energy, electricity and climate change in Nigeria, the sources of renewable energy in Nigeria, and the challenges to renewable energy development in Nigeria and how to achieve renewable energy in Nigeria's energy mix. Chapter three gives a detailed investigation of the legislative and institutional framework of electricity supply and renewable energy in Nigeria, including the laws, policies, guidelines, regulations and the agencies created by the Nigerian power sector to handle the intrinsic challenges of improved power supply. An investigation of the legitimate structure of the

³⁸ *Ibid.*

³⁹ *Ibid.*

⁴⁰ C. Kopp, "Fossil Fuel Britannica" (2020) <<https://www.britannica.com/science/fossil-fuel>> accessed 30 May 2021

⁴¹ Merriam Webster, "Definition of Fossil Fuels" <<https://www.merriam-webster.com/dictionary/fossil%20fuel>> accessed 30 May 2021

Ghanaian electricity sector determined to make a near examination of this jurisdiction with the Nigerian energy/power area and afterward making pertinent proposals for Nigeria is given in Chapter four. Lastly, summary, and conclusion for definite legitimate and institutional changes for the Nigerian electricity supply area are recommended in Chapter five.

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Chapter Two

Literature Review and Theoretical Framework

2.1 Conceptual Review

According to the World Outlook Report, access to affordable and reliable energy services is fundamental to reducing poverty and improving health, increasing productivity (food, clothing, and shelter), enhancing competitiveness and promoting economic growth in developing countries.⁴² Energy is a term that refers to the source of one of the most important factors in any nation's economic growth, progression, advancement and security.⁴³

Energy supply reliability is a critical concern for all governments today. The drawn out supply of fuel from sources that are reasonable, available and environmental friendly is basic for future financial development. Energy is interwoven with security, environmental change, and general wellbeing. Energy assumes an essential part in each part of a nation's economy. The per capita energy utilization of a nation can be straightforwardly connected with its way of life.⁴⁴

The act of lighting, machine use, channeled water or sewerage, fundamental medical services (refrigerated inoculations, crisis, and serious consideration), instructive help and correspondence are totally made conceivable by energy (radio, TV, electronic mail, the World Wide Web), as well as transportation, farming, trade, assembling, industry and mining are useful exercises that depend on energy. Lack of access to energy, on the other hand, adds to poverty and hardship, as

⁴² The World Energy Outlook (2014) <<https://www.iea.org/reports/world-energy-outlook-2014>> accessed 16 June 2021

⁴³ *Ibid.*

⁴⁴ O. Ohunakin, 'Energy Utilization and Renewable Energy Sources in Nigeria' *Journal of Engineering and Applied Sciences* (2010) 5(2) *Journal of Engineering and Applied Science*, 171–7

well as economic loss. Energy and poverty reduction are not just intertwined, but also with socioeconomic growth, which includes productivity and innovation.⁴⁵

Energy is a source that has come to protect a vital spot in the improvement of any nation. For sure, energy is principal to the satisfaction of fundamental individual and local area needs.⁴⁶ Since all these services are resources by which a country's advancement and improvement are estimated, it then follows that energy is the significant determinant of each and every nation's monetary and social turn of events.⁴⁷ The sad reality is that a greater number of the world's population cannot access good energy sources.⁴⁸ Studies show that over 1.3 billion people living in the poverty-stricken areas in the world have little or no access to electricity⁴⁹ and over 1.2 billion people will still be unable to access electricity in 2030 should the current investment patterns be maintained. Here in Nigeria, about 60 to 70 percent of the Nigerian population has inadequate access to electricity.⁵⁰ Approximately 2.7 billion people, globally, make use of biomass sourced fires for heating and cooking purposes. Although biomass might be good for making fires, it lacks the exigent qualities required to lift people out of poverty.⁵¹

Fossil fuel has remained the mainstream of energy supply across the globe due to high level of dependency of many countries on fossil fuel as their major sources of energy and foreign exchange earnings with the corresponding oil booms. Undoubtedly, emissions from petroleum

⁴⁵ C.E. Nnaji & C.C. Uzoma, "CIA World Fact Book Nigeria" (2010) <<https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html>> accessed 17 June 2021

⁴⁶ O.V. Ojo, 'An Overview of the Legal and Regulatory Framework for Renewable Energy Projects in Nigeria: Challenges and Prospects' (2017) 1(1) *Unilag Law Review* 1

⁴⁷ T. Esan, "Status of Renewable Energy Policy and Implementation in Nigeria" (2008) *Institute for Science and Society, University of Nottingham, United Kingdom*

⁴⁸ Kaime T & R.L Glicksman, "An International Legal Framework for Sustainable Development Law Imperatives" (2015) 38 *Fordham International Law Journal* 1405, 1406

⁴⁹ IEA, UNDP & UNIDO Release Energy Poverty Report, international Institute for Sustainable Development <<http://climatel.iisd.org/news/iea-undp-and-unido-release-energy-poverty-report/>> accessed 20 June 2021

⁵⁰ *Ibid.*

⁵¹ *Ibid.*

products are hurtful to the climate and are liable for the upgraded dangerous atmospheric deviation that has prompted environmental change.⁵² Fossil fuel usage has led to emission of greenhouse gases which are unsustainable globally.⁵³ Subsequently, the world's consideration has been attracted to the requirement for a reasonable improvement plan that requests the utilization of cleaner structures energy, for example, renewables that can advance human prosperity, financial turn of events and ecological security.⁵⁴

Climate change is an inarguable 21st century environmental issue that the world is currently experiencing and attempting to adapt to and reduce its effects. According to the United Nations Framework Convention on Climate Change (UNFCCC), climate change is defined as a change in the composition of the global atmosphere across comparable time periods that is related directly or indirectly to human activities.⁵⁵ Climate change is already having an impact on life on the planet. Seasons are altering around the world, temperatures are rising, and sea levels are rising. Climate change impacts everyone, but the poorest people are the ones who suffer the most although they contribute the least to the problem. According to scientific evidence, the net climatic change has been predominantly driven by atmospheric greenhouse gases.⁵⁶

Subsequently, the world's consideration has been attracted to the requirement for a reasonable improvement plan that requests the utilization of cleaner structures energy, for example, renewables that can advance human prosperity, financial turn of events and ecological security.

⁵² Z.A. Elum & A.S. Momodu, "Climate Change Mitigation and Renewable Energy for Sustainable Development in Nigeria: A Discourse Approach" (2017) *Renewable and Sustainable Energy Reviews Vol. 76 at 72-80* <<https://www.climatechange.mitigationand.renewableenergyforsustainabledevelopmentinNigeria:A.discourseapproach-ScienceDirect>> accessed 20 June 2021

⁵³ O.J Olujobi, O.M. Olujobi & D. Ufua, "The Legal Regime on Renewable Energy as Alternative Sources of Energy in Nigeria's Power Sector: The Impacts and the Potentials" (2020) 19(3) *Academy of Strategic Management Journal*, 1-19

⁵⁴ *Ibid.*

⁵⁵ *The United Nations Framework Convention on Climate Change (UNFCCC) 1992*

⁵⁶ N.E Ebele & N.V Emodi, "Climate Change and its Impact in Nigerian Economy" (2016) 10:(6) *Journal of Scientific Research & Reports*, 1-13

As a result of its duration, unpredictability, occurrences, repercussions, and fairness and justice within global power asymmetries, climate change has been viewed as a complex environmental issue. Climate change, for example, is already relegating people to poverty and hurting economic progress.⁵⁷

Climate change issues such as global warming, greenhouse gas effects, flooding, acid rain typhoons, and increasing sea levels continue to pose a hazard to the planet. Both the United States and China signed the Paris Climate Change Agreement, which aimed to decrease carbon emissions in half over the following fifteen years. This is noteworthy because the United States and China are thought to account for roughly 40 percent of global carbon emissions.⁵⁸

Climate change in Nigeria is wreaking havoc on millions of people's lives. Following the delivery of the 5th Intergovernmental Panel on Climate Change (IPCC) Assessment Report,⁵⁹ climate change has been verified. Africa, of which Nigeria is a part, would be the most impacted by the consequences of climate change.⁶⁰ The threat of climate change to our green planet earth requires a significant increase in renewable energy's proportion of total energy output and consumption as an issue of earnestness. Environmental change influences both human and natural environments, and it might bring about significant changes in asset utilization, creation and financial action.⁶¹ Worldwide, provincial, public, and neighborhood endeavors have been made in developed countries and executed because of the current and possible results of environmental change brought about by the utilization of non-renewable energy sources. The

⁵⁷ *National Climate Change Policy (2021-2030)*

⁵⁸ Jumoke Beyioku, "Climate Change in Nigeria: A Brief Review of Causes, Effects and Solution" (2016), *Federal Ministry of Information, & Culture, Federal Republic of Nigeria* <[https://www.climate change in Nigeria: A brief review of causes, effects and solution - Federal Ministry of Information and Culture \(fmic.gov.ng\)](https://www.climatechangeinigeria.gov.ng)> accessed 16 June, 2021

⁵⁹ *Ibid.*

⁶⁰ *Ibid.*

⁶¹ *The Intergovernmental Panel on Climate Change (IPCC), 1988*

objective is to restrict and decrease future ozone depleting substance fixations in the earth's climate.⁶²

Various models from history delineate how the progress of civilization and human government assistance is personally connected to environment.⁶³ Fossil fuel use will influence future environment. Petroleum derivatives, at present the pillar of monetarily created and emerging nations, supply energy either straightforwardly as fuel or by implication as produced power, for assembling, farming, transportation, and space warming. Future GHG outflows and the resultant environmental change will rely generally upon what's to come of non-renewable energy source utilization.⁶⁴

In lieu of this, the Intergovernmental Panel on Climate Change established in 1988 by the World Meteorological Organization and the United Nations Environment Programme provides authoritative information on the climate change phenomenon, claims that the most recent 100 years warming was strange and probably not going to be normal in beginning.⁶⁵ The IPCC credits essentially the last part of the century's warming to an increase in greenhouse gas emissions into the atmosphere, which is primarily due to human activity: carbon dioxide (CO₂) is generated through the burning of fossil fuels (coals, oil, gas) and land use exercises like deforestation; methane is delivered by animals, rice farming, petroleum derivative use, and landfills; and nitrous oxide is created by the compound business, cow feedlots, and agrarian soils. People have raised their degrees of creation and utilization, which has brought about an ascent in

⁶² P.E Ugwuoke & U.C Agwunobi & A.O Aliyu, "Renewable Energy as Climate Change Mitigation Strategy in Nigeria" (2012) 3(1) *International Journal on Environmental Science*, 11-19

⁶³ C.E Nnaji & C.C Uzoma & J.O Chukwu, 'Analysis of Factors Determining Fuel Wood Use for Cooking by Rural Households in Nsukka Area of Enugu State, Nigeria' (2012) 6(2) *Continental Journal of Environmental Science*, 1-6

⁶⁴ *Ibid.*

⁶⁵ *Ibid.*

ozone harming substance discharges. CO₂, methane, and nitrous oxide outflows have become by 31, 15, and 17 per cent, separately, beginning around 1750, when the modern upset started. Moreover, these gases' emanations are consistently expanding.⁶⁶

The pace at which fossil fuels are used is determined by a number of complicated and interconnected variables. Population growth, fossil fuel supply, energy efficiency, conservation measures, and the use of non-fossil energy sources, general industrial productivity, energy policy, and future climate all influence demand. All of these factors will have an impact on the use of fossil fuels and the future climate.⁶⁷

The growing economies of Africa are at the forefront of an urgent need to combine energy development policies and initiatives with measures to build adaptive capability. They are not only dealing with substantial depletion and pressures on natural resources and ecosystems as a result of climate change, but they are also dealing with rising resource demand.⁶⁸ It is believed that households and communities that rely on fossil fuels for energy face a growing problem as a result of climate change.⁶⁹

2.1.1 Fossil Fuels as Evidence of Climate Change Impacts in Nigeria

According to Elum and Momodu, scientists have noticed and highlighted the link between climate change and the production and use of fossil fuel to generate power supply. Fossil fuels, which are abundant in Nigeria, have been identified as important drivers to increased global

⁶⁶ E. Uyigue, "Renewable Energy and Energy Efficiency and Sustainable Development in Nigeria" (2017) *CREDC Conference on Promoting Renewable Energy and Energy Efficiency in Nigeria*

⁶⁷ *Ibid.*

⁶⁸ F.X. Johnson & F. Lambe, "Energy Access, Climate and Development" (2009) *Stockholm Environment Institute (SEI)* <https://www.0905_SEI_-_Energy_Access_Climate_and_Development.pdf (globalbioenergy.org)> accessed 17 June 2021

⁶⁹ *Ibid.*

warming. Nigeria is on the global map as one of the largest producers of greenhouse gases (GHG) emissions in Africa and this is as a result of the ongoing gas flaring in its Niger Delta region.⁷⁰

This process emits CO₂, which contributes to global warming.⁷¹

According to Oniemola and Sanusi, Nigeria's vast crude oil reserve is located in the Niger Delta region of the country, and more than 11 oil companies are engaged in oil exploitation, during which process approximately 17 billion cubic metres of associated gas is flared, releasing approximately 12 million tons of methane, 3.5 million tons of carbon dioxide, and 160 tons of sulphur dioxide into the atmosphere. As a result, acid rain and oil spills are severe issues in the Niger Delta. These data highlight the significant threat faced by increased energy exploitation of fossil fuels.⁷²

Climate change's detrimental repercussions have prompted the promotion of a green economy. A green economy is one that prioritizes efficient production operations for long-term human well-being, economic progress, and environmental improvement. Although it is widely acknowledged that the developed world's industrialization has been based on energy derived from fossil fuels, developing countries, particularly poor African countries, cannot be exempted from the global drive to mitigate climate change, as there is widespread agreement that effective climate change mitigation requires global efforts. This is due to the inability of GHGs in the atmosphere to be controlled within borders.

Nigeria, like most other developing countries, is extremely vulnerable to the effects of climate change due to its reliance on fossil fuels, and so requires a plan to not just develop responsibly

⁷⁰ Z. Elum & A. Momodu, "Climate Change Mitigation and Renewable Energy for Sustainable Development in Nigeria: A Discourse Approach" (2017) 76 *Renewable and Sustainable Energy Reviews*, 72-80

⁷¹ *Ibid.*

⁷² P. Oniemola & G. Sanusi, "The Nigerian Bio-Fuel Policy and Incentives: A Need to Follow the Brazilian Pathway" (2009) *International Association for Energy Economics*, 35-39

and limit GHG emissions, but also to efficiently transition to a green economy. Renewable energy sources, on this basis, have been promoted to the globe as complementary and/or alternative energy sources of energy because they do not release the toxic GHGs. As a result, several economies are implementing policy and technological changes to boost the share of renewable energy in their energy supply mix. Nigeria is one of these countries that has committed to developing renewable energy to ensure long-term development.

2.1.2 Causes of Climate Change in Nigeria

A report by the Pan African Climate Justice Alliance (PACJA) shows that the earth has already warmed by 0.8 degrees Celsius (0.8°C) prior to the industrial period. By 2060, the average global temperature might increase by around 2 degrees Celsius under the status quo (2°C). The threat posed by climate change is growing more serious and pervasive, affecting every region of the globe.⁷³

According to the IPCC and significant scientific organizations of the developed countries, climate change is caused by two main factors: natural processes (bio geographical) and human activity (anthropogenic) greenhouse gases concentration via the greenhouse effect.⁷⁴ Natural causes outside the climate system can influence the earth's climate, such as variations in volcanic activity, solar output, and the earth's orbit around the sun; however, these factors and their consequences have only a short-term impact on climate.⁷⁵ Human activities such as the burning of fossil fuels, gas flaring, urbanization, agriculture, and changes in land use such as

⁷³ C. Emenyonu, C. Eze & O. Ejike, "Factors Influencing Cassava Farmer's Climate Change Perception in Anambra State, Nigeria" (2020) 9(3) *American Journal of Climate Change* <<https://www.scirp.org/journal/paperinformation.aspx?paperid=102685>> accessed 14 September, 2022

⁷⁴ N.E Ebele & N.V Emodi, "Climate Change and its Impact in Nigerian Economy" (2016) 10:(6) *Journal of Scientific Research & Reports*, 1-13

⁷⁵ Acts on Climate Change. By Canada's action on climate change <<https://www.climatechange.gc.ca/>> accessed 20 June 2021.

deforestation emit greenhouse gases into the atmosphere, increasing the concentration of these gases already present. Human influences have been demonstrated to be blame for the unmistakable climate change or global warming that is occurring.⁷⁶

According to the National Climate Change Policy (NCCP) 2021-2030 the agricultural industry is said to account for a significant portion of Nigeria's Gross National Product, and it employs the vast majority of the country's rural population. This is because the agricultural segment plays a major role in the development of the country and a slight climatic change can have catastrophic social consequences.⁷⁷ Policies aimed at lowering the consumption of fossil fuels such as oil, gas, and carbon has substantial economic consequences for both the producers and suppliers of these energy sources that are not renewable.⁷⁸ Nigeria is renowned as Africa's largest oil producer due to its large landmass of abundant natural gas reserves and the fourth-largest liquefied natural gas (LNG) exporter in 2015.⁷⁹ This is the reason it is discovered that a sustained reduction in the supply and usage of fossil fuels will have a significant impact on Nigeria's national economy.

The oil sector generates about 80 percent of the government revenue, 95 percent of commodity income and in excess of 90 percent of unfamiliar trade profit. Also, Nigeria's government has attempted to diversify her earnings in recent years as it is obvious that a sustained reduction in fossil energy usage will have a significant impact on Nigeria's national economy.⁸⁰ Climate change represents an unprecedented threat to the economy as a whole. Droughts are getting

⁷⁶ N.E Ebele & N.V Emodi, "Climate Change and its Impact in Nigerian Economy" (2016) 10:(6) *Journal of Scientific Research & Reports*, 1-13

⁷⁷ *National Climate Change Policy 2021-2030*

⁷⁸ *Ibid.*

⁷⁹ BP, Statistical Review of World Energy, Excel workbook of historical data, 2015 <<https://www.Nigeria Energy Profile: Largest Oil Producer In Africa And World's Fourth-Largest Exporter Of LNG – Analysis – Eurasia Review>> accessed 20 June 2021

⁸⁰ O.A. Olaniyi, Z.O. Ojekunle & B.T. Amujo, "Review of Climate Change and Its Effect on Nigeria Ecosystem" (2013) 1 *International Journal of African and Asian Studies - An Open Access International Journal* <<https://core.ac.uk/download/pdf/234689728.pdf>> accessed 14 September, 2022

worse in Nigeria's extremely dry zones, and climatic uncertainty is expanding. Northern Nigeria's excessively dry zones are becoming dryer, while the country's southern regions are becoming wetter.⁸¹ All of the attempts to help this great country will be for nothing unless climate change is adequately addressed. Environmental change is not just taking place, but it is also having an impact on how we live. We adapt to environmental instability and control its effects on a regular basis, but we must first understand what environmental change and environmental justice are, how we contribute to it, and how we may mitigate our shortcomings. Environmental change, which is the direct result of a dangerous atmospheric deviation and the disruption of environmental designs and their subsequent effects on the climate and human life, and an increase in earth's average temperature all need urgent interventions.⁸²

2.1.3 Effects of Climate Change in Nigeria

Nigeria is one of the highest emitters of greenhouse gases in Africa, with carbon dioxide emissions among the highest in the world. The act of gas flaring by oil organizations working in Nigeria has been a significant method through which ozone harming substances are delivered into the environment. Some 45.8 billion joules of heat are discharged into the air of the Niger Delta from flaring 1.8 billion ft³ of gas every day. The activities of flaring gas into the atmosphere is held to be unconstitutional as it violates the guaranteed fundamental human rights of life⁸³ and dignity of persons⁸⁴ which are provided in the Constitution of the Federal Republic of Nigeria, 1999 and the African Charter on Human and Peoples Rights.⁸⁵ The court held in the celebrated case of *Jonah Gbemre v Shell Petroleum Development Company of Nigeria Ltd &*

⁸¹ *Ibid.*

⁸² National Aeronautics and Space Administration Global Climate Change (Vital Signs of the Planet). <<https://www.climate.nasa.gov/resources/global-warming-vs-climate-change>> accessed 23 June 2021

⁸³ s33(1) CFRN 1999

⁸⁴ s34(1) CFRN 1999

⁸⁵ Articles 4, 16, and 24 of the African Charter on Human and Peoples' Rights (Ratification and Enforcement) Act

Others as the effect of gas flaring activities is a violation of Section 2(2) of the Environment Impact Assessment Act.⁸⁶

In this way, it was found that the utilization of sustainable power sources will decrease the over-reliance on the consuming of petroleum derivative. Gas eruption has raised temperatures and delivered huge areas of Nigeria appalling. Rather than erupting gas in Nigeria, the gases can be switched over completely to methanol and utilized as a fuel for both homegrown and modern use. Great energy productivity practices and items will extraordinarily limit the need to consume petroleum derivative for energy. The review plans to distinguish the blend of energy utilization that diminishes the emanation of GHGs fit for guaranteeing an eco-accommodating climate for supportable improvement in Nigeria. However some investigations on the utilization of renewable energy and sustainable power to alleviate environmental change have been done.⁸⁷

The country's reliance on fossil fuels as a substantial source of energy causes environmental issues such as oil pollution, carbon emissions, water pollution, climate change, and damage to vegetation and the wildlife. These environmental issues are addressed in a variety of situations. For instance, in *Edamkue & Others v Shell Petroleum Development Company*, the offended parties/respondents founded activity in court for harms coming about because of an oil spillage that had happened throughout the oil investigation exercises of the litigant. Judgment was given for the offended party/respondents both at the Trial Court and at the Court of Appeal.⁸⁸ Nonetheless, the appellants further engaged the Supreme Court on the premise that the offended parties/respondents had the onus to demonstrate that the spillage happened due to the

⁸⁶ [2005] AHRLR 151 NgHC 2005

⁸⁷ *Ibid*

⁸⁸ [2003] 11 NWLR pt832 at 533

carelessness of the appellants. In maintaining the decisions of the lower courts, the Supreme Court depended on strict liability, as laid out in the rule of *Rylands v Fletcher*.⁸⁹

Also the case of *Chief Joel Anaro v Shell Petroleum Development Company*, Shell had laid its pipelines conveying raw petroleum across the land involved by the respondents.⁹⁰ Throughout its oil investigation exercises, oil spilled and yields and vegetation were harmed. The Supreme Court maintained the utilization of the rule of *res ipsa loquitur* by the lower courts, considering the spillage that had occurred. Accordingly, exceptional and general harms that had been granted to the offended party/respondents by the lower courts were maintained.⁹¹

In the case of *Farrah v Shell Petroleum Development Company*, the petition by the plaintiff party was made in a representative capacity, mentioning that damages be paid by Shell to them in light of an oil explosion from the Bomu well possessed and worked by the SPDC.⁹² The explosion went on for quite a long time and substances like rough hydro carbon, sulfur or harmful materials were radiated. These substances framed thick layers over the outer layer of the abutting lands and obliterated ranch land crops, trees with a financial reason, and provincial vegetation. The court awarded judgment in favour of the plaintiff by granting damages.⁹³

Also in the case of *Ambah v Shell Petroleum Development Company*, the offended plaintiff by a writ of summons petitioned for himself and for the Wasewese family of Ojobo in the Burutu Local Government Area protested both general and special damages endured by them when the defendants through their representatives obliterated the fish lakes, streams, lakes and channels arranged close to Beniseide oil fields in Burutu Local Government Area, Delta State of Nigeria.

⁸⁹ UKHL 1 [1868] LR 3 HL 330

⁹⁰ [2002] FWLR 1654, 17

⁹¹ *Chief Joel Anaro v SPDC* Supra

⁹² [1995] 3 NWLR pt 382 at 148

⁹³ *Ibid.* p.192 para E-F

SPDC refused to pay the plaintiff in spite of persistent requests.⁹⁴ The court subsequently granted and awarded special damages against the respondent.

In *Isaiah v Shell Petroleum Development Company*, the appellant's oil pipeline was damaged when an old tree fell on it. The free flow of the crude oil was impeded by this. Crude oil leaked during pipeline maintenance work and landed on the respondent's swamp area as well as on other land, streams, and fish ponds. The plaintiff/respondent was awarded damages in both the trial court and the Court of Appeal. But in a subsequent appeal to the Supreme Court, where the appellant disputed the trial court's authority, the Supreme Court overturned the earlier rulings on the grounds that the trial court lacked jurisdiction. This researcher fully concurs with the Supreme Court's ruling since the fundamental principles that maintain orderliness in pursuing legal remedies, such as making sure the court has the authority to hear a case, ought not to be broken in an effort to uphold environmental rights.⁹⁵

These occurrences show how the multinational oil companies have annihilated neighborhood populaces' normal assets, including their air, water, land, and marine life, while participating in oil exploration exercises. Due to the inescapable error between their assumptions and corporate social obligation, host communities currently view these multinational companies with disdain.⁹⁶ Thus, before another philosophy, for example, inexhaustible power age could be effectively taken on; a seriously soothing procedure would be expected to sharpen these host populaces to the possible benefits of such production. Moreover, thorough adherence to the standards of the regulation overseeing these ventures will be expected to guarantee their drawn out suitability.⁹⁷

⁹⁴ [1996] 66 LRCN 390

⁹⁵ [2001] 11 NWLR pt723, 168

⁹⁶ Oke Yemi, *Nigerian Electricity Law and Regulation* (1st edn LawLords Publications 2013)

⁹⁷ *Ibid.*

In the 2008 case of *Milieudefensie and others v. Royal Dutch Shell Plc (Re Oil Pollution in Nigeria)*, the Dutch appellate court held that Shell is liable for environmental harm caused by oil spills in the Niger Delta, and must compensate Nigerian farmers who have been seriously affected.⁹⁸ The court also ordered the Anglo-Dutch conglomerate to build the necessary measures to protect oilfield infrastructure in the future and Shell must reduce CO₂ emissions by 45 percent by 2030 compared to 2019 levels.⁹⁹ In this case, the plaintiffs (four Nigerian farmers) sued Shell in 2008 in the Netherlands, where the parent corporation, Royal Dutch Shell, is located. The plaintiffs filed three cases, each dealing with the effects of oil spills in the three communities of Oruma, Goi, and Ikot Ada Udo. Shell Nigeria was found responsible for the harm caused by the oil leaks by the Dutch Court of Appeal in January 2021. Royal Dutch Shell was found responsible for failing to avoid future oil leaks and had a duty of care to the affected villages.¹⁰⁰

Oil spills occurred on June 26, 2005, according to the Oruma's complaint, and Shell only closed the pipeline hole on June 29, 2005. The oil allegedly flooded plaintiffs' fields and fishponds, contaminating and rendering them unsuitable for use. The plaintiffs further alleged that the cleanup began in November 2005 and that Shell Nigeria has failed to sufficiently repair the environment around Oruma or their oil-polluted land. The action claimed that Shell Nigeria was negligent in enabling the oil leak to happen, or at the very least in failing to prevent or restrict it, and in failing to effectively remove the oil. Plaintiffs further claimed that Shell Plc (the parent corporation) was negligent in failing to guarantee that its subsidiary carried out oil production in

⁹⁸ [2008] ECLI:NL:RBDHA:2021:5337

⁹⁹ *Ibid.*

¹⁰⁰ *Ibid.*

Nigeria safely, despite the fact that it had the ability and obligation to do so. The other two complaints allege the same thing about oil spills in Goi and Ikot Ada Udo.¹⁰¹

Shell denies any responsibility. Shell claims that the leaks were caused by sabotage, and therefore there is no culpability under Nigerian law in that instance. Furthermore, Shell believes that the pollution has been properly cleaned up. Shell claims that no matter what caused the leaks, they would be cleaned up.¹⁰² The allegations were substantively evaluated by the court under the Nigerian law.¹⁰³ According to the legislation, the party claiming pipeline sabotage bears a severe burden of evidence (Shell in this case).¹⁰⁴ As a result, sabotage must be shown beyond a reasonable doubt.¹⁰⁵ As a result, Shell Nigeria is responsible for any harm caused by the leaking of such pipes. The court ruled that Royal Dutch Shell owed a duty of care to the villagers who were harmed by the oil spill, and that the company is responsible (along with Shell Nigeria) for any failure to prevent future oil spills. The company was also ordered to install leak detection equipment in its pipelines.¹⁰⁶

Following a combined examination of Sections 20 and 33 of the Constitution of the Federal Republic of Nigeria, 1999 (as amended) and Articles 16 and 24 of the African Charter on Human and Peoples' Rights, the Court declared that the State owes the community (represented by the plaintiff) a duty to protect against noxious and toxicant pollutants from the exploration and production of natural resources. The State has implications for future climate claims. Its importance lies in its purposeful interpretation of the legally binding African Charter on Human and Peoples Rights' guarantees of the right to life, the duty of the State to protect the

¹⁰¹ *Ibid.*

¹⁰² *Ibid.*

¹⁰³ s131(1) of the Evidence Act 2011

¹⁰⁴ *Ibid.*

¹⁰⁵ *Owena Mass Transportation Co. Ltd v. Okonogbo* (2018) LPELR-45221(CA)

¹⁰⁶ *Milieudefensie & others. v. Royal Dutch Shell Plc (Re Oil Pollution in Nigeria) Supra*

environment, and the right of all people to a generally satisfying environment favorable to their development as a foundation for recognizing the right to a clean and healthy environment and for establishing a range of qualitative human rights. Given that protecting the environment is both a legal requirement of the Climate Change Act and a fundamental human right.¹⁰⁷

2.1.4 Renewable Energy and Climate Change in Nigeria:

Since 1972, renewable energy has been offered to the world as the energy source of the future for sustainable development.¹⁰⁸ Wind, biomass, geothermal, solar, hydropower, are examples of renewable energy sources. These energy sources are regarded as critical components of long-term development for the following reasons: they have a lower environmental impact than nonrenewable sources, and their use has the potential to address current and future environmental concerns about GHG emissions such as carbon dioxide, oxides of nitrogen and sulphur, and particulate matter caused by the use of power generated from oil, natural gas, and coal.¹⁰⁹ Renewable energy sources are also not exhaustible throughout the course of a human lifetime, unlike fossil fuel resources, which are done through extraction and consumption. Renewable energy sources promote system decentralization and autonomy by enabling local solutions to be employed independently of national or central networks, enhancing system flexibility in terms of delivering economic benefits and services.¹¹⁰

¹⁰⁷ *Centre for Oil Pollution Watch v. Nigerian National Petroleum Corporation* [2019] 5 NWLR pt. 1666 p.518

¹⁰⁸ Z. Elum & A. Momodu, "Climate Change Mitigation and Renewable Energy for Sustainable Development in Nigeria: A Discourse Approach" (2017) 76 *Renewable and Sustainable Energy Reviews*, 72-80

¹⁰⁹ M. Shaban & J.O. Petinrin, "Renewable Energy Potentials in Nigeria: Meeting Rural Energy Needs" (2014) 29 *Renewable Sustainable Energy Reviews* 72-84

¹¹⁰ S.O. Oyedepo, "Energy and Sustainable Development in Nigeria: The Way Forward" (2015) *Energy Sustainable Society* 2:15

According to Twidell and Weir, renewable energy is characterized as “energy got from the persistent and redundant flows of energy repeating on the indigenous habitat.”¹¹¹ The Texas Renewable Energy Industries Alliance (TREIA) likewise gave a satisfactory meaning of the idea of renewable energy which has been embraced by the Texas Legislature and follows: Renewable energy is any energy asset that is normally recovered throughout a brief time frame scale and got straightforwardly from the sun (in warm, photochemical and photoelectric structure), by implication from the sun (in wind, hydroelectric and photosynthetic structure energy put away in biomass), or other regular developments and components in the climate (like geothermal and flowing energy).¹¹²

The Nigerian Renewable Energy and Energy Efficiency Policy (NREEP), 2015 defines renewable energy as energy obtained from energy sources whose utilization does not result in depletion of the earth’s resources. Renewable energy also includes energy sources and technologies that have minimal environmental impacts, such as less intrusive hydro’s and certain biomass and combustion. These sources of energy normally will include solar energy, wind, biomass, small and medium hydro, geothermal, tide and wave energy.¹¹³ No matter what the definition, the idea of sustainable power remains something similar. As opposed to non-renewable energy sources, they are ecologically valuable, self-recharging, boundless, and in this manner viewed as the method representing things to come. Developed nations strive for environmentally friendly energy resource utilization that has little to no negative effects on the environment. Over time, technology for generating energy from renewable sources has

¹¹¹ G. Boyle, “Renewable Energy: Power for a Sustainable Future” (2nd edn, Oxford London Publishers 2015) p.10

¹¹² *Texas Renewable Energy Industries Alliance*: “Definition of Renewable Energy”
<<https://www.treia.org/renewable-energy-defined/>> accessed 14 August 2021

¹¹³ Para 1-3 *National Renewable Energy and Energy Efficiency Policy, 2015*

changed.¹¹⁴ The number of countries generating power from renewable sources is growing.¹¹⁵ Germany, China, the United States, Brazil, Canada, South Australia and South Africa are examples of nations that have been observed to have achieved substantial advancements in their renewable energy sub-sector.¹¹⁶

However, implementing such a shift in Nigeria has been challenging since the country's energy plans have yet to bear fruit. Nigeria's future energy demands will be driven by a mix of variables, the most significant of which are population expansion and ambition for industrialization. Rising population is anticipated to lead to growing urbanization, which would need an increase in the demand for residential and commercial structures. Deforestation which is typically connected with urbanization as trees are chopped down to make room for roads and buildings is a danger to sustainable development because it lowers the earth's capacity to absorb carbon. More importantly, deforestation deprives wildlife of their habitat.¹¹⁷

Nigeria will need to increase its focus on renewable energy as demand for its crude oil, which provides the majority of its foreign exchange, dwindles due to increased use of alternative energy. Rising population indicates greater usage of vehicles, which leads to increased automobile exhaust emissions and GHGs such as CO₂ and NO₂.¹¹⁸ In light of these circumstances, Nigeria must build a solid strategy based on in-depth policy research in order to meet present and upcoming difficulties.

¹¹⁴ "International Energy Agency, Renewables in Global Energy Supply: An IEA fact sheet 2007" <https://iea.blob.core.windows.net/assets/f27528ad-012a-4d4b-992c-382c2d1d7478/renewable_factsheet.pdf> accessed 20 June, 2022

¹¹⁵ A. Aliyu & J. Dada & I. Adam, "Current Status and Future Prospects of Renewable Energy Use in Turkey" (2015) 48 *Energy Explore Exploit* 336–46 <<https://www.dx.doi.org/10.1260/0144-5987>> accessed 15 August 2021

¹¹⁶ F. Beck & E. Martinot, "Renewable Energy Policies and Barriers" (2017) *Encyclopedia of Energy* 5:365–83

¹¹⁷ *Ibid.*

¹¹⁸ J.R. Nolon, "Land Use for Energy Conservation and Sustainable Development: A New Path towards Climate Change Mitigation" (2016) 27 *Journal of Land Use Environmental Law*, 295–337

In addition, the Energy Commission of Nigeria (ECN) reported that Nigeria's annual consumption of electricity has increased from 1273 GWh in 1970 to 29,573 GWh in 2012, representing an annual growth rate of 2.2 percent in 42 years. Electricity demand projection for 2030 was put at about 192,000 MW at an estimated per capita consumption level of 5026 KWh. This figure represents an annual increase rate of 4.7 percent in power consumption, which is more than double the pace between 1970 and 2012. The implications of more than tripling the pace of growth in energy demand are mind-boggling, given that capacity expansion was stagnant between 1970 and 1999.¹¹⁹

According to current estimates, only approximately 40 percent of Nigeria's population is linked to the national power system, and those that are connected are constantly plagued by unpredictable power outages.¹²⁰ As a result of the constant power outages, many residents resort to using private generators, which significantly contribute to air and noise pollution.¹²¹ It is obvious that power consumption in Nigeria exceeds existing supply, which has been seen as a major impediment to the country's economic and technical growth. Thus, in light of rising population, it is understandable that increasing demand for fossil-fuel-based energy would be unsustainable, resulting in additional environmental degradation and increased climatic unpredictability. As a result, the use of renewable energy sources will provide a consistent and long-term supply of energy in Nigeria.¹²²

¹¹⁹ Energy Commission of Nigeria National Energy Masterplan (Draft Revised Edition) 2014 <https://rise.esmap.org/data/files/library/nigeria/Clean%20Cooking/Supporting%20Documentation/Nigeria_National%20Energy%20Master%20Plan%20Draft.pdf> accessed 20 June, 2022

¹²⁰A.S. Aliyu, J.O. Dada & I.K. Adam, "Current Status and Future Prospects of Renewable Energy Use in Turkey" (2015) *Energy Explore Exploit*, 336-46

¹²¹ *Ibid.*

¹²² *Ibid.*

Nigeria has progressed toward exploitation of its various and accessible energy sources against the backdrop of climate change management and energy security concerns. This trend may be seen in the shifts in policy and law that affect the trajectory of innovations and practices in the country's energy sector. These reforms, which include the creation of the Renewable Energy Master Plan in 2006 to encourage the use of renewable energies and the Electric Power Sector Reform Act 2005 in the traditional energy sector, demonstrate a country that is aiming for the most efficient use of these energy sources.¹²³ Despite the fact that the country's electrical infrastructure is mostly fueled by hydropower and fossil fuel resources,¹²⁴ Nigeria is endowed with an abundance of renewable energy resources. Nigeria's renewable energy potential is around 1.5 times that of its fossil energy resources, with hydropower being the greatest and most important source of power generation and supply.¹²⁵ Nigeria first incorporated renewable energy in its National Energy Policy (NEP) in 2003, and as part of its long-term growth strategy, the Renewable Energy Master Plan (REMP) was created in 2006.¹²⁶ The NEP states that the nation would continue to make significant investments in the advancement of electric power, with the goal of supplying dependable electricity to 75 percent of the population by 2020, as well as improving the energy mix for generating electricity.¹²⁷ The policy focuses on Nigeria's demand for greater energy supply, enhanced system stability, and security.

Like the UNFCCC the Clean Development Mechanism (CDM) was incorporated into the Kyoto Protocol, CDM projects enable organizations from developed nations to invest in projects in

¹²³ *Electric Power Sector Reform Act, 2005*

¹²⁴ A.S. Aliyu, J.O. Dada & I.K. Adam, "Current Status and Future Prospects of Renewable Energy Use in Turkey" (2015) *Energy Explore Exploit*, 336-46

¹²⁵ M. Shaban & J.O. Petinrin, "Renewable Energy Potentials in Nigeria: Meeting Rural Energy Needs" (2014) 29 *Renewable Sustainable Energy Reviews* 72-84

¹²⁶ Vanguard Newspaper Boost Renewable Energy in Nigeria (2012) <<https://www.vanguardngr.com/2012/12/boost-Renewable-Energy-in-Nigeria/>> accessed 10 September 2021

¹²⁷ National Energy Masterplan (Draft Revised Edition) 2014

developing countries.¹²⁸ Verified emission reductions are obtained by the investor in the industrialized nation in exchange for this investment. This allows developed nations to fulfill their Kyoto Protocol carbon reduction objectives more cost-effectively, while also supporting sustainable development in poorer countries.¹²⁹

Investments in clean energy infrastructure are often seen as the most effective strategy to enhance Nigerian proponent's involvement in the CDM process, and therefore the global carbon market. Investment in green energy is described as investment in an energy supply and usage system that produces the needed energy with minimum negative environmental and social repercussions.¹³⁰

The salient characteristics of clean energy investment are: (i) the resulting system results in little or no emissions of obnoxious gases and particulates; (ii) the clean energy technologies have a carbon footprint that is much lower than the baseline emission scenario; (iii) the technology is accessible, and the required investment is available for adoption in developing countries like Nigeria; and (iv) the implementation of the clean energy technology will contribute to sustainability.¹³¹

According to the second assessment report of the IPCC, the only way to stabilize atmospheric greenhouse gas concentrations at levels that would prevent significant interference with the climate system is to greatly increase the usage of renewable energy. In one IPCC scenario, if greenhouse emissions are stabilized by 2050, renewable energy's contribution in the global

¹²⁸ H. Winkler & D. Van, "Energy Efficiency and CDM in South Africa: Constraints and Opportunities" (2018) *Journal of Energy in South Africa* 18:29-37

¹²⁹ *Ibid.*

¹³⁰ OECD – Mobilizing Investment in Clean Energy Infrastructure (2018) <<https://www.oecd.org/investment/clean-energy-infrastructure/htm>> accessed 19 June, 2022

¹³¹ *Ibid.*

energy balance must rise tenfold from its current level. The needed rise in underdeveloped nations is considerably more drastic, predicted to be a 20-fold increase between 1990 and 2050. Further gains in energy efficiency and conservation can cut emissions in the short term, effectively buying time for the necessary adjustments in energy production.¹³² Nigeria is one of the highest emitters of greenhouse gases in Africa. The use of renewable energy sources will reduce over dependence on fossil fuel. Instead of flaring gas, the gases can be converted to methanol and used as a fuel for both domestic and industrial use.¹³³

2.1.5 Renewable Energy Generation in Nigeria

The rising need for renewable sources of energy is a direct reaction to the issues of the century: The decreasing supply of crude oil,¹³⁴ the adverse impacts of climate change, and global warming generated by the combustion of fossil fuels for energy production are a few of these issues. The sources of energy were chosen based on convenience, availability, and the immediate demand for energy before there was an increase in lobbying for the introduction of renewable energy into the power sector.¹³⁵ However, the former energy choices coal, crude oil, and gas have necessitated the growth of the energy industry through the investigation of cleaner energy alternatives.

¹³² “The United Nations (UN) Report on the National Fuel wood Substitution Programme: United Nations Publications”, New York, Energy Statistics Yearbook (1993)
<<https://www.un.org/press/en/1995/19951031.stat431.html>> accessed 20 June, 2022

¹³³ L.F. Awosika, “Impacts of Global Climate Change and Sea Level Rise on Coastal Resources and Energy Development in Nigeria” cited in J.C. Umolu, “Global Climate Change: Impact on Energy Development” (2015) *DAMTECH Nigeria Ltd*, 108-157

¹³⁴ Bruce Usher, “*Renewable Energy*” (Columbia: Columbia University Press, 2019) p.7-9

¹³⁵ E.L Efurumibe, A.D. Asiegbu, G.U. Chukwu & M.O. Eze, “Energy Problem in Nigeria-Advantages of Renewable Energy Sources over the Current Energy Matrix in Nigeria” (2015) (3)2 *International Journal of Engineering and Technical Research* 142 at 143

The earliest source of energy in history was fire, which was used by humans to burn wood for thousands of years.¹³⁶ This was related to the large number of forest reserves from which the wood was sourced.¹³⁷ As the number of people on earth increased and more housing was needed for them, the price of wood increased, and the energy sector switched from using wood to coal as a source of energy.¹³⁸ Two things about this first stage should be kept in mind, even though burning wood releases twice as much carbon into the atmosphere as burning coal does,¹³⁹ the wood was taken from naturally sustainable forests, and the number of polluting humans was still quite small.¹⁴⁰

Given that coal is a source of energy that emits GHGs and has detrimental effects on the environment, its usage has led to new issues. During this time, the energy mix also included other traditional, GHG-emitting energy sources including natural gas and crude oil.¹⁴¹ However, as time went on, it became impossible to ignore the impacts of pollution. A phase of transition to renewable energy sources with a lower environmental effect was started in the twenty-first century.

The cost, repercussions, and sustainability of the technologies that will be used in the transition are often the most important factors to take into account before agreeing to any change in the

¹³⁶ G. Pagnoni & S. Roche, *"The Renaissance of Renewable Energy"* (Cambridge: Cambridge University Press, 2015) 26

¹³⁷ *Ibid.*

¹³⁸ U. Aswathanarayana & T. Harikrishnan & K. Sahini, *"Green Energy Technology, Economics and Policy"* (CRC Press Taylor & Francis Group, 2010) at 7-10

¹³⁹ PFPI: "Carbon Emissions from Burning Biomass for Energy"

¹⁴⁰ *Ibid.*

¹⁴¹ U. Aswathanarayana & T. Harikrishnan & K. Sahini, *"Green Energy Technology, Economics and Policy"* (CRC Press Taylor & Francis Group, 2010) at 7-10

energy industry.¹⁴² The case for switching to renewable energy is typically weak economically since conventional energy is so abundant and affordable.¹⁴³

The perspectives of the various groups of people engaged have a significant impact on sociological responses to energy transition. For instance, any plan to rescue the planet and stop the dangers that climate change brings to the globe is beneficial in the eyes of environmentalists.¹⁴⁴ While there are obvious environmental repercussions, the economist, on the other hand, first strives to take into account the financial ramifications of new technology required for any energy sector shift.¹⁴⁵ Despite arguments based solely on economics to the contrary, it is urgently necessary to shape and restructure Nigeria's legal system, policies, and institutions to accommodate changes in the energy sector. This is because the technologies used to produce renewable electricity have lower emissions than electricity produced using fossil fuels.¹⁴⁶

As explained in Chapter One of this research work, particularly the background to the study, for all of citizens of Nigeria, there is not enough energy available. Both conventional and renewable energy sources are available in the nation.¹⁴⁷ To a significant degree, it is reasonable to consider combining this energy mix to meet the demands of the country's urban and rural areas or at the very least, to raise the level of electrification in the nation to help the economy.¹⁴⁸ Crude oil,

¹⁴² P. Anthony, *Transforming Energy: Solving Climate Change with Technology Policy* (Cambridge: Cambridge University Press, 2015) p.151

¹⁴³ Bruce Usher, *Renewable Energy* (Columbia: Columbia University Press, 2019) p.7-9

¹⁴⁴ *Ibid.*

¹⁴⁵ *Ibid.*

¹⁴⁶ National Academy of Engineering & National Research Council of the National Academies, *Electricity from Renewable Resources Status Prospects and Impediments* (National Academies Press, 2010) 8-9

¹⁴⁷ "Conventional energy sources are sources of energy such as natural gas, oil and coal that have limited capacity" <<https://www.sciencedirect.com/>> accessed 22 June, 2022

¹⁴⁸ O. Olatunji, S. Akinlabi, O. Ajayi, A. Abioye, F. Ishola, P. Mashini & N. Madushele, "Electric Power Crisis in Nigeria: A Strategic Call for Change of Focus to Renewable Sources" (2018) *IOP Conference. Series: Materials Science and Engineering* 413 <<https://core.ac.uk/download/pdf/250567965.pdf>> accessed 22 June, 2022

natural gas, tar sands, and coal are a few of Nigeria's traditional energy resources.¹⁴⁹ Currently, the nation's main energy source is crude oil.

According to studies, Nigeria is abundant in renewable sources of energy as wind, solar, hydro, biomass, geothermal, wave, and tidal energy.¹⁵⁰ The global climate change issue, the volatile price of crude oil in connection with its detrimental effects on the environment, and the social crisis that the host communities of oil and gas projects experience as a result of the adverse effects that oil and gas exploration brings to their regions have made renewable energy an unavoidable choice for the Nigerian energy sector. These main sources of renewable energy are:

2.1.5.1 Solar Energy

Solar energy is energy derived from sunlight and sunlight is one of our planet's most abundant and freely available energy resources.¹⁵¹ It is often used for a variety of applications. It is utilized commercially as a significant source of energy to power businesses and industry. Surprisingly, plants rely on it for photosynthesis.¹⁵² Solar energy is also an efficient renewable source of energy utilized to power smaller grids in places that are not currently linked to the national grid. One method is to utilize photovoltaic equipment and heating water to drive turbines in thermal electric generators.¹⁵³

2.1.5.1.1 Advantages of Solar Energy

1. Constant Availability:

¹⁴⁹ *Ibid.*

¹⁵⁰ *Ibid.* para 2.1-2.6 NREEEP

¹⁵¹ O. Njoku, "Renewable Energy as an Alternative to Fossil Fuel Use: A Legal Framework for Advancing Low Carbon Energy Transition in Nigeria" (2019) *Electronic Thesis and Dissertation Repository* 6651

¹⁵² P. Matthew, "Photosynthesis 60 Essays in Biochemistry" (2016) 255

¹⁵³ T. Olaoye, T. Ajilore, K. Akinluwade, F. Omole & A. Adetunji, "Energy Crisis in Nigeria: Need for Renewable Energy Mix" (2016) 4:1 *American Journal of Electrical and Electronics Engineering*, 1-8

Solar energy, a sun powered energy is a normally inferred wellspring of energy. Along these lines, insofar as nature exists and there is sun, its accessibility is guaranteed. Dissimilar to a few other elective wellsprings of energy that are occasional in nature, daylight is not occasional in Nigeria and could be an appropriately bridled type of energy.

2. Zero Carbon Emissions, Availability of Employment and Economic Benefits:

Solar energy does not emit GHGs. It does not release environmentally harmful greenhouse gases or carbon. It is a very clean and green source of power.¹⁵⁴ Where there are appropriate legal and institutional structures in place to enhance the use of solar power as a major source of energy, there is an assurance of adequate returns on investment through the provision of grants, tax incentives and economic rebate plans to offset the initial high cost involved in erecting the solar panels.¹⁵⁵

3. Stress Free Maintenance

Solar panels are mostly inclined with low maintenance costs. However, the inverters may need to be changed after a limited period of time, but the cost of refurbishing the solar system is usually minimal.¹⁵⁶

2.1.5.1.2 Disadvantages of Solar Energy

¹⁵⁴ Ogechi Judith Njokoji, "Renewable Energy as an Alternative to Fossil Fuel Use: A Legal Framework for Advancing Low Carbon Energy Transition in Nigeria" (2019), Electronic Thesis and Dissertation Repository, The University of Western Ontario <<https://core.ac.uk/download/pdf/250567965.pdf>> accessed 19 June, 2022

¹⁵⁵ *Ibid.*

¹⁵⁶ *Ibid.*

1. High Initial Capital:

One of the major disadvantages of solar power projects is the high initial cost of constructing the solar panels needed to harness the energy. This informs the negative attitude of countries with strong fossil fuel background towards exploring renewable energy as an alternative source.¹⁵⁷ However, once the equipment has been successfully installed and the energy sources are properly harnessed, it becomes a very cost effective model. Therefore, transforming to this should involve taking a long-term approach because its benefits are not immediate. Also, apart from the monetary cost of erecting solar panels, another major form of initial cost incurred is termed energy cost.¹⁵⁸ The manufacturing of solar panels requires raw minerals whose extraction involves a high cost in terms of energy, especially with relation to GHG and carbon emitting energy generation sources. Some of these raw minerals include quartz, aluminum and copper.¹⁵⁹

2. Climatic Variations:

The amount of energy to be derived from solar is largely dependent on the atmospheric conditions of each day.¹⁶⁰ Despite the assurance that the availability of sunlight makes for an abundance of solar power, the level of power generated on cloudy or rainy days cannot be the

¹⁵⁷ *Ibid.*

¹⁵⁸ *Ibid.*

¹⁵⁹ *Ibid.*

¹⁶⁰ O. Bamisile, D. Mustafa, B. Akinola & O. Ayodele, "A Review of Renewable Energy Potential in Nigeria: Solar Power Development over the Years" (2017) 44:4 *Engineering and Applied Science Research* 242 <<https://www.researchgate.net/publication/321384759>> accessed 12 October 2021

same as that on sunny days. This has led to the addition of batteries to store solar energy for readiness purposes.¹⁶¹

3. Battery Storage Problems

Despite the fact that solar is constantly available because of its naturally derived nature, solar power is largely dependent on weather conditions and the timing of the day. Therefore, it is important to seek appropriate measures to store the energy derived from the solar panels; this implicitly necessitates the use of batteries. Also, an alternative to grid connected solar systems is an off-grid or stand-alone solar system that would require battery storage and batteries could be very complicated and costly.¹⁶²

4. Recycling Problems

In Nigeria, solar power is just a new idea that is yet to be fully harnessed. However, it would be beneficial to factor in the ways in which these solar panels could be disposed of at the end of their cycle, with stringent legal consequences for breach of such procedures. That would ensure that the same environmental degradation issues that necessitated the transition to renewable energy sources in the first instance would not simply re-occur. Solar panels have a life cycle of 20 to 30 years and are associated with the production of a large amount of waste that is difficult to recycle. When compared to nuclear energy, for instance, they produce more toxic waste because they contain lead, cadmium and other toxic materials that can only be gotten rid of by breaking apart the equipment to dispose of all the individual components.¹⁶³

5. Insurgency and Insecurity

¹⁶¹ *Ibid.*

¹⁶² *Ibid.*

¹⁶³ *Ibid.*

In order to harness solar energy in large capacity (off grid) in Nigeria, the Northern areas are the best places for its generation. However, the insecurity occurring in the country as a result of banditry can make the initiative be dead before arrival.

2.1.5.2 Wind Energy

Wind energy is derived by using a wind turbine and other elements to transform kinetic energy of moving air into electricity or other forms of energy as required. These wind turbines are usually in one of two forms: large wind turbines that generate electricity and feed it into the grid, or small turbines that are erected specifically to provide electricity directly to consumers such as individual homes, small businesses, or farms.¹⁶⁴ The latter form has experienced significant growth in recent times. Research shows the presence of wind energy in Nigeria, particularly in the Northern part of the country where there is abundance of wind, for example in states like Yola, Jos and Sokoto. However, wind energy is not in use for commercial production of electricity in Nigeria.¹⁶⁵

A major wind mill project is to be found in the Rimi Local Government Area (LGA) in Kastina State. It promises a constant power supply to the local communities around the project site. This is Nigeria's first ever wind farm power project and the government is positive that it will provide the surrounding areas with adequate light without the need to depend on the national grid.

2.1.5.2.1 Advantages of Wind Energy

¹⁶⁴ Henrik Lund, "Renewable Energy System: A Smart Energy Systems Approach to the Choice and Modeling of 100% Renewable Solutions" (2nd edns, Academic Press Elsevier Incorporation, 2015) 12-14

¹⁶⁵ O. Bamisile, D. Mustafa, B. Akinola & O. Ayodele, "A Review of Renewable Energy Potential in Nigeria: Solar Power Development over the Years" (2017) 44:4 *Engineering and Applied Science Research* 242 <<https://www.researchgate.net/publication/321384759>> accessed 12 October 2021

Since wind energy does not require direct sunlight exposure like solar energy does, it provides benefits and is an effective alternative for many different regions of the world.

1. Non-usage of fuel

Wind energy does not use fuel because wind turbines themselves are entirely powered by wind energy. The turbine does not require fuel or a power source to function after it has been built and installed. Compared to other renewable energy sources, which could require some energy expenditure, this also lowers the total cost to maintain large-scale wind farms.¹⁶⁶

2. Clean form of energy

Wind energy does not cause climate change by releasing greenhouse gases during energy generation since the turbines are not powered by fossil fuels. The only times wind energy indirectly emits greenhouse gases are during the production, transportation, and installation of the wind turbines.¹⁶⁷

3. Does not disrupt farmland operators

Wind turbines can be installed by energy providers on existing farms in exchange for contracts or leases from the farm owners. This is a huge benefit for farmers who might use some additional money, and because wind turbine footprints are so small on the ground, it won't affect how productive their farm is. For instance, wind energy accounts for less than 1.5% of the total land

¹⁶⁶ *Ibid.*

¹⁶⁷ *Ibid.*

area in the contiguous United States currently.¹⁶⁸ However, there is a lot of room for growth if landowners and government land managers are game, given the abundance of plains and cattle land in the interior of the nation.¹⁶⁹

4. Reduces fossil fuels dependency

Someday, it is believed that we will eventually run out of energy produced by fossil fuels, which also contributes to climate change. There will always be wind as long as the sun warms the globe.¹⁷⁰ Furthermore, it is a horrible waste of human resources, private money, and government money to create and invest in technology that can only operate on a limited resource that we could run out of in our lifetime.¹⁷¹

2.1.5.2.2 Disadvantages of Wind Energy

Wind energy still has drawbacks and restrictions even though it is a renewable, environmentally friendly kind of electricity generation.

1. Wildlife endanger

Wildlife is known to be endangered by wind turbines. The blades that move on the fan-like structure of wind turbines as they are spinning might hurt or kill flying birds and bats that cross their habitats or migratory routes. Fish and animal conservation organizations are concerned

¹⁶⁸ Office of Energy Efficiency & Renewable Energy, Wind Vision: A New Era for Wind Power in the United States, <<https://www.energy.gov/eere/wind/maps/wind-vision>> accessed 22 June, 2022

¹⁶⁹ *Ibid.*

¹⁷⁰ Office of Energy Efficiency & Renewable Energy, Wind Energy Basics <<https://www.energy.gov/eere/wind/wind-energy-basics>> accessed 22 June, 2022

¹⁷¹ *Ibid.*

about the mortality of birds and bats at wind farm locations since it is a contentious issue.¹⁷² Wildlife on the ground may also be impacted by noise pollution from spinning blades, in addition to wildlife that flies through the air. Although wind turbines might harm animals, other structures like skyscrapers and big windows are similarly dangerous and are still being developed with little concern or equivalent protest.¹⁷³

2. Noise Pollution

Wind turbines are typically situated in relatively rural locations where few people dwell because they may be rather noisy. Noise is not a problem depending on where the turbine is, such as offshore. Newer designs have been demonstrated to have substantially lower noise complaints because to technological developments.¹⁷⁴

3. Expensive

These enormous constructions of wind turbines frequently reach heights of several hundred feet and demand a large “initial investment. In order to transfer power to more inhabited places like towns and cities where it is required, placing wind turbines in rural areas necessitates additional investment in underground connections. The early building and installation phase accounts for the bulk of the expense, but after those stages are completed wind energy generates an infinite supply of electricity for as long as there is wind”.¹⁷⁵

4. Unpredictable and unreliable

¹⁷² Wind Energy Development Programmatic EIS, Wind Energy Development Environmental Concerns <<http://windeis.anl.gov/guide/concern/index.cfm>> accessed 22 June, 2022

¹⁷³ Wind Energy: Pros and Cons op cit.

¹⁷⁴ *Ibid.*

¹⁷⁵ *Ibid.*

Because of the erratic nature of the wind, wind energy experiences a problem known as intermittency. It is challenging to forecast how much energy wind will be able to gather at any particular time since wind might blow at different speeds. This implies that in the event that the winds die down for an extended period of time, providers and towns must have a store of energy or other sources of electricity.¹⁷⁶

2.1.5.3 Hydro Energy

Hydro energy is conceivably regarded as the major source of electric power generation and supply in Nigeria because the country is endowed with large rivers, waterfalls and dams. Only large hydropower technology is the prominent commercial renewable energy technology in the electricity supply mix of the country. Due to economy of scale, large hydro energy technology takes the lion share of the entire commercial renewable energy sources for electricity generation under any CO₂ emission constraints.¹⁷⁷

Unlike fossil fuel, hydro energy is renewable and can supply uninterrupted fuel, except for the question of water levels. “Nigeria’s current electricity supply mix shows that hydropower accounts for about 19 percent of the entire electricity grid.¹⁷⁸ Statistics as provided by the International Hydropower Association also shows that as of 2017, the total installed hydro energy capacity was 2,062 MW and the actual hydro energy generated for the year amounted to 7,310 GWh”.¹⁷⁹

¹⁷⁶ *Ibid.*

¹⁷⁷ J.F. Akinbam, “Renewable Energy Resources and Technologies in Nigeria: Present Situation, Future Prospects and Policy Framework” (2017) *Mitigation and Adaptation Strategies for Global Change Vol. 6(2):155–82*

¹⁷⁸ “The World Fact Book” (2019) Central Intelligence Agency

¹⁷⁹ *Ibid.*

Nigeria has large rivers and natural waterfalls. Prominent among these are the famous Niger and Benue rivers and also the Lake Chad basin, with a good amount of water resources being available in them.¹⁸⁰ Inadequate investment in these resources has caused Nigeria to be described as an “economically water-scarce country”, not because the country lacks water, but due to the failure to devise adequate legal strategies to enhance the exploitation of this resource.¹⁸¹ Even with the recent NREEEP that acknowledges the government’s goal of fully harnessing Nigeria’s hydropower potential by promoting investments into the sector in alignment with Sustainable Energy for All (SE4ALL)’s initiative,¹⁸² it is still difficult to see the direct impact that these efforts has had because the regulatory institutions lack the requisite checks and balances to be able to enforce the policies in question. Hence the insignificant increase in the percentage that hydropower has to contribute to Nigeria’s electricity supply mix. For instance, it is not enough for the NREEEP to state in its hydropower programme targets that it aims to achieve a certain quantity of hydro energy generation and detailing its short term, medium term and long term goals, the relevant institution must be equipped with the necessary funds and must have its activities verified to ensure proper implementation.

2.1.7.1 Advantages of Hydro Energy

¹⁸⁰ *Ibid.*

¹⁸¹ *Ibid.*

¹⁸² *Sustainable Energy for All Initiative*

The most well-known type of hydro energy, usually referred to as hydroelectric power, is a sizable dam that stores water in a reservoir. Water is released from the reservoir when energy is required, and the water then drives turbines to generate electricity.

1. **Renewable Nature**

Hydro energy is categorized as a renewable energy source because it is powered by water, which is a naturally renewing resource. A hydro energy plant generates power using water as its energy source, hence no pollution is released during the process. Hydro energy is renewable because water naturally replenishes itself and does not produce greenhouse gas emissions.¹⁸³

2. **Low emissions**

Carbon dioxide, a greenhouse gas that fuels global climate change, is not released during the process of producing electricity using hydro energy. In contrast to many of its non-renewable energy competitors, such as coal and natural gas, hydro energy plants do not release pollutants into the atmosphere after they are built.¹⁸⁴

3. **Reliable**

A particularly dependable renewable energy source is hydro energy. When choosing the location for a hydro energy plant, either on a river that is actively flowing or created with a dam to control water flow, it is taken into account that water flow is often quite predictable. The output of power can also be changed. Water may be diverted away from the turbines and less energy is

¹⁸³ Solar Reviews: Hydropower Pros and Cons <<https://www.solarreviews.com/blog/hydroelectric-energy-pros-and-cons>> accessed 22 June, 2022

¹⁸⁴ *Ibid.*

produced if there is less demand for energy. Contrarily, more water can enter the plant for the purpose of producing electricity if more energy is required.¹⁸⁵

4. **Safe**

In general, hydro energy is a highly safe method of producing electricity. Since a hydro energy plant solely uses water as fuel, no disease-causing pollutants is released during energy production, and there is absolutely no risk of oil spills or gas pipeline breaks.¹⁸⁶

2.1.7.2 **Disadvantages of Hydro Energy**

Despite being a fantastic technique to generate power, hydroelectric dams have several disadvantages.

1. **Environmental Consequences**

Hydro energy plants may be challenging to construct because, when a dam is employed, a formerly dry land area would be inundated with water and used as a reservoir. That implies that whatever ecosystem was there will be destroyed. The river's natural flow will also be impacted. A non-natural water flow causes problems that range from altering fish migratory patterns to less silt reaching the river's terminus, which is a natural manner to build up and sustain land. Additionally, as many rivers cross many states, damming them might result in upstream nations taking more water than they should while leaving less water for nations downstream.¹⁸⁷

¹⁸⁵ *Ibid.*

¹⁸⁶ *Ibid.*

¹⁸⁷ *Ibid.*

2. Expensive to build

Any sort of power plant construction is expensive; hydro energy facilities, which typically have capacities between 10MW and 30MW, may be built for as much as \$580 per kilowatt (where one MW is equal to 1,000 kilowatts). This implies that the initial expense of constructing a hydro energy plant can be in the millions of dollars. Hydropower is a more difficult renewable energy project to finance in comparison to the declining costs of solar systems, for instance.¹⁸⁸

3. Drought Potential

If there is a drought and insufficient water is coming into the plant, the capacity to produce energy may be significantly decreased. The good news is that most droughts only disrupt the normal water cycle for a brief period of time, meaning that energy production should only be somewhat hampered.¹⁸⁹

4. Limited reservoirs

Finding a location that is acceptable, has a plentiful year-round water supply, has the correct volume of water, and is close enough to current electricity lines is difficult. Maintaining enough river water naturally (that is, without dams) as against damming several rivers for power requires a complex balancing act.¹⁹⁰

2.1.8 Biomass Energy

Biomass is an indirect form of solar energy because it arises due to photosynthesis. Fuel wood is the most common form of biomass energy. Nigeria is very rich in biomass resources such as

¹⁸⁸ *Ibid.*

¹⁸⁹ *Ibid.*

¹⁹⁰ *Ibid.*

wood, forage grasses and shrubs, wastes arising from forestry, agricultural, municipal and industrial activities, as well as aquatic biomass.¹⁹¹ In Nigeria the average waste generated is estimated at 0.43 kg/head per day and the majority of this derives from organic waste.¹⁹² No percentage of Nigeria's electricity mix is currently derived from biomass. Also, most often corn husks, shells and other unfinished products of the agricultural process are left to decompose and waste away with little or no efforts being made to exploit this source of energy and convert it into a form of energy that can be used.¹⁹³

A notable pioneering attempt to determine the viability of biomass as a useful source of energy for Nigeria was made by the All Power Labs (APL)¹⁹⁴ by developing technology¹⁹⁵ that makes renewable energy from biomass (waste). In Lagos State, for instance, research has shown that the State produces over 13,000 tonnes of garbage comprising 50 percent organic waste over the course of a single day. In response to this, the government collaborated with Midori Environmental Solutions (MES), an environmental company based in Lagos State, to research the viability of producing electricity through waste. This was a major indication of the State government's interest in improving access to electricity. However, the project was abandoned four years later because of lack of proper supervision.¹⁹⁶

¹⁹¹ B. Edirin & A. Nosa, "A Comprehensive Review of Biomass Resources and Biofuel Production Potential in Nigeria" (2017) *Research Journal in Engineering and Applied Sciences* 149

¹⁹² T. Ogwuleka, "Municipal Solid Waste Characteristics and Management in Nigeria" (2016) *Iran Journal Environmental Health Science & Engineering* 173, M. Sridhar & T. Hammed, "Turning Waste to Wealth in Nigeria: An Overview" (2016) *International Journal of Human Ecology* 195. 46:2

¹⁹³ M Khallaf, "Air Pollution in the Niger Delta Area: Scope, Challenges and Remedies in the Impact of Air Pollution on Health" (2017) *Journal of Economy Environment and Agricultural Sources*

¹⁹⁴ *Ibid.*

¹⁹⁵ *Ibid.*

¹⁹⁶ *Ibid.*

2.1.9 Geothermal Energy

Geothermal energy is a form of renewable energy that is derived from the earth's internal heat. It could be derived in the form of hot water or hot rock usually found under the surface of the earth. Geothermal heat pumps are often used to tap these sources. Other techniques used to obtain energy from geothermal sources are geothermal springs from power plants, dry steam power plants, flash steam power plants and binary-cycle power plants. One of the most prominent uses of geothermal energy is the generation and supply of electricity. Generally speaking, not many countries have exploited the use of geothermal energy as a source of renewable generation because of limited accessibility.

In Nigeria, there is a potential presence of geothermal energy in numerous states such as Benue, Gombe and Plateau in the Northern part of the country where there are rocks and over 80 volcanoes; the Ikogosi warm spring in Ekiti State located in the South Western part of Nigeria;¹⁹⁷ and in the Niger Delta region located in the Southern part of Nigeria. Like other forms of renewable energy, it is usually very costly to design and establish the geothermal plant. But its long-term benefits outweigh this initial cost. Some of these benefits include: its natural source, the unlimited production of magma by the earth,¹⁹⁸ the impossibility of climatic variations to affect this availability, its environmentally friendly and reliable nature, and its cost-effective nature taken over the long-term.¹⁹⁹

¹⁹⁷ E. Abraham & E. Nkitnam, "Review of Geothermal Energy Research in Nigeria: The Geo-science Front" (2017) *International Journal of Earth Science Geophysics* 1(7). 3:015

¹⁹⁸ *Ibid.*

¹⁹⁹ *Ibid.*

2.1.10 Wave and Tidal Energy:

Wave and tidal energy are environmentally friendly and renewable sources of energy that are present in Nigeria and are a viable source for mitigating the harsh effects of fossil fuels in the country.²⁰⁰ Surface waves are produced by the wind that blows across the surface of ocean. It is a more certain form of energy because its inflow time can be predicted at the wave power facility. On the other hand, tidal energy is derived by converting the gravitational interaction between the earth and the moon on the ocean's waters through tidal energy generators.²⁰¹ These sources of renewable energy have generally not been properly exploited. Some of the constraints to their use are the high costs associated with establishing the necessary facilities and the inadequate number of sites with the requisite tidal ranges and velocity flows needed for energy production.²⁰²

However, there is hope that with sufficient public policies, technological advancement and research, more positive sites will be found so that this source of energy could also be harnessed in future. In Nigeria, the potential for wave and tidal energy is found more in a state like Lagos that is close to the ocean.²⁰³

Researchers posit that the focus for harnessing this source of renewable energy should be on a small rather than a large scale so as to ensure that the Nigerian electricity sector is ready for a more robust exploitation of this form of energy when it is utilized.²⁰⁴

²⁰⁰ C. Nwaokocho & A. Layeni, "Estimation of Tidal Power Potential of Nigeria Coastal Area" (2015) *Journal of Power & Energy* 163 at 164

²⁰¹ "International Renewable Energy Agency (IRENA) Renewable Energy Technologies: Cost Analysis Series 2012"

²⁰² M. Erhun & D. Johnson, "A Legal Framework for Sustainable Electrical Energy Industry in Nigeria" (2018) *Journal of Energy and Environment Research* 8(2)45

²⁰³ *Ibid.*

²⁰⁴ *Ibid.*

2.2 Theoretical Framework

Two theories relating to renewable energy are examined in this research. These theories are: Resource Curse Theory and Sustainable Development Theory.

2.2.1 The Resource Curse Theory

The Resource Curse Theory evolved in the year 1970-1990.²⁰⁵ The term “resource curse” is referred to the paradoxical situation by which a country underperforms economically, despite the fact that the same country is enriched with abundant natural resources such as oil and gas, tar, coal, bitumen, iron and many others.²⁰⁶ For instance, Nigeria has high poverty rate and low rate of social and economic growth compared to Taiwan and South Korea that are developed countries who lack natural resources.²⁰⁷ The resource curse is also known as the resource trap or the paradox of abundance.

Nigeria is renowned as “Africa’s top crude oil producer”²⁰⁸ with large oil reserves, ranking as one of the “world’s top crude oil producers”.²⁰⁹ The economic growth of Nigeria is dependent and focused on its oil rent, which accounts for the majority of government revenue. This revenue accounts for around 90 percent of Nigeria’s total export.²¹⁰ As a result of the country’s over

²⁰⁵ O.J. Olujobi & O.M. Olujobi, ‘The Legal Regime on Renewable Energy as Alternative Sources of Energy in Nigeria’s Power Sector: The Impacts and Potentials’ (2020) *Academy of Strategic Management Journal* <<https://www.researchgate.net/publication/346570803>> accessed 16 October, 2021

²⁰⁶ R. M. Auty, “Sustainable Development in Minerals Economics: The Resource Curse Theory” (London Routledge 1993)

²⁰⁷ A.J Onyeukwu, “Resource Curse in Nigeria: Perception and Challenges” (2007) *International Policy Fellowship Program, Open Society Institute* <<https://core.ac.uk/download/files/415/11871241.pdf>> accessed 16 October 2021

²⁰⁸ H. Tina, “Regulation of the Upstream Petroleum Sector: A Comparative Study of Licensing and Concession Systems” (Edward Elgar Publishing 2015). See also A. Anar & G. Fari, “Tackling the Resource Curse: The Role of Democracy in Achieving Sustainable Development in Resource-Rich Countries” (2016) *International Institute for Democracy and Electoral Assistance* <

²⁰⁹ *Ibid.*

²¹⁰ A.J Onyeukwu, “Resource Curse in Nigeria: Perception and Challenges” (2007) *International Policy Fellowship Program, Open Society Institute* <<https://core.ac.uk/download/files/415/11871241.pdf>> accessed 16 October 2021

dependence on its oil sector, Nigeria has become a mono-economy. Nigeria's oil income dependence is referred to as the "live wire of the Nigerian economy"²¹¹ claiming that it accounts for about 70 percent of federal government revenue.²¹² The irony is that, despite its abundant resources, Nigeria still remains one of the world's poorest countries, with over 62 percent of its over "170 million people living in severe poverty",²¹³ surviving on less than US\$1 per day²¹⁴, and a low Gross Domestic Product (GDP), with oil accounting for 40 percent of GDP.²¹⁵

As a result of this, it is clear that the wealth produced from Nigeria's oil sector does not reflect in the lives of its people or the country's degree of socioeconomic growth, as both the state and federal governments struggle to pay wages, pensions, unemployment, scarcity of food supplies, inflation in exchange rates and other financial problems. This is also owing to the recent drop in oil prices, along with significant corruption among governmental officials, which has resulted in mismanagement and inefficient expenditure of its oil revenue.²¹⁶

Prior to the existence of the resource curse theory, natural resources were known to be a blessing with the potential to progress and secure the state's long-term development and socioeconomic growth²¹⁷. According to Auty, who originally proposed the resource curse theory, he opined that

²¹¹ I.T. Chukwuma, "The Resource Curse in Nigeria: Lessons and Policy Option" (2015) 2(8) *International Journal of Research in Humanities and Social Studies*, 38-42

²¹² C. McPherson, "Petroleum Revenue Management in Developing Countries" (2004) 2(2) <<https://www.ogel.org/article.asp?key=1161>> accessed 14 September, 2022

²¹³ "Central Intelligence Agency, The World Fact Book Economy Overview: Country Comparison to The World" (2016) <<https://www.cia.gov/library/publications/the-world-factbook/fields/2116.html#ni>> accessed 16 October 2021

²¹⁴ O.L. Omoregie, "Renewable Energy Resource Utilization in Nigeria: A Case for Accelerated Investment and Development" (2018) 2(2) *The Nigerian Journal of Business Management Sciences* 105-124

²¹⁵ C. McPherson, "Petroleum Revenue Management in Developing Countries" (2004) 2(2) <<https://www.ogel.org/article.asp?key=1161>> accessed 14 September, 2022

²¹⁶ I.T. Chukwuma, "The Resource Curse in Nigeria: Lessons and Policy Option" (2015) 2(8) *International Journal of Research in Humanities and Social Studies*, 38-42

²¹⁷ P. Stevens, G. Lhan & J. Kooroshy, "The Resource Curse Revisited" (2015) *Research Paper Chatham House the Royal Institutes of International Affairs* <<https://www.chathamhouse.org/sites/default/files/publications/research/20150804ResourceCurseRevisitedStevensLahnKooroshyFinal.pdf>> accessed 14 September, 2022

instead of natural resources' abundance contributing to economic progress, it has led to underdevelopment and decreased economic growth.²¹⁸ According to him, less-developed nations with abundant natural resources tend to have lower economic growth than those with few or no natural resources.²¹⁹ According to John, he further emphasized that in developing nations, abundant natural resources become a burden rather than a gift when there is evidence of negative developmental consequences such as excessive violence, low economic performance and growth, inefficient governance, and a high level of corruption.²²⁰

Researchers such as Mahler,²²¹ Auty, and Peterson have identified Nigeria as a country that is blessed with abundant petroleum resources, and suffering from the resource curse syndrome because the enormous oil revenue derived from exploring oil has instead resulted in high poverty, violence, corruption, and less socioeconomic development.²²²

This view is consistent with that of Van der Ploeg and Venables, who attributed the resource curse to governments' failure to convert their oil resources into surface assets that provide sustainable future income streams resulting in sustainable economic development.²²³ Wenar agreed that the resource curse afflicts poor and developing nations that draw a major portion of

²¹⁸ R. M. Auty, "Sustainable Development in Minerals Economics: The Resource Curse Theory" (London Routledge 1993)

²¹⁹ *Ibid.*

²²⁰ Jonathan Di John, "The Resource Curse: Theory and Evidence" (2010) 172 *Real Institute Elcano* <<https://core.ac.uk/download/files/442/12091606.pdf>> accessed 16 October 2021

²²¹ A. Mähler, "Nigeria: A Prime Example of the Resource Curse? Revisiting the Oil-Violence Link in the Niger Delta" (2010) *Working Paper 120 German Institute of Global and Area Studies* <https://www.giga-hamburg.de/en/system/files/publications/wp120_maehler.pdf> accessed 16 October 2021

²²² R. M. Auty, "Sustainable Development in Minerals Economics: The Resource Curse Theory" (London Routledge 1993)

²²³ Frederick van der Ploeg & Anthony J Venables, 'Natural Resource Wealth: The Challenge of Managing a Windfall' (2012) *Annual Review of Economics* 315-337.

their revenue from extractive resources such as petroleum as the situation in Nigeria, Saudi Arabia, and Norway.²²⁴

It is clear from the above that there is a relationship between a low degree of socioeconomic development and an abundance of oil wealth. The curse of natural resources is a barrier to long-term growth.²²⁵ Especially since Auty reasoned that a country's abundance of natural resources renders it vulnerable to price instability and windfall gains from exporting commodities.²²⁶ This is consistent with the empirical finding that commodity volatility is a significant component of the resource curse identified by Van der Ploeg and Poelhekke.²²⁷

However, there is another argument contrary to that of Auty's that a country's excessive dependence on oil income as the primary source of government revenue exposes it to the economic impact of oil price shock.²²⁸ This leads its currency to appreciate in value, distorting the country's GDP growth, as it was found that oil price shock has a long-run substantial influence on Saudi Arabia's GDP.

According to the resource curse theory, rich and diverse natural resources have a detrimental influence on economic growth, since nations that export natural resources have slower economic growth than those that export non-mineral resources.²²⁹ It has, however, been shown that there is

²²⁴ Leif Wenar, "Property Rights and the Resource Curse" (2017) <<http://siteresources.worldbank.org/INTDECINEQ/Resources/PropertyRights.pdf>> accessed 16 October 2021

²²⁵ T.W. Walde, "Natural Resources and Sustainable Development: From Good Intentions to Good Consequences (2014) 2(1) *Oil, Gas & energy Law Intelligence*

²²⁶ R. M. Auty, "Sustainable Development in Minerals Economics: The Resource Curse Theory" (London Routledge 1993)

²²⁷ Steven Poelhekke & Frederick van der Ploeg, "Volatility and the Natural Resource Curse" (2019) 61(4) *Oxford Economic Papers*, 727-760

²²⁸ G.J. Algahtani, "The Effect of Oil Price Shocks on Economic Activity in Saudi Arabia: Econometric Approach" (2016) *International Journal of Business and Management* 125-133

²²⁹ D. Sachs & M. Warner, "Natural Resource Abundance and Economic Growth" (1995) *Natural Resource Abundance and Economic Growth*, NBER Working Papers 5398, National Bureau of Economic Research <<https://ideas.repec.org/p/nbr/nberwo/5398.html>> accessed 14 September, 2022

little evidence to show that rich and diverse natural resources have an impact on growth, concluding that the concept of a resource curse caused by an abundance of natural resources is a farce.²³⁰ Other significant ideas that aim to explain the resource curse theory have been examined over the years as the resource curse theory has progressed.

There are three major theoretical approaches to explaining the resource curse, which will be discussed in turn: the economic explanation, the political explanation, and the violent conflict theory. According to economic theory, the resource curse is connected with over-reliance on oil and a lack of economic diversification, which crowds out other sectors and causes the state to suffer from the “Dutch Disease”.²³¹ The Political theory, explains the contradiction in terms of abundance as a result of corruption and rent-seeking among government officials, which impedes wise resource management and efficient policy execution. The violent conflict theory explains that natural resource dependent countries are more prone to violent conflicts (for example the Congo DR War, Sierra Leone Civil War) than less resource dependent countries.

2.2.1.1 The Economic Theory

Prior to the concept of the resource curse theory, it was a conventional knowledge that abundant natural resources allowed countries’ economies to flourish and develop. This is the situation in Norway, where the country’s natural resources have been considered as a godsend for fostering

²³⁰ D. Lederman & W. Maloney, “Does What You Export Matter? In Search of Empirical Guidance for Industrial Policies” (2012) *International Bank for Reconstruction and Development*

²³¹ Dutch disease is a concept that describes an economic phenomenon where the rapid development of one sector of the economy (particularly natural resources) precipitates a decline in other sectors. It is also often characterized by a substantial appreciation of the domestic currency. Dutch disease is a paradoxical situation where good news for one sector of the economy, such as the discovery of natural resources, results in a negative impact on the country’s overall economy <[https://www.Dutch Disease - Definition, Disadvantages, and How to Avoid \(corporatefinanceinstitute.com\)](https://www.Dutch Disease - Definition, Disadvantages, and How to Avoid (corporatefinanceinstitute.com))> accessed 17 October 2021

long-term economic and social growth.²³² However, this assumption has been disproved that countries with abundant natural resources, such as Nigeria, have seen less economic development and growth than those without natural resources.^{233,234} This gave rise to the notion that a lack of economic diversification might result in the resource curse theory, in which countries with abundant natural resources rely on their natural resources as the foundation of their economy.²³⁵

The “Dutch Disease” is described as the most common cause of low economic growth, occurs when resource-rich developing countries are insufficient in terms of promoting and creating competitive manufacturing sectors, and instead rely heavily on their natural resource wealth for state budget.^{236,237} According to Oxfam International, the over-reliance on oil wealth abundance, which has resulted in less economic growth, is caused by the fact that natural resources are not pro-poor because they do not create low-skilled jobs and crowd out other pro-poor sectors such as manufacturing and agriculture, which typically create less skilled employment.²³⁸

Financial advancement will in general diminish when the inflow of oil income expands the worth of these nations' monetary standards. This is because of the way that they import more than they send out, which raises the conversion standard of non-business merchandise in Nigeria, deterring

²³² A.K. Ahmadov & F. Guliyev, “Tackling the Resource Curse: The Role of Democracy in Achieving Sustainable Development in Resource-Rich Countries” (2016) *IDEA Discussion Paper* <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2746878> accessed 20 June, 2022

²³³ T.L. Karl, ‘Understanding the Resource Curse, Covering Oil: A Reporters Guide to Energy and Development’ (2015) *Open Society Institute Journal* 22-25

²³⁴ M. Li, “Corruption, Transparency and the Resource Curse” (2017) *International Journal of Social Science and Humanity* 572-575

²³⁵ Saudi Arabian Monetary Agency (SAMA) “*First Fifty Annual Report*” (2015) No. 51 <https://www.sama.gov.sa/en-US/EconomicReports/AnnualReport/5600_R_Annual_En_51_Apx.pdf> accessed 17 October 2021

²³⁶ P.J. Neary & S. Wijnbergen, “Natural Resources and the Macroeconomy: A Theoretical Framework” (1985) *Working Paper Series 36 Research Repository Ucd Centre for Economic Research*

²³⁷ E. Weinthal & P.J. Luong, “Combating the Resource Curse: An Alternative Solution to Managing Mineral Wealth” (2006) 4(1) *Perspective on Politics*, 37

²³⁸ *Ibid.*

unfamiliar purchasers as its different commodities become excessively costly for them, and de-industrialization is the undeniable underlying change that happens because of over reliance on its plentiful normal assets.²³⁹ This has a detrimental impact on growth, particularly as the state's reliance on oil exports grows and the state's economic diversification declines. This parallel growth is known as the Dutch Disease, and it is the cause of slow economic progress in emerging countries endowed with natural resources. This is one of the reasons why Nigeria, despite its abundant natural resources, has a high poverty rate.

The third economic reason of the resource curse theory, according to Weinthal and Loung, is the volatility or instability of global oil prices over short periods of time. This frequently has an influence on a state's economic development and progress by hindering the government's capacity to sustain its budget, public goods supply, and investment, as well as deterring private investment in the sector,²⁴⁰ which, according to Karl, raises the poverty rate.²⁴¹

The price of oil has an impact on the economic growth of the majority of petroleum-rich countries.²⁴² According to Goblan,²⁴³ there is a long-run link between negative oil price shock and government spending, which lead to a decrease in Saudi economic development (GDP, real investment and real trade balance). One could argue that the volatile and uncertain nature of oil revenue makes resource dependence harmful to a state's economy, especially since it was found that higher macroeconomic volatility swamps any direct effect of resources on economic

²³⁹ Jonathan Di John, "The Resource Curse: Theory and Evidence" (2010) 172 *Real Institute Elcano* <<https://core.ac.uk/download/files/442/12091606.pdf>> accessed 16 October 2021

²⁴⁰ E. Weinthal & P.J. Luong, "Combating the Resource Curse: An Alternative Solution to Managing Mineral Wealth" (2006) 4(1) *Perspective on Politics*, 37

²⁴¹ T.L. Karl, 'Understanding the Resource Curse, Covering Oil: A Reporters Guide to Energy and Development' (2015) *Open Society Institute Journal* 22-25

²⁴² M. Mehrara & K. Oskoui, "The Sources of Macroeconomic Fluctuations in Oil Exporting Countries: A Comparative Study" (2017) *Economic Modelling* 365-379 <<http://dx.doi.org/10.1016/j.econmod.2017.08.005>> accessed 17 October 2021

²⁴³ G.J. Algahtani, 'The Effect of Oil Price Shocks on Economic Activity in Saudi Arabia: Econometric Approach' (2016) *International Journal of Business and Management* 125-133

growth” and that countries with poor financial systems tend to be more vulnerable to price shocks as borrowing causes people to become indebted.²⁴⁴ This viewpoint contends that the resource boom-bust cycle is the primary cause of natural resource reliance, which is exacerbated by volatile commodity prices and debt overhang.²⁴⁵

2.2.1.2 The Political Theory

The political theory is referred to as “the Rentier State Model”, where the resource curse occurs when income obtained from natural resources is not managed correctly, which can therefore lead to poor economic growth.²⁴⁶ This is commonly the situation when the economy has inadequate and inexperienced organizations prior to the oil extraction.²⁴⁷ As a result, oil extraction actively encourages corruption and rent-seeking activities among political actors and elites, which thwarts institutional development and, as a result, diminishes project investment, hampering economic progress. This theory is sometimes referred to as the “boom or bust” of the economy, and based on how successfully a state manages its natural resources.²⁴⁸

The second political argument blamed the resource curse theory on inadequate institutions, arguing that the government’s easy access to oil income reduces incentives to develop strong and effective institutions, such as a tax system. The enormous revenue generated by oil wealth encourages rent-seeking, patronage, and reduces state citizen dialogue, because state citizens do

²⁴⁴ Steven Poelhekke & Frederick van der Ploeg, “Volatility and the Natural Resource Curse” (2019) 61(4) *Oxford Economic Papers*, 727-760

²⁴⁵ O. Manzano & R. Rigobon, ‘Resource Curse or Debt Overhang?’ (2011) <https://web.mit.edu/rigobon/www/Robertos_Web_Page/Research_files/resourcecurse.pdf> accessed 17 October 2021

²⁴⁶ J.D. John. “Oil Abundance and Violent Political Conflict: A Critical Assessment” (2017) *Journal of Development Studies* 961-986

²⁴⁷ A.K. Ahmadov & F. Guliyev, “Tackling the Resource Curse: The Role of Democracy in Achieving Sustainable Development in Resource-Rich Countries” (2016) *IDEA Discussion Paper* <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2746878> accessed 20 June, 2022

²⁴⁸ E. Weinthal & P.J. Luong, “Combating the Resource Curse: An Alternative Solution to Managing Mineral Wealth” (2006) 4(1) *Perspective on Politics*, 37

not participate in the creation of state revenue, which reduces political bargaining between interest groups and states, making the government less accountable to the people. The failure of the federal government to develop a sustainable tax structure is identified as a barrier to economic progress.²⁴⁹

The third political argument of the resource curse theory is the “flooding out of human capital”, because most developing resource-rich countries generally disregard education and forget that economic growth is a result of individual abilities.²⁵⁰ The demand and price for simple commodities are inconsistent, and as a result, the collapse of the manufacturing sector curtails economic growth, resulting in a decrease in the need for and supply of skilled employment.²⁵¹ The above, in consequence, diminishes employment, economic disparity, and educational prospects.

2.2.1.3 The Theory of Violent Conflict

Another resource curse theory is that natural resource dependent countries seem to be more prone to violent conflicts than less resource dependent countries.²⁵² They suggest that increasing a state’s dependence on natural resources from zero to 32 percent increases the probability of civil conflict by roughly 22 percent.²⁵³ Similarly, Wenar claimed that less-developed nations, such as Nigeria, that rely heavily on petroleum rent for government revenue are generally vulnerable to “three overlapping curses,” one of which is a high probability of unrest and conflict.

²⁴⁹ X. Martin & A. Subramanian, “Addressing the Natural Resource Curse: An Illustration from Nigeria” (2013) *Working Paper 9804 National Bureau of Economic Research*

²⁵⁰ E. Weinthal & P.J. Luong, “Combating the Resource Curse: An Alternative Solution to Managing Mineral Wealth” (2006) 4(1) *Perspective on Politics*, 37

²⁵¹ *Ibid.*

²⁵² P. Collier & A. Hoeffler, “Greed and Grievance in Civil War” (2011) 56(4) *Oxford Economic Papers* 563-595

²⁵³ *Ibid.*

On the other hand, violence is linked to the Rentier theory, even though there is currently no evidence that there is indeed a significant correlation with both oil abundant supply and violence, resulting in the resource curse, as he questioned the purported link between violence and the resource curse.²⁵⁴ It has, however, been discovered that the Rentier State theory, in which oil resources obscures socio-economic growth due to rent-seeking and corrupt practices within and between ruling classes, is clearly apparent in Nigeria's resource curse theory and deduced that resource capital really does have a major influence on and prompts wars and conflicts.²⁵⁵

On the other hand, John opined that, while these theories aim to explain the resource curse theory, the political theory that corruption and rent-seeking are development stifling is lacking in evidence.²⁵⁶ This is due to the fact that the political theory has still not been backed by realistic or substantial evidence, but the link between oil abundant amount and the development of economic growth is heavily influenced by the nature of the state's politics as well as the structure of ownership in the oil sector.²⁵⁷

In summary, the resource curse theory is not a sham; it is a problem that has indeed afflicted, especially resource-rich developing countries, by adversely affecting socioeconomic development. A state that reflects any of the problems described in the theories is deemed to be inadequate in sustainable growth. The resource curse theory therefore, highlights that developing countries must secure the growth and development of renewable energy sources by legislative framework in order to protect and promote the social, economic, and ecological interests of the

²⁵⁴ J.D. John. "Oil Abundance and Violent Political Conflict: A Critical Assessment" (2017) *Journal of Development Studies* 961-986

²⁵⁵ A. Mähler, "Nigeria: A Prime Example of the Resource Curse? Revisiting the Oil-Violence Link in the Niger Delta" (2010) *Working Paper 120 German Institute of Global and Area Studies* <https://www.giga-hamburg.de/en/system/files/publications/wp120_maehler.pdf> accessed 16 October 2021

²⁵⁶ J.D. John, "Is There Really a Resource Curse? A Critical Survey of Theory and Evidence" (2011) *Global Governance* 17: 167-184

²⁵⁷ *Ibid.*

current generation while also securing the same for coming generations. Developing markets must guarantee that their extractive resources do not encourage economic stagnation as well as other economic crises inherent with resource-rich countries, such as poverty and inadequate social infrastructure.²⁵⁸

2.2.2 The Theory of Sustainable Development

Another pertinent theory adopted in this research is the sustainable development theory. As the harmony between ecological decay, social disparity, and financial development was raised doubt about, the hypothesis of sustainable development was created. Somewhere close to keeping up with natural essentialness, advancing monetary achievement, and expanding the general personal satisfaction, analysts perceived that these objectives could not really be completely accomplished without risking the adequacy of the others. This knowledge prompted the end that either alleviating or creating different cultural parts will have broad repercussions for people in the future.²⁵⁹ The roots of sustainable development theory can be traced back to the 1970s modern green economy movement. The United Nations Conference on the Human Environment (also known as the Stockholm Conference) was an international conference convened under the auspices of the United Nations which has been held in Stockholm, Sweden since 1972. It was the UN's first major conference on international environmental issues, and marked a turning point in the development of international environmental policies.²⁶⁰

²⁵⁸ O.J. Olujobi & O.M. Olujobi, "Theories of Corruption: Public Choice Extractive Theory as Alternative for Combating Corruption in Nigeria's Upstream Petroleum Sector" (2020) 11(2) *International Journal on Environmental Sustainability Green Technologies (IJEST)*, 12

²⁵⁹ B. Douglas, "Theory Survey: Sustainable Development" <<https://www.microsoft.com/Word/Douglas/SustainableDevelopmentTheory.docx> (weebly.com)> accessed 18 August 2021

²⁶⁰ Report of the United Nations Conference on the Environment, Stockholm, 5-6 June 1972 <https://www.un.org/Depts/los/convention_agreements/convention_treaties_agreements/Convention_agreements/Convention_agreements.htm> accessed 18 August 2021

This conference's most important output addressed the effort to discover favorable correlations between environmental concerns and economic challenges such as development, growth, and employment.²⁶¹ The 1980 World Conservation Strategy underlined that responsible resource consumption might be in the best interests of humanity.²⁶² It provided a very different definition of sustainable development from that of development. Sustainable development as claimed means the integration of conservation and development to ensure that modifications to the planet do indeed secure the survival and well-being of all people. Development, however, means the modification of the biosphere and the application of human, financial, living and non-living resources to satisfy human needs and improve the quality of human life.²⁶³

The World Commission on Environment and Development (WCED) has declared that sustainable development is the development that meets the needs of the present without compromising the capabilities of future generations.²⁶⁴ Sustainable development is difficult to put into practice. The definition of sustainability, the extent to which it should be executed, and the balance between geographical and temporal equality are all crucial components of an equation.²⁶⁵

In principle, the theory of sustainability and sustainable development appears clear and exact; nevertheless, its application in the actual world leads in compounded and sometimes unexpected complications. The use of the precautionary principle is crucial to sustainable development:

²⁶¹ E. Andres, "The Sustainability Revolution: Portrait of a Paradigm Shift" (New Society Publishers, Gabriola Island 2005)

²⁶² C. Berwick, 'The International Union for Conservation of Nature and Natural resources: Current Activities and Situation' (1969) *Biological Conservation* (3)191-199

²⁶³ D. Simon, "The Principles of Sustainability" (Earthscan Publications, London 2002) <<https://www.worldcat.org/title/principles-of-sustainability/oclc/654736465>> accessed 20 June, 2022

²⁶⁴ World Commission on Environment and Development (WCED), 'From One Earth to One World: An Overview' (Oxford, Oxford University Press 1987) <[https://www.World Commission on Environment and Development \(1987\) \(wsu.edu\)](https://www.World Commission on Environment and Development (1987) (wsu.edu))> accessed 18 August 2021

²⁶⁵ D. Simon, "The Principles of Sustainability" (Earthscan Publications, London 2002) <<https://www.worldcat.org/title/principles-of-sustainability/oclc/654736465>> accessed 20 June, 2022

where there are dangers of substantial or permanent damage, lack of full scientific confidence should not be used as a rationale for deferring steps to avoid environmental deterioration.²⁶⁶ The essence of the theory of sustainability is to meet the needs of the present without compromising the ability of future generations to meet their own needs.²⁶⁷ There are three main areas of influence, and they are referred to as the “*Three Pillars of Sustainability*”, which are the environmental, economic and social aspect.²⁶⁸

It should be noted however, that these three aspects are interconnected and if they are combined and applied in real world situations they can create a steady base for a sustainable world from which everybody can benefit, because when natural resources are preserved, the environment is protected, and the economy is not harmed and the quality of life for our people is improved or maintained.²⁶⁹

2.2.2.1 Environmental Sustainability

In order to achieve environmental sustainability, the natural environment must keep its full functionality and utility for an extended length of time. It is desirable for activities to support positive development rates while also encouraging a balance in our natural environment. Any activities that upset the environment’s equilibrium should be avoided, but if they do occur, they should be confined to a smaller extent. The environmental consequences of each activity or choice should be considered.²⁷⁰ Environmental sustainability encompasses a wide range of

²⁶⁶ *Ibid.*

²⁶⁷ Introduction to Sustainable Development, A brief handbook for students by students (2015) International Hellenic University <<https://www.ihu.edu.gr/>> accessed 22 August, 2021

²⁶⁸ *Ibid.*

²⁶⁹ *Ibid.*

²⁷⁰ D. Simon, “The Principles of Sustainability” (Earthscan Publications, London 2002) <<https://www.worldcat.org/title/principles-of-sustainability/oclc/654736465>> accessed 20 June, 2022

concerns, from pollution to natural resource management. The primary goal of environmental sustainability is to reduce pollution.²⁷¹

2.2.2.2 Economic Sustainability

Economic sustainability refers to an economy's capacity to sustain a specific level of economic production indefinitely. Every initiative or choice has the potential to generate economic value. Economic sustainability refers to decisions made in the most sensible manner feasible in relation to the other components of sustainability. When just the economic elements are examined, true sustainability is not encouraged. On a broad scale, the traditional attitude was business as usual²⁷² which meant that profit was the sole focus and goal of businesses. However, when excellent economic practices are combined with the social and environmental components of sustainability, the end result is far more promising. When viable business practices are merged with the social and environmental components of sustainability, the outcome is far more beneficial.²⁷³

Many factors contribute to economic sustainability. From smart growth, to green development subsidies or tax advantages. The economy, similar to the environment, is inseparably connected: an expansion in human resources might prompt higher effectiveness of actual capital, bringing about a decrease in the amount of normal capital important to control the actual capital.²⁷⁴

²⁷¹ B. Douglas, "Theory Survey: 'Sustainable Development'" <<https://www.microsoft.com/Word-Development-Theory.docx> (weebly.com)> accessed 18 August 2021

²⁷² *Ibid.*

²⁷³ *Ibid.*

²⁷⁴ *Ibid.*

2.2.2.3 Social Sustainability

Social sustainability is based on actions and programs that support societal development in general. In general, the social element of sustainability supports the notion of intra-generational justice, which states that future generations have the same or a greater right to a good life than present generations. This concept encompasses a wide range of social issues, including environmental law, human and labor rights, health equity, community development through public involvement and participation, social capital, support justice and responsibility, cultural competence, community resilience, and human adaptation. The social aspect of sustainability is as essential as the other two pillars. If it is not handled seriously, it may lead to the collapse of the entire sustainability process as well as the society itself.²⁷⁵

From the above, the sustainability of the environment is without a doubt the most broad and impractical of the three degrees of maintainability. It advocates for the all-out conservation of normal assets as well as the reception of a bio driven philosophy that predominantly dismisses the significance of the economy and reasonableness issues. It consolidates a worth framework identical to that of a profound scientist: that each living animal has intrinsic worth and a right to life similar to that of an individual.²⁷⁶ It underlines that inordinate human contact pollutes the common habitat and that we should not view nature as a product to be taken advantage of, but instead as something living with whom we should live.²⁷⁷

Therefore, the sustainable development theory on environment states that governments should use their extractive resources in a sustainable growth manner that meets current demands without

²⁷⁵ *Ibid.*

²⁷⁶ B. Douglas, "Theory Survey: 'Sustainable Development'" <<https://www.microsoft.com/Word/Products/MS-Word/2016/Features/Document-Inspector/Document-Inspector-Details.aspx>> accessed 18 August 2021

²⁷⁷ *Ibid.*

jeopardizing capacity or the needs of future generations. The theory enables the general public in understanding the necessity for efficient use of extractive resources, the funding strategy, the push of technical innovation, and the regulatory framework in accordance with worldwide best practices for humankind and nature's sustainability. The idea emphasizes the need of utilizing natural resources for the benefit and worth of current and future generations while having no negative consequences on the environment.²⁷⁸

²⁷⁸ O.J. Olujobi, O.A Oyewunmi & A.E. Oyewunmi, "Oil Spillage in Nigeria's Upstream Petroleum Sector: Beyond the Legal Frameworks" (2018) *International Journal on Energy Economic Policy*, 8(1), 220–226

Chapter Three

The State of Renewable Energy and Power/Electricity Supply in Nigeria

3.1 Electricity Generation in Nigeria

As a consequence of the EPSRA's restructuring of the Nigerian power sector, a new Nigerian Electricity Supply Industry (ESI) was established with 23 grid-connected generating plants²⁷⁹ totaling 12,522 MW installed capacity and 6,056 MW usable capacities.²⁸⁰ Thermal energy is used to generate the bulk of the power, or around 81 percent of the total installed capacity (10,142 MW), with a total capacity of 5,026.48 MW.²⁸¹ Hydropower is mostly produced by three facilities; totaling 1,938.4 MW installed capacity and 1,060 MW of usable capacity.²⁸²

The Nigerian electricity industry has three main parts that make up the electricity generation sub-sector:- the National Independent Power Projects (NIPPs), which are managed by the government and currently, have three generating facilities, the Independent Power Producers (IPPs), which need licenses to operate and are controlled and supervised by the private sector, and the six (6) Generation Companies (GenCos). By virtue of the provisions of sections 32, 62 and 64 of the ESPRA, there are different types of generation licenses, which are: the on-grid electricity generation license, the embedded generation license, and the off-grid electricity generation license.

²⁷⁹ N.V. Emodi & S.Yusuf, "Integrating Renewable Energy and Smart Grid Technology into the Nigeria Electricity Grid System" (2014) 5 *Smart Grid and Renewable Energy* 220

²⁸⁰ *International Atomic Energy Agency (IAEA) Country Nuclear Power Profiles*

<<https://www.iaea.org/publications/10374/country-nuclear-power-profiles>> accessed 13 July, 2022

²⁸¹ *Ibid.*

²⁸² *Ibid.*

3.1.1 On-Grid Electricity Generation License:

This license permits the holder to generate energy and connect it to the national grid by entering into a long-term power purchase agreement with Nigerian Bulk Electricity Trading Plc. Through a connection agreement, the holder is also permitted to work with the Transmission Company of Nigeria (TCN) to connect, evacuate, and transfer the electricity through the national grid.²⁸³

3.1.2 Embedded Generation License:

This license does not need a connection agreement with TCN or the Nigerian Bulk Power Trading Plc, unlike the on-grid electricity generating license (NBET).²⁸⁴ The licensee is permitted to produce energy, directly eject it, and link it through the independent distribution licensee or the already-existing distribution infrastructure. The holder is anticipated to enter into the necessary power purchase agreement with an electrical distribution licensee in order to do this (Disco).²⁸⁵

3.1.3 Off-Grid Generation License:

This license permits its owner to produce power and sell it to a solitary customer. As a result, with this type of license, the licensee may only sell electricity to the off-taker through the use of a power purchase agreement (PPA).²⁸⁶

²⁸³ *Ibid.*

²⁸⁴ *Ibid.*

²⁸⁵ *Ibid.*

²⁸⁶ *Ibid.*

3.2 Electricity Transmission in Nigeria

In the Nigeria, the Transmission Company of Nigeria is the only dominating company. Three branches make up this subsector: Transmission Service Providers (TSP), System Operations (SO), and Market Operations (MO).

3.2.1 Transmission Service Provider (TSP)

The interconnected transmission infrastructure of substations and electricity lines is managed by the TSP. Its principal duties include ensuring that the transmission grid is expanded to include off-grid areas and that the system's physical infrastructure is adequately maintained.²⁸⁷

3.2.2 System Operations

This department is in charge of making sure the grid system is effectively guarded and maintain the highest level of safety in addition to making sure the transmission system is run in a safe and dependable way.²⁸⁸ It contains seven sub-departments: operations/control, transitional electricity market, system planning, supervisory control and data acquisition (SCADA), technical services, communications, and system performance. Each of these is led by the Executive Director.²⁸⁹

3.2.3 Market Operations

In addition to overseeing market participant supervision, this department is also in charge of administering market settlement systems, managing payment and commercial arrangement administration, maintaining market efficiency, and assuring periodic reporting on how market regulations are being followed. In Nigeria, there are now 105 132/33/11 kV substations with a

²⁸⁷ Energy Transmission <<https://www.nercng.org>> accessed 13 July, 2022

²⁸⁸ *Nigerian Electricity System Operator*

²⁸⁹ *Ibid.*

total installed transformation capacity of 9130 MVA, 32 330/132 kV substations with a total installed transformation capacity of 7,688 MVA, and 5523.80 km of 330 kV and 6801.49 km of 132 kV. The average capacity is 330/132 kV at 7,364 MVA, and 132/33 kV at 8,448 MVA.²⁹⁰

3.2.4 Off-take Prospects in Nigeria

The distribution of project expenditures is also decided upon in this chapter. The cost of project establishment, upgrades to the transmission and distribution lines, the electric transformer station, and other equipment-related ancillary costs are all on the developer.²⁹¹ The little connection expenses that occur while transporting power. When the Commission determines that it is fair to do so, the Off-taker may pay the interconnection costs; this can be done through a written contract and is subject to recovery from the vendor under the Feed in Tariff (FIT) procedures.²⁹² The Transmission System Provider or the Licensed Distributors, depending on the situation, may be responsible for covering additional deep connection and supporting costs. The Renewable Energy Power Generators will be responsible for the grid's costs.²⁹³

3.3 Small-Scale Renewable Energy in Nigeria:

The production, transmission, and distribution of electricity are essential for every country's economic development.²⁹⁴ Energy produced and held on a small scale by people, small enterprises, and communities is referred to as small-scale renewable electricity. It is typically small or medium sized and has shown to be a successful method for supplying a country's

²⁹⁰ O.T. Patrick & O. Sunny, "Smart Grid Technology and its Possible Applications to the Nigeria 330Kv Power Systems" (2013) 4 *Smart Grid and Renewable Energy*, 391

²⁹¹ *Ibid.* s5(g)

²⁹² *Ibid.* s5(i)

²⁹³ *Ibid.* s5(h)

²⁹⁴ M.O. Erhun & D.O. Johnson, "A Legal Framework for Sustainable Electrical Energy Industry in Nigeria" (2018) 8:2 *Energy and Environment Research* 45 at 45

energy demands.²⁹⁵ Some advantages include a significant decrease in greenhouse gas emissions and the promotion of environmentally friendly energy sources; improved economic stability through energy security; the establishment of a level playing field (fair and competitive market); the creation of an environment that is favorable for energy sector investments; the creation of a sense of economic belonging and fairness for rural communities; and the establishment of a competitive energy market.²⁹⁶ Sections 31, 32, 62, 64–70, and 88–92 are the main provisions of the EPSRA, which regulates the licensing of renewable energy projects and the expansion of rural electrification in Nigeria.

The Nigerian Electricity Regulatory Commission was established by the EPSRA with the primary goals to ensure proper regulation of the Nigerian electricity industry through appropriate licensing measures, fair pricing, an emphasis on consumer satisfaction and protection, the encouragement of competition, and the integration and contributions of the private sector where possible. Therefore, the necessary license must be obtained in accordance with Section 62 of the EPSRA in order to engage in any sector of the Nigerian electricity industry that involves the core activities of electricity generation, excluding (captive generation),²⁹⁷ electricity transmission, system operation, electricity distribution, and electricity trading.²⁹⁸

The aforementioned general rule does not apply to the production and distribution of energy, though. According to the Act, 100 kW of power can be delivered and up to 1 MW of electricity can be produced without a license.²⁹⁹ The holder of a generating license generally has the necessary capacity to build, own, operate, and maintain an electrical generation firm, as well as

²⁹⁵ ‘The Case for Small- Scale and Community Owned Renewable Energy in Alberta’ <<https://3cenergy.org/>> accessed 24 June, 2022

²⁹⁶ *Ibid.*

²⁹⁷ *Ibid.*

²⁹⁸ s62 ESPRA

²⁹⁹ *Ibid.* s62(2)

to sell power and carry out various extra tasks in accordance with the conditions of the license and the Act's requirements.³⁰⁰ According to section 8 of the EPSRA, Successor Generation Companies or Independent Power Producers (IPP) are eligible for this type of license.^{301,302}

The conditions of his license according to the provisions of the Act, the owner of a transmission license is allowed to build an electrical grid and operate and maintain transmission systems. Additionally, the system operation license gives the licensee the ability to manage the whole sale electricity market, including the activity of advertising. These activities include generation scheduling, commitment and dispatch, transmission scheduling and generation outage coordination, transmission congestion management, international transmission coordination, procurement and scheduling of ancillary services and system planning for term capacity.³⁰³

The energy distribution license enables the licensee to construct, maintain, and operate an electrical distribution system, guaranteeing that consumers receive an appropriate supply of power, controlling how meters are read and billed, among other services.³⁰⁴ On the other hand, the trading license enables the licensee to buy and sell electricity in line with predetermined terms and conditions.³⁰⁵

The EPSRA also created a tripartite strategy to address Nigeria's electrical issues. It covers the development of Nigeria's distant and mini-grid systems, the expansion of the main grid, and the production of power from renewable energy sources. Under the direction of the Rural Electrification Agency and the NERC, this crucial strategy will be put into action through the

³⁰⁰ *Ibid.* s64

³⁰¹ *Ibid.* s64(3)(a)-(b)

³⁰² *Ibid.* s8

³⁰³ *Ibid.* s66(1)

³⁰⁴ *Ibid.* s67

³⁰⁵ *Ibid.* s68

Rural Electrification Strategy and Plan.³⁰⁶ The likelihood or otherwise of small-scale renewable power generation in Nigeria will then be explored, along with its potential for generation, connection, transmission, and off-take.³⁰⁷

3.4 Commercial Mini-Grids in Nigeria

According to the report of the World Bank Group on the information on private mini-grids in Nigeria, there are several energy developers generating renewable energy.³⁰⁸ These companies include GVE Projects Ltd, Nayo Tropical Technical Ltd, Havenhill Synergy Ltd and Rubiec Solar Ltd among others.³⁰⁹ Off-grid electrification was not officially governed by any legislative policy prior to 2016. However, a legal framework was established with the adoption of the NERC Mini Grid Regulations in 2016. The Regulations³¹⁰ offer a framework for the electrification of off-grid locations in Nigeria and establish policies to guarantee that underserved regions would have access to dependable alternative energy sources. The Regulations promote participation from various parties, including the public, the commercial sector, and nongovernmental organizations. By mandating registration as a prerequisite for isolated mini grids up to 100 kW,³¹¹ and a permit as a requirement for isolated mini grids greater than 100 kW of distributed power and up to 1 MW of generating capacity, they expand the licensing provision of the EPSRA.³¹²

³⁰⁶ *Ibid.* s88(9)

³⁰⁷ *Ibid.* s64

³⁰⁸ “Mini Grids in Nigeria: A Case Study of a Promising Market- Energy Sector Management Assistance Program” (2017)

³⁰⁹ *Ibid.*

³¹⁰ Nigerian Electricity Regulatory Commission Regulation for Mini-grids 2016 <<https://www.nep.nerc.gov.ng/docs>> accessed 13 July, 2022

³¹¹ *Ibid.* s8

³¹² *Ibid.* s7 & s8

3.5 The Challenges to Renewable Energy Development in Nigeria:

In Nigeria, there are several challenges to the production and development of renewable energy projects. Even though they appear to be roadblocks now, they can at the long run offer up possibilities for long-term investment by both international and domestic investors.³¹³ The basic indicators of sustainable development and clean electricity have been empirically proven to be unsatisfied by fossil fuels. The researcher will examine briefly the different challenges identified by policy analysts and energy specialists as a stumbling block to the growth of renewable energy projects in Nigeria.

1. Regulatory and Policy Challenges

The principal challenge to the development is the unavailability of law in place to achieve sustained implementation of the renewable energy plan in the country.³¹⁴ Lack of appropriate legislation is seen as one of the factors militating against renewable energy development in Nigeria.³¹⁵ It is also noted that the challenges confronting Nigeria quest for renewable energy development evolve around inconsistency in policy implementations.³¹⁶ Apparently, the REMP is just a policy with no legal backing and this coupled with lack of funding for renewable energy projects and poor incentives for investors have been considered major obstacles towards the

³¹³ Recently, the French Government, through the French Development Agency/Agence de Developpement (AFD), has agreed to invest \$70million into renewable energy projects in Nigeria at the Sustainable Use of Natural Resources and Energy Finance (SUNREF) Nigeria programme investor conference 2021. <<https://www.nairametrics.com/2021/10/22/french-government-to-invest-70-million-in-nigerias-renewable-energy/>> accessed 24 October, 2021

³¹⁴ S.O. Oyedepo, "Towards Achieving Energy for Sustainable Development in Nigeria" (2014) *Renewable and Sustainable Energy Review* 255, 269

³¹⁵ B. Amigun & R. Sigamoney & H. Von Blottnitz, "Commercialization of Biofuel industry in Africa: A Review" (2020) *Renewable Sustainable Energy Review* 12:690–711

³¹⁶ E.J. Bala & G.Y. Pam, "Energy Sources and Sustainable Development of the North in Arewa House" (2016) Editor, Kaduna: North Strategic Sustainable Development

implementation of the REMP³¹⁷. Also, the roles and functions of different regulatory bodies and institutions in charge of the power sector in Nigeria which are the Nigerian Electricity Regulatory Commission (NERC), the Energy Commission of Nigeria (ECN), and the Federal Ministry of Power, have also been observed to be closely linked. From a regulatory point of view, it appears that these bodies have similar, if not the same, roles to play in the development and management of Nigeria's renewable energy sector.

The lack of clearly defined and independent functions among the regulatory bodies ultimately means that investors and active players in this business will have to deal with all these governmental institutions and agencies before investing, thereby creating ambiguity and misunderstanding in the minds of investors. It is preferable to have a single regulatory body that is up and running in its splendor and categorically responsible for overseeing the affairs of the subsector than to have multiple regulatory bodies each with their own pie of regulatory responsibilities and regulatory overlaps. Nigeria's progress has been hampered by the lack of a coherent coordination of institutions for the development of renewable energy.³¹⁸ As a result, clarifying the legal and regulatory responsibilities of institutions may be beneficial in order to avoid any potential investor misunderstanding.

2. Technological Challenges

In addition, there is inadequate manpower to develop and deploy appropriate technology that will enable the country to move from its current near absolute monolithic dependence on fossil-fuel economy. Renewable energy mandates the use of new technology, which is expensive in nature.

³¹⁷ O.O. Ajayi, 'Nigeria's Energy Policy: Inferences, Analysis and Legal Ethics Toward Renewable Energy Development' (2018) *Energy Policy Review* 60:61-7

³¹⁸ E. Efurumibe, "Barriers to the Development of Renewable Energy in Nigeria" (2013) *Scholarly Journal of Biotechnology* 12

Thus, the implication of using renewable energy is that it comes with higher than normal costs and the supply is intermittent. This is because such activities entail obtaining energy from non-traditional and non-conventional sources; they need the development of new and unique technologies, which are typically neither inexpensive nor cost-effective. The lack of these sophisticated technologies in harnessing Nigeria's vast renewable energy potential has always been a stumbling block to the development of renewable energy projects in the country.³¹⁹

Therefore, to successfully transit to the use of renewable energy, reliability and continuity of energy supply are two basic technical requirements that must be factored into the planning process to enable it stand as substitute for fossil fuels. Studies³²⁰ have shown that renewable energy resources are associated with high cost, especially at start-up. However, future projections indicate that these costs will go down with research and development and increasing/widespread usage.³²¹

3. Lack of Public Awareness of Renewable Energy Potential

There is lack of public awareness of renewable energy and its unlimited potentials in Nigeria, as most Nigerian citizens are mostly used to the electricity generated from the non-renewable sources of energy. Thus, the insufficient awareness and lack of information with respect to the enormous prospects of renewable energy establishes a lacunae that results in higher risk discernment for potential renewable energy projects.³²²

³¹⁹ *Ibid.*

³²⁰ REN 21. Renewables 2014 Global Status Report. Paris; 2014.

³²¹ *International Renewable Energy Agency (IRENA). Renewable Energy Technologies: Cost Analysis Series. 2012*

³²² *Ibid.*

4. Lack of Investments and Funding

Renewable energy projects are universally recognized by professionals and legislators to be exorbitantly expensive and capital-intensive. Hence, for appropriate implementation and execution, such projects need a large capital investment and financial backing. This indicates that the lack of a strong financial background and capital prospects for “such investment projects is a roadblock to the growth of renewable energy developments. Financing is known to be a big obstacle to the development of this subsector in Nigeria, and it will remain to be so except appropriate and long-term financing sources are established. It will need a full dedication from the government to use Public Private Partnerships (PPPs) for the funding/investing of these projects across the energy value chain to successfully tackle and combat this problem as advised, because fossil fuels in Nigeria have benefitted more from subsidies and incentives than the renewable energy industry. Thus, for a country like Nigeria, it is imperative that, if it must achieve the goal of reducing fossil fuel dependence and sustainable development, then incentives would have to be provided for investments in renewable energy sources.

5. Lack of Legal Enforcement Mechanisms

The lack of a competent, sustainable, and effective legal enforcement mechanism is the problem with any legal system.³²³ To the researcher, ineffective enforcement and execution of legal frameworks is the same as the current legal system does not support renewable energy sources into the Nigeria energy generation mix. Incidentally, as discussed earlier, there are a plethora of laws, rules, regulations, policies, and master plans governing renewable energy projects in

³²³ E. Ohimain, “Can the Nigerian Biofuel Policy and Incentives Transform Nigeria into a Biofuel economy?” (2017) *Energy Policy Review* 54:352–9

Nigeria, but without effective legal enforcement, this legal system will be useless.³²⁴ In this regard, the present regulatory organizations' weak legal enforcement has hampered the growth of renewable energy projects in Nigeria, thus rendering the existing legal framework void.³²⁵

3.6 Ways to Achieve Renewable Energy in Nigeria's Energy Mix:

Implementing renewable sources of energy into the overall Nigeria energy mix is paramount to achieving sustainable development. However, there are a few steps that must be taken which are paramount to achieving this goal as enunciated in the REMP. The study by the REN21 steering committee as superimposed on the system mapping steered the analysis in this section. For fiscal planners, policy makers and educators, it is important that they fully understand the issues of stock and flows in planning for sustainable development as a climate change response strategy through the deployment of renewable energy resources. The key factors are enunciated below:

1. Ensuring Policy Coherence and Stability:

This is crucial to making the right decisions. "It has been proven globally that appropriate policies have largely driven the expansion of renewable energy market. Countries like Brazil, Senegal, China, India, and South Africa have been successful in making significant progress in addressing the dual challenges of energy access and sustainability due to the inclusion of renewable energy initiatives in broader long-term rural electrification programmes that are supported politically and backed by adequate funding.³²⁶ For example, Brazil's Light-for-All

³²⁴ A.S. Sambo, 'The Place of Renewable Energy in the Nigerian Energy Sector (2019) *Renewable Energy Policies Addis Ababa, Ethiopia* 18

³²⁵ "International Monetary Fund: Energy Subsidy Reform: Lessons and Implications" 2013

³²⁶ *REN 21 Renewables 2014 Global Status Report Paris*

programme aimed at providing light for 15 million people³²⁷ took a decade to be completed in 2013. Nigeria will need to follow this global trend to promote renewable energy through direct policy support with energy targets. Both coherence and stability of formulated policies is needed to sustain renewable energy development and utilization. Coherent policy frameworks are needed to build up production capacities, develop new technologies and to expand the base of skilled employees. Direct policy support that is both stable and predictable with energy targets will be of immense benefit for Nigeria in terms of renewable energy development.

2. Enhancing the Integration of Renewable Energy Deployment:

Researches have shown that the penetration of renewables is no more dependent on technology or economics than on developing markets that are flexible and provides smarter energy systems.³²⁸ Factors responsible for enhancing renewable energy deployment also help to improve energy security, encourage economic development, particularly as it concerns rural and agricultural sector as well as protect the climate and wider environment from impacts of fossil fuel use. A review of the literature shows that different types of policies have been used in many countries around the world to promote renewable power generation. For instance, some countries have established special renewable energy funds to directly finance investments, provide low-interest loans, or facilitate markets for renewables in diverse ways that include research, education, and standards. A good example is the rural electrification fund established in Senegal providing financing for renewable energy concessions with investment subsidies of up to 80 percent of initial capital. Similarly, the Philippines established a \$2 billion (equivalent) fund in

³²⁷ *Ibid.*

³²⁸ M. Clancy & J. Scheer, “The Case for Sustainable Energy: A Review and Analysis of the Economic and Enterprise Benefits” (2019)

2009 and were supporting more than sixty five renewable energy projects.³²⁹ In terms of improving energy security, Nigeria must focus on having more flexible power grids, increasing demand-side integration, and integrating power systems with transport, buildings, industry and all relevant sectors with supportive regulations, business, and finance models. Globally, support policies like feed-in-tariffs or premiums have proven to be excellent primary drivers of the renewable energy market. Obviously, in Nigeria, there would be need for more-rigorous support policies with increasing renewable energy deployment.

3. Removal of Fossil Fuel Subsidies:

Global subsidies for fossil fuels and nuclear power remain high despite reform efforts. According to REN21,³³⁰ though the exact level of subsidies is unknown, estimates range from USD 544 billion³³¹ to USD 1.9 trillion per year.³³² Further, subsidies have been noted to stifle research and development in efficient energy technologies, crowd out private investors and create incentives for smuggling.³³³ For example, a recent report described how subsidized fuel has been often diverted or smuggled from Nigeria to neighbouring countries.³³⁴

In this regard, creating a level playing field by the removal of fossil fuel subsidies can promote a more efficient allocation of financial resources and eliminate rent-seeking activities. However, as a State, Nigerian cannot afford a big bang change in energy sources. Given the state of economy and standard of living, the government cannot afford to subject its citizens to further hardship by imposing on them high pricing of electrical energy that come with renewables. This has the

³²⁹ *Ibid.*

³³⁰ *Ibid.*

³³¹ World Bank Subsidies in the Energy Sector 2015: An Overview

³³² International Monetary Fund note431

³³³ *Ibid.*

³³⁴ O. Odutayo, “*The Smugglers Way: Stealing Nigeria’s Fuel to Benin Republic*”. Punch Newspaper (2015) <<https://www.punchnews.com/2015/06/Stealing-Nigerias-Fuel-to-benin-republic>> accessed 13 October, 2021

potential to impact negatively on small businesses dependent on electricity. More so, it may lead to loss of jobs, discourage potential investors in small-medium enterprises and compound current levels of unemployment in the country. Therefore, Nigeria can gradually develop its renewable energy base alongside its reduced dependence on fossil fuel.

4. Accurate and Current Energy Data for Evaluation

The undersupply of data in Nigeria is a major curse to developmental planning. Accurate and current data on renewable energy are needed to develop energy plans. There is need for proper implementation and monitoring of policy strategies to improve the country's renewable energy policies.³³⁵

³³⁵ *Ibid.*

Chapter Four

Legal and Regulatory Framework, Statutory Institutions Regulating Renewable Energy and Electricity in Nigeria and Ghana

4.1 History of Electricity and Renewable Energy Legal Regulation in Nigeria

This chapter gives a detailed explanation on the relevant laws, policies and statutory institutions that have been developed to address electricity challenges and renewable energy in Nigeria.³³⁶ As discussed in Chapter 1 of this research, the universal demand for renewable energy sources has been driven in large part by the increasing need for energy to power industrial, manufacturing, and household activities in a sustainable way. It also aims to address environmental degradation as well as the national and global economic effects of oil and gas price changes.³³⁷ Power generation and distribution in Nigeria have been described as “epileptic”, hardly a suitable label for an economy expected to rank among the top 20 in the world by 2020.³³⁸ According to the African Development Bank,³³⁹ the most significant barrier to conducting business in Nigeria is the insecurity of energy supply.³⁴⁰ Nigeria, which is perpetually on the lookout for trustworthy answers to its energy challenges, has launched laws and regulations to propel its renewable power subsector. Subsequently, a far reaching and cognizant legitimate structure is basic in overseeing a country towards proficient utilization of energy

³³⁶ C. Ogbumgbada, “Developing an Effective Legal Framework for Renewable Energy Utilization in Nigeria” (2018) *RELP* 1 at 1; see also O. Ojo, “An Overview of the Legal and Regulatory Framework for Renewable Energy Projects in Nigeria: Challenges and Prospects” (2017) *Unilag Law Review* 22

³³⁷ J. Onwubuariri, “Reviewing the Legal Framework for Renewable Energy Projects in Nigeria” (2015) <https://www.academia.edu/12116036/Reviewing_the_Legal_Framework_for_Renewable_Energy_Projects_in_Nigeria> accessed 20 June, 2022

³³⁸ *Ibid.*

³³⁹ African Development Bank Annual Report 2009 <https://www.afdb.org/sites/default/files/documents/publications/annual_report_2009.pdf> accessed 20 June, 2022

³⁴⁰ J. Onwubuariri, “Reviewing the Legal Framework for Renewable Energy Projects in Nigeria” (2015) <https://www.academia.edu/12116036/Reviewing_the_Legal_Framework_for_Renewable_Energy_Projects_in_Nigeria> accessed 20 June, 2022

resources. Having a clear legislative structure, however, does not ensure prudent administration of the country's energy resources.³⁴¹ The reality is that the Nigerian power sector is so inefficient that it is a significant barrier to economic growth and social well-being; therefore, access to cost-effective and sustainable energy services is essential to re-launching the Nigerian economy and achieving SDGs and NEEDS objectives.^{342, 343}

Also, a sustainable legal and regulatory framework is one of the instruments that have been discovered to be useful in establishing a thriving and secure energy future for the country. Subsequently, the Nigerian government should be focused on laying out the right and helpful lawful climate for the upgrade and advancement of environmentally friendly power project fully intent on gathering continuous Foreign Direct Investment (FDI) into this area, making enhancements to the country's energy security and supplies, and in the long run emphatically influencing the energy sector in Nigeria.³⁴⁴ However, before examining the relevant laws and policies it is of utmost importance to note that the Nigerian Renewable Energy Policy aims to increase renewable energy generation and distribution while decreasing the over dependence on fossil fuels. The approach is not a regular type, although, complementary, in the sense that it is neither recommended as the only answer to Nigeria's energy demands.³⁴⁵

³⁴¹ O.V. Ojo, 'An Overview of the Legal and Regulatory Framework for Renewable Energy Projects in Nigeria: Challenges and Prospects' (2017) 1(1) *Unilag Law Review*, 1

³⁴² United Nations Sustainable Development Goals <<https://sdgs.un.org/goals>> accessed 20 June, 2022

³⁴³ National Economic Empowerment and Development Strategy <[³⁴⁴ O.V. Ojo, 'An Overview of the Legal and Regulatory Framework for Renewable Energy Projects in Nigeria: Challenges and Prospects' \(2017\) 1\(1\) *Unilag Law Review*, 1](https://www.walyben.com/national-economic-empowerment-and-development-strategy-needs/#:~:text=National%20Economic%20Empowerment%20and%20Development%20Strategy%20(NEEDS)%20is%20a%20holistic,generation%20and%20valued%20re%2Dorientation.> accessed 20 June, 2022</p></div><div data-bbox=)

³⁴⁵ J. Onwubuariri, "Reviewing the Legal Framework for Renewable Energy Projects in Nigeria" (2015) <https://www.academia.edu/12116036/Reviewing_the_Legal_Framework_for_Renewable_Energy_Projects_in_Nigeria> accessed 20 June, 2022

Thus, the following laws, policies, and action plans constitutes Nigeria's legal system that governs electricity: "The National Renewable Energy Policy 2003 and 2005", "The Electric Power Sector Reform Act 2005", "The Renewable Energy Policy 2006" and "The National Renewable Energy and Energy Efficiency Policy". The relevant institutions governing the Nigerian electricity industry include: "The Energy Commission of Nigeria (ECN)", "The Nigerian Electricity Regulation Commission (NERC)", "The Ministry of Power and Steel", "The National Council on Privatization (NCP)" and "The Bureau of Public Enterprise". Additional important agencies governing the Nigerian electricity sector are: "The Nigerian Electricity Bulk Trading Plc", "The Gas Aggregation Company Nigeria Ltd", "The Nigerian Electricity Management Services Authority (NEMA)", "The National Power Training Institute of Nigeria" and "The Nigerian Electricity Liability Management Company".

4.1.1 National Renewable Energy Policy 2003 & 2005:

There was no comprehensive energy policy in Nigeria prior to the establishment of the National Renewable Energy Policy in 2003.³⁴⁶ The Energy Commission of Nigeria, on the other hand, issued the policy in April 2003 to advocate the government's policy on the development and exploitation of all of Nigeria's energy resources, addressing environmental issues, energy utilization and efficiency, financing, and policy implementation. It also outlines the government's policy on energy production, supply, and consumption, taking into consideration the country's organizational requirements and alternatives. The NREP's main goal is to create energy security by diversifying energy supply and energy carriers based on the principle of an energy economy in which modern renewable energies increase their share of energy consumed

³⁴⁶ O.V. Ojo, 'An Overview of the Legal and Regulatory Framework for Renewable Energy Projects in Nigeria: Challenges and Prospects' (2017) 1(1) *Unilag Law Review*, 1

and provides affordable access to energy throughout Nigeria, thus contributing to sustainable development and energy conservation.³⁴⁷

The NREP sets out the following relevant principles and policies in relation to renewable sources of energy, identification of nuclear, biomass, wind, solar, hydro and hydrogen as viable energy sources to be harnessed by the nation in an environmentally sustainable manner, local research, development and exploitation of the foregoing energy potentials to be commercially undertaken through public, private and indigenous participation. Non-renewable energy sources are to be used conservatively while Nigeria makes a steady and reliable availability of power at all times to at least 75 percent of the population by the year 2020 at economic rates for social, industrial and economic activities and an integrated energy planning system to be developed, involving energy related programs and activities of other sectors.³⁴⁸

From the provisions of the NREP, it clearly lacks legislative support and does not enforce any legislative support and legal force, and it enforces no specific statutory obligations on either the government or private or institutional investors. In strict sense, the relevant stakeholders in the energy sector, particularly the government, cannot be forced to implement and execute the policy's key objectives through a Court order or injunction. This does not go well for the development of the renewable energy sub-sector, which necessarily involves consistent, committed, unrelenting, and pragmatic efforts to implement.

However, the Energy Commission of Nigeria created the Renewable Energy Master Plan (REMP), a three-tier time framed plan of 20 years in 2005 as a response of an intensified drive to

³⁴⁷ K.T. Lawal, "Law, Policy, and the Development of Renewable Energy Law in Nigeria: A Case for Renewable Energy Law in Nigeria" (2021) 49(1) *International Journal of Legal Education*, 3-15 <<https://doi.org/10.1017/jli.2021.7>> accessed 19 June, 2022

³⁴⁸ *Ibid.*

support cleaner energy sources in the Nigeria's electricity supply mix.³⁴⁹ In other words, the REMP is a 20-year plan with the triple goal of raising the percentage of renewable energy's contribution to Nigeria's power generation from 13 percent in 2015 to 23 percent in 2025 to 36 percent in 2030.³⁵⁰ This would result in a 10 percent contribution from renewable energy sources to the whole energy industry. The goal of the REMP was to make a concentrated effort to attain dependence on a cleaner, more reasonably priced, and dependable energy supply as well as to provide a framework for demonstrating the viability of private sector involvement in the power industry.³⁵¹ Sadly, due to the restricted authority afforded by its enabling statute to the then-regulatory entity, the Nigerian Energy Commission, little progress was achieved towards reaching the renewable energy targets outlined in the Renewable Energy Master Plan.³⁵²

4.1.2 Electric Power Sector Reform Act (EPSRA) 2005:

The EPSRA was enacted by the National Assembly in 2005 in response to the need for far-reaching reforms in the power sector as a result of the inefficiency of the National Electric Power Authority (NEPA), later renamed Power Holding Company of Nigeria (PHCN) in generating and distributing energy across the whole of Nigeria.³⁵³ The EPSRA established a strong and viable legal foundation and legislative framework for the strategic and phased implementation of power sector reforms in Nigeria until an optimal capacity generation and fully competitive market is

³⁴⁹ Renewable Energy Master Plan 2005

³⁵⁰ *Ibid.*

³⁵¹ Yemi Oke, "Nigerian Electricity Law and Regulation" (1st edn, LawLords Publications, 2013)

³⁵² Energy Commission of Nigeria Act, 1979

³⁵³ J. Onwubuariri, "Reviewing the Legal Framework for Renewable Energy Projects in Nigeria" (2015) <https://www.academia.edu/12116036/Reviewing_the_Legal_Framework_for_Renewable_Energy_Projects_in_Nigeria> accessed 20 June, 2022

achieved, that is, a transition from a vertically integrated, government-owned, monopolistically competitive market to a completely liberalized and privatized electricity generation market.³⁵⁴

The EPSRA is broken down into 13 parts, each of which addresses different aspects of the initial holding company's formation,³⁵⁵ its ownership,³⁵⁶ the transfer of assets and employees,³⁵⁷ and other procedural issues related to the liberalization of the Nigerian electricity supply industry. It offers recommendations for introducing competition into the Nigerian electricity supply business and is designed to create a market that promotes the involvement of firms in the private sector.

Another significant change brought about by the EPSRA is the creation of a new entity known as the Nigerian Electric Regulatory Commission (NERC) in accordance with the provision of section 31,³⁵⁸ which is bestowed with the authority to control and regulate the Nigerian Electric Supply Industry and has been given responsibility for the main goal and duties of promoting the electricity supply industry, such as ensuring that resources are used as effectively as possible.

Compared to other policies, the EPSRA is a legislative instrument with the force and backing of the law that can be enforced in any Nigerian court of law. As a result, the government or any relevant stakeholder in the industry can be charged to court at any time for the enforcement of the various rights and obligations enshrined in the Act. The Act's enforceability is a sign of hope for the development of Nigeria's renewable energy subsector, and it is the right legislative instrument in the right direction.

³⁵⁴ Electric Power Sector Reform Act, 2005

³⁵⁵ *Ibid.* s1

³⁵⁶ *Ibid.* s2

³⁵⁷ *Ibid.* s3&5

³⁵⁸ *Ibid.* s31

4.1.2.1 The Nigerian Electricity Regulatory Commission (NERC):

The creation of the NERC in 2007 is one significant structural change brought about by the EPSRA as discussed earlier. NERC is bestowed with the legal capacity to institute legal action and defend legal action in its own name, that is, the legal capacity to sue and be sued.³⁵⁹ Additionally, NERC has a *quasi-judicial* power to settle disputes that arise in the industry, with the exception of those that involve the courts through the use of arbitration or other means of Alternative Dispute Resolution.³⁶⁰ This is done upon the receipt of a formal petition from market participants involved in dispute.³⁶¹

Since the creation of NERC, its principal duty has been to serve as the primary regulator of the Nigerian power supply sector, which includes regulating electricity pricing (electricity tariffs), performance standards compliance, licensing, and consumer protection.³⁶² As stated in the Commission's vision and purpose, its main goal is to keep lights on. NERC also operates on the principles of leadership, professionalism, teamwork, and good governance.³⁶³ The important question is, however, how much of these requirements can be considered to have been completed since the commission was established 15 years ago as it has been criticized as not being fully independent even with its liberalization nature.³⁶⁴ Scholars have also recommended that the

³⁵⁹ *Ibid.* s31

³⁶⁰ *Nigerian Electricity Regulation Company v Abuja Electricity Distribution Company*, Case No NERC/01/000002/2008

³⁶¹ EPSRA ss45 & 62(4), Chapter II of the NERC Business Rules of the Commission Regulation, 2006

³⁶² *Ibid.* s32

³⁶³ Nigerian Electricity Regulatory Commission <<https://www.nerc.gov.ng>> accessed 18 August, 2022

³⁶⁴ O. Osasu, "Is the Nigerian Electricity Regulatory Commission Truly Independent?" (2014) 7 *International Environmental Law Report*, 261-265

NERC be given new goals because the existing ones are insufficient to address the problems that are prevalent in the Nigerian Electricity Supply Industry.³⁶⁵ The recommended goals comprise:

*ensuring that preferential prices for renewable electricity are set to cover costs due to the unique costs, geographic constraints, and other challenges involved in producing renewable energy; ensuring that the proper environmental impact assessments are carried out prior to the awarding of licenses; guaranteeing that renewable energy investors receive favorable tax treatment and, in its quarterly report to the president and National Assembly, especially addressing the state of the renewable electricity business.*³⁶⁶

Additional roles that are proposed include:

*the creation of streamlined licensing processes for renewable energy investment, reduced licensing fees for renewable electricity licenses, significantly reducing the regulatory compliance and reporting burden on renewable energy investors, the creation of a framework for power purchase agreements that guarantees: access to grid-based renewable electricity, long-term contracts that guarantee price and market for renewable electricity, and the creation and maintenance of quality standards for renewable energy.*³⁶⁷

4.1.2.1.1 The Goals and Objectives of the Nigerian Electricity Regulatory Commission

Each of the NERC's major aims has been assigned a set of business objectives, and the Commission has made sure that these objectives are consistent with its goals and functions as outlined in the EPSR Act, 2005. Hence, these business objectives are linked with four significant goals namely: uninterrupted electricity, private sector participation, consumer protection.³⁶⁸

These goals are highlighted as follows:

Goal One: Uninterrupted Electricity

- a. To ensure a constant and reliable power supply because it is essential to the development and growth of the Nigerian economy.

³⁶⁵ O. Aigbovo & E. Ogboka, "Electric Power Sector Reform Act 2005 and the Development of Renewable Energy in Nigeria" (2016) 20:7 (21) *Renewable Energy Law and Policy Review*, 20-29

³⁶⁶ *Ibid.*

³⁶⁷ *Ibid.*

³⁶⁸ Nigerian Electricity Regulatory Commission <<https://www.nerc.gov.ng>> accessed 18 August, 2022

- b. To ensure that many Nigerians have access to electricity and power supply must have a broad national footprint
- c. To ensure that Nigeria receives a service for the transmission, distribution, and trading of electricity that is secure, adequate, and reasonably priced through appropriate guidelines.³⁶⁹

Goal Two: Private Sector Participation

NERC is in charge of the following:

- a. Encouraging the involvement of private sector in the Nigerian electricity supply industry.
- b. Guaranteeing the development and implementation of regulations that support profitable pricing and effective competition among market players
- c. Making sure that the proper norms of conduct and rules of engagement are properly upheld to guarantee a productive and investor-friendly market; and
- d. Observes business practices and guards against market exploitation.³⁷⁰

Goal Three: Consumer Protection

NERC is in charge of making sure consumers uphold their end of the bargain by paying for the electricity they use and that their interests are safeguarded and in carrying out this duty, NERC:

- a. Creates fair pricing guidelines and customer service standards in cooperation with licensees;
- b. Ensures that customers are in regular communication so they are aware of their rights and obligations;

³⁶⁹ “NERC Goals and Objectives” <<https://www.nerc.gov.ng/index.php/about/commission/385-goals>> accessed 18 August, 2022

³⁷⁰ *Ibid.*

- c. Ensures that information on consumer rights (safety, service, etc.) is current, accessible, and readily available;
- d. Creates and maintains a successful dispute resolution process to assure consumer protection while simultaneously promoting involvement from the private sector.³⁷¹

Goal Four: Fair Regulation

NERC makes sure of the following to provide a level playing field for all operators and to protect consumers:

- a. Fair enforcement of industry regulations.
- b. Strict monitoring of the industry.
- c. Enforcement of its laws and regulations with fairness and rigor.³⁷²

The main question raised by the creation of NERC is whether it has materially improved the management of the Nigerian Electricity Supply Industry as there are several arguments that it has not actually made significant improvements in the Nigerian electricity supply industry as it is currently a toothless bulldog. Also, NERC's level of independence is a further cause for concern which raises the question of whether or not it is indeed autonomous.

4.1.2.1.2 NERC's Renewable Energy Sourced Electricity

There are many different renewable energy sources available in Nigeria, but the most common ones include solar, wind, biomass, and small hydro power. In order to encourage investment in the production of renewable energy in Nigeria, NERC made a commitment. The commitment

³⁷¹ *Ibid.*

³⁷² *Ibid.*

was setting a goal to produce at least 2,000 MW of power from renewable sources by the year 2020, recognizing the enormous and mostly untapped potential of renewable energy resources.³⁷³

The primary characteristics of NERC's electricity from renewable sources include:

- a. Guaranteed price and grid access;
- b. Feed-In Tariff for Small Hydro, Wind, Biomass, & Solar;
- c. Power Purchase Agreement (PPA) with a 20-year plant life cycle;
- d. The Companies that distribute electricity (DisCos) must purchase at least 1000MW (50 per cent of the total projected renewable sourced electricity); and
- e. The Nigerian Bulk Electricity Trading Company (NBET) must purchase no less than 1000MW (50 per cent of the total projected renewable sourced electricity).³⁷⁴

Additionally, NERC authorized three windows for grid-connected renewable energy projects in accordance with the National Policy on Renewable Energy and Energy Efficiency Policy (NREEEP) 2015. These windows include:

1. Net-metering for extremely small capacities, typically below 1MW;
2. Feed-in tariff for capacities as high as:
 - a. 5 MW of solar power;
 - b. 10 MW of wind power;
 - c. 10 MW or less of biomass; and
 - d. 30MW of small hydropower.

³⁷³ NERC's Renewable Energy Sourced Electricity <<https://www.nerc.gov.ng/index.php/home/operators/renewable-energy>> accessed 19 August, 2022

³⁷⁴ *Ibid.*

3. Through NBET, competitive tenders will be used to purchase capacity exceeding these criteria.

4.1.2.1.4 NERC's Mini-Grids and Mini-Grid Regulation

According to International Energy Agency, mini-grids are defined as:

A set of electricity generators and, possibly, energy storage systems interconnected to a distribution network that supplies the entire electricity demand of a localized group of customers. This power delivery architecture can be contrasted with single customer systems (example, solar home systems) where there is no distribution network interconnecting customers, and with centralized grid systems, where electrical energy is transmitted over large distances from large central generators and local generators are generally not capable of meeting local demand.³⁷⁵

Additionally, by virtue of the provisions of the Nigerian Electricity Regulatory Commission Mini-Grid Regulation 2016, mini-grids are defined as:

A stand-alone power system or an integrated local generation and distribution system with installed capacity below 1 MW, capable of serving numerous end-users independent of the national grid. A min-grid can provide constant and affordable electricity in remote places where the population density is low to economically justify connecting that community to the national grid and represents a viable and cost-effective solution to the electrification of Nigerian communities through a decentralized energy system.³⁷⁶

The NERC Mini-Grid Regulation of 2016 was passed expressly to create a strategic framework for electricity availability via mini grids.³⁷⁷ Currently, there are two types of mini-grids; an isolated mini-grid and an interconnected mini-grid are the two types of mini-grids recognized by the NERC.³⁷⁸ Isolated mini-grids are independently operating grids that are designed to generate power for a small group of people, typically in remote places where connecting to the main grid

³⁷⁵ International Energy Agency Photovoltaic Power Systems Programme, "PV Hybrid Systems within Mini-Grids" <<https://www.iea-pvs.org/research-tasks/pv-hybrid-systems-within-mini-grids/>> accessed 19 August 2022

³⁷⁶ Nigerian Electricity Regulatory Commission Mini-Grid Regulation 2016

³⁷⁷ Nigerian Electricity Regulatory Commission Regulation for Mini-Grids 2016

³⁷⁸ *Ibid.* para 5

is challenging.³⁷⁹ On the other hand, interconnected mini-grids are grids that have been created in a way that makes interconnection with the main grid conceivable.³⁸⁰ Mini-grids foster a sense of involvement in rural communities and have a good impact on the political structure, according to research on the sociological effects of their growth as a potential solution to countries' power problems.

The provision of section 88(9) of the Electric Power Sector Reform Act is the section of the Act that goes into the most depth about the production of power from renewable sources. However, this provision is insufficient to address the issue of inadequate access to power supply. Nigeria must solve all current institutional and legislative barriers in its power sector if it wants to encourage investments in renewable energy sources and address environmental concerns.³⁸¹ The limited reach of Nigeria's technology transfer regulations, flaws in the Electric Power Sector Reform Act of 2005, and a lack of intergovernmental ties are only a few of these legal and institutional barriers to achieving the energy mix goals.³⁸² Nigeria should use and encourage investments in renewable energy despite its abundance in oil and gas.³⁸³ The country's access to electricity would be greatly improved by investments like those in off-grid solar energy. Along with environmental and economic issues, there are also issues with access to energy that need to be resolved.³⁸⁴ The contribution of renewable energy to Nigeria's electricity production is now woefully inadequate; hence the country must change its electrical supply mix to encourage the

³⁷⁹ *Ibid.* para 7 - 8

³⁸⁰ *Ibid.* para 9

³⁸¹ P. Oniemola, "Commercializing Renewable Energy in Nigeria through a Legal Framework for Competitive Bidding Scheme" (2016) 19 *Nigerian Law Journal*, 94

³⁸² L. Salami & A. Elebiju, "Investment for Electricity Business in Nigeria" (2004) 22, *Journal of Energy and Natural Resources Law*, 94

³⁸³ P. Oniemola, "Why Should Oil Rich Nigeria Make a Law for the Promotion of Renewable Energy in the Power Sector?" (2016) 60:1 *Journal of African Law*, 29-55 <<https://www.cambridge.org/core/journals/journal-of-african-law/article/abs/why-should-oil-rich-nigeria-make-a-law-for-the-promotion-of-renewable-energy-in-the-power-sector/7855C581E2CD7FEF044D7F73837371C8>> accessed 23 August, 2022

³⁸⁴ *Ibid.*

use of these sources in the creation of electricity. Although each type of the sources of renewable energy has its drawbacks, however, overall advantages outweigh the risks.

Consequently, supportive legal frameworks and schemes should be implemented to encourage the use of renewable energy by introducing tariff methodologies and tradable quota schemes that require utilities to produce or use a specific amount of electricity from renewable energy sources. Additionally, strategies to enhance electricity licensing, environmental impact assessments, planning approval/permits, grid connection and access, as well as land use rights, should be adequately implemented.³⁸⁵

Nevertheless, since one of the main problems in the Nigerian power sector is the lack of a streamlined legislation to solve the issue of infusing renewable energy resources into the system, the importance of renewable energy needs to be taken into cognizance.³⁸⁶ First, renewable energy ensures sustained availability to energy for any nation's development. This is the major justification for the adoption of renewable energy sources for power generation in Nigeria. Second, it is a true tool for solving the worldwide challenge of climate change.³⁸⁷

Thus, cost, insufficient legal and regulatory frameworks, inadequate market performance, and weak standards are among the issues impeding the development of renewable energy.³⁸⁸ A stronger legal structure, financial solutions, private sector participation, technology transfer measures, cost reduction initiatives, and tax-based incentives are the measures required for the implementation of a robust energy mix in Nigeria.

4.1.2.1.5 Nigerian Electricity Structural Licensing

³⁸⁵ *Ibid.*

³⁸⁶ C. Ogbumbada, "Developing and Effective Legal Framework for Renewable Energy Utilization in Nigeria" (2018) 8:3 *Renewable Energy Law and Policy Review*, 1

³⁸⁷ *Ibid.*

³⁸⁸ *Ibid.*

The provision of the EPSRA particularly section 62 requires anybody who wishes to build, own, or operate a project in electricity generation, transmission, operation, distribution, or trade to have a license. The general norm, however, includes an exception defined in section 62(2) for those who propose to construct, own, or run a project for generating electricity of little more than 1 megawatt (MW) or for distribution of no more than 100 kilowatts (KW). By the provision of the EPSRA, the applicable licensing organization is the NERC.³⁸⁹ The EPSRA also specifies the requirements for obtaining different categories of licences, including general licences,³⁹⁰ transmission licences,³⁹¹ system operation licence,³⁹² distribution licences,³⁹³ and trading licences.³⁹⁴ It also includes instructions for application for a licence,³⁹⁵ restriction on licences,³⁹⁶ renewal of licence,³⁹⁷ amendment of licences,³⁹⁸ cancellation of licences,³⁹⁹ and enforcement of licences.⁴⁰⁰

The main objective of reforming the Nigerian electricity supply industry is to promote competition, and in any reformed industry, the licensing procedure is critical in establishing how fair the market would be.⁴⁰¹ However, the new licensing arrangement under the EPSRA raises some peculiar issues, the most prominent of which is the duration of the license granted by the Commission under the Act and its viability in terms of the sufficiency of the time granted to enable investors in the electricity industry to both recover and profit from their investment.

³⁸⁹ *Ibid.* s62(3)

³⁹⁰ *Ibid.* s64

³⁹¹ *Ibid.* s65

³⁹² *Ibid.* s66

³⁹³ *Ibid.* s67

³⁹⁴ *Ibid.* s68

³⁹⁵ *Ibid.* s70

³⁹⁶ *Ibid.* s69

³⁹⁷ *Ibid.* s72

³⁹⁸ *Ibid.* s73

³⁹⁹ *Ibid.* s74

⁴⁰⁰ *Ibid.* s75

⁴⁰¹ O. Arowolo, "Nigerian Power Sector Reform: Why Distribution Requires a Clean Strategy" (2005) 7 *Electricity Law and Regulation*, 163 <<https://www.ogel.org/article.asp?keys=1867>> accessed 23 August, 2022

Thus, the NERC has attempted to reassure potential investors in the company through public statements that as long as the duties under their licenses are completed in strict compliance, the renewal of their license for a second term will be automatic.⁴⁰² It is, however, strongly advised that this NERC purpose be incorporated into the Act through an amendment. In order to solve the deficiencies inherent in the Electric Power Sector Reform Act,⁴⁰³ scholars have also proposed capacity expansion and development,⁴⁰⁴ appropriate staff training, less government interference, the introduction of a competitive legislation and a national energy law, and a unified approach to effective policy implementation.⁴⁰⁵

4.1.2.1.6 Electricity Tariff System in Nigeria

Tariffs are referred to as the rate at which one is charged for the use of public services such as gas and electricity. In other words, tariffs are fees levied on a product or service.⁴⁰⁶ In Nigeria, the NERC, is however, charged with the responsibility of regulating the tariff rates for the electricity supply industry.⁴⁰⁷ By virtue of the provision of section 76(1) EPSRA, the following activities are subject to tariff regulation:

⁴⁰² W. Arowolo & Y. Perez, "Market Reform in Nigeria Power Sector: A Review of Issues and Potential Solutions" (2017)

<https://www.researchgate.net/publication/315836865_Market_Reform_in_Nigeria_Power_sector_A_review_of_issues_and_potential_solutions> accessed 23 August, 2022

⁴⁰³ S. Amadi, "The Rule of Law Approach to Regulating Electricity Supply in Nigeria" (2017) 8 *Journal of Sustainable Development Law and Policy*, 26

⁴⁰⁴ B. Saidu, "Committing to Legal and Regulatory Reform: An Analysis of the Legal and Regulatory Framework of the Electricity Supply Industry in Nigeria" (2011) 29:3 *Journal of Energy and Natural Resources Law*, 1

⁴⁰⁵ *Ibid.*

⁴⁰⁶ Collins English Dictionary <<https://www.collinsdictionary.com/dictionary/english/tariff>> accessed 23 August, 2022

⁴⁰⁷ EPSRA s76(2)

- (a) Generation and trading, in respect of which licences are required pursuant to this Act, where the Commission considers regulation of prices necessary to prevent abuses of market power⁴⁰⁸; and
- (b) Transmission, distribution and system operation, in respect of which licences are required under this Act.⁴⁰⁹

As a result, the NERC introduced the Multi-Year Tariff Order (MYTO) in 2008, in accordance with the authority conferred on it by sections 76(1) and 76(2). The Multi-Year Tariff Order (MYTO 1) was established in 2008 by NERC, and NERC also released another (MYTO 2) running from the year 2012. The MYTO 1 and 2 is a fifteen-year road map towards cost reflective tariffs, and the reason behind this innovation of cost reflective tariffs was to make sure that the end users are satisfied in order to attract creative investments into the Nigerian Electricity Supply Industry (ESI). The ESPRA also ensured NERC to note the overall total of the electricity consumed, the duration of the electricity consumption, power factors, level of voltage, load factors and areas (location/residence) of the consumers. Although MYTO 1 and MYTO 2 were designed to keep consumer prices relatively low, there were some improvements made on MYTO 2. MYTO 2 will be reviewed twice in a year and changes may be made for all electricity generated wholesale contract prices, adjusted for the Nigerian inflation rate, current exchange rate, and daily generation capacity, among others.⁴¹⁰

There have been several controversies as regards the tariff models in the electricity sector which has led to conflicts. In the case of *Funke Adekoya v Victoria Garden City Management &*

⁴⁰⁸ *Ibid.* s76(1)(a)

⁴⁰⁹ *Ibid.* s76(1)(b)

⁴¹⁰ *Ibid.*

Maintenance Co Ltd & Another,⁴¹¹ the petitioner filed a petition against Victoria Garden City estate in order to discover the validity of the arrangements for power supply in the in the area, as the estate without a proper license from the NERC as the tariff imposed on residents were excessive contrary to the provisions of the law. The NERC maintained that the power supply plan was in opposition to the arrangements of EPSRA, that duties payable by occupants in the domain could not be expanded freely by the conveyance organization, and that all overabundance finances previously charged ought to be gotten back to the impacted occupants. This ruling made it clear that it is only NERC that is obligated with the power to determine the general prices of electricity, which is universal; and the distribution models agreed into by distribution companies. This ruling by NERC also reestablished the principle of consumer protection and fairness which are the functions of the NERC as provided for by the ESPRA.

Also in the case of *Petadis Enterprise v HFP Properties Ltd* an action was instituted on behalf the Ikota shopping complex occupants in Lagos, on the grounds of the unlawful power supply plans by a representative (HFP Properties Limited) of the neighborhood conveyance organization (Eko Electricity Distribution Company (EEDC)) responsible for the area. NERC upheld the EEDC was in opposite with the agreements of their permit as they were disallowed from moving the rights accommodated in their permit without the assent of NERC. NERC additionally decided that the EEDC ought to consent to the endorsed charging designs.⁴¹² Moreso, in order to sustain the price stability for electricity generated from renewable sources, the Feed-in-Tariffs

⁴¹¹ NERC/H/061

⁴¹² NERC/10/0011/08

(FIT) was released to safeguard competent return on investments for private organization and individual investors in renewable energy generation framework.⁴¹³

4.1.3 Renewable Energy Policy Guidelines (REPG) 2006

Following the enactment of the EPSRA in 2005, the Federal Government of Nigeria enacted a new policy known as the Renewable Energy Policy of 2006, which resulted in Policy Guidelines on Renewable Energy, recognizing that renewable energy would be a more decentralized and cost-effective option for the Nigerian power sector. The policy guidelines also call for the establishment of the Rural Electrification Agency (REA) and the Renewable Electricity Trust Fund (RETF) for the exclusive purpose of financing renewable energy. The policy guidelines established the following goals for the NERC:

- a. To develop simpler licensing techniques for investments in renewable energy;
- b. To develop a framework for power purchase agreements that ensures access to grid-based renewable electricity;
- c. To develop and maintain the equipment and installations of renewable electricity;
- d. To ensure proper conduct of the requisite environmental impact assessment before the award of a license; and
- e. To update the President and the National Assembly on the status of the renewable energy sector of the Nigerian electricity supply industry through quarterly reports.⁴¹⁴

⁴¹³ EPSRA s32(1) and 96 vests power on NERC to make Regulations on Feed-in Tariff for Renewable Energy Sourced Electricity in Nigeria.

⁴¹⁴ Paragraph 7.3 Renewable Energy Policy Guidelines 2006

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

The policy is Nigeria's first and so far the only unified initiative to promote renewable energy production and resource efficiency. It is a specific guideline that has been deliberately established with the goal of addressing the restrictions that have put the renewable energy sector at a disadvantage when compared to other kinds of energy.⁴¹⁵ The policy recognized the diverse characteristics of energy and devised implementation plans to handle the various difficulties inherent in the energy industry as it considers renewable energy as the best way to close the gap of the limited national grid's reach. The purpose of the policy guidelines include:

- a. Framework for clean energy;
- b. National significance of renewable energy and energy efficiency especially for energy security;
- c. Increase in renewable energy mix in line or above ECOWAS regional targets, and set national targets for renewable energy and energy efficiency;
- d. Integration of renewable energy and energy efficiency into national and state level planning, and creation of the necessary enabling environment;
- e. Preparation of the National Renewable Energy Action Plan (NREAP) and a National Energy Efficiency Action Plan (NEEAP).
- f. Mandatory requirement for the Federal Ministry of Power to develop an Integrated Resource Plan (IRP), and ensure continuous review and implementation of the policy provisions; and

⁴¹⁵ Paragraph 1.4 National Renewable Energy and Energy Efficiency Policy 2015

- g. Framework development for sustainable financing of renewable energy and energy efficiency projects and programmes.⁴¹⁶

Additionally, the objectives of the policy guidelines include:

- a. The development of Nigeria's renewable energy resources by diversifying the energy mix to achieve national energy security and an efficient energy delivery system;
- b. Guarantee of adequate, reliable, affordable, equitable and sustainable supply of renewable energy at cost-reflective and appropriate prices, as well as in an environmentally friendly manner;
- c. Acceleration of the process for acquisition and diffusion of technology, management expertise and indigenous participation in the renewable energy and energy efficiency sector;
- d. Guarantee of efficient, location-specific and cost-effective consumption pattern of renewable energy resources and improved energy efficiency;
- e. Promotion for investments for the renewable energy and energy efficiency sector;
- f. Foster international co-operation in trade and project development at the regional, continental and global level;
- g. Provision of abundant electricity access to Nigerians;
- h. Establishment of appropriate financing mechanisms that support private investment in the renewable energy and energy efficiency sub-sector; and
- i. Effective coordination and collaboration among all key stakeholders in the renewable energy and energy efficiency sub-sectors in Nigeria.⁴¹⁷

⁴¹⁶ *Ibid.* para 1.1

⁴¹⁷ *Ibid.* para 1.2

It is, however, important to note that one of the key initiatives provided for by the policy guidelines is the issue of energy efficiency, which is geared toward promoting energy conservation and ensuring the reduction of greenhouse gases emission caused by the consumption of fossil-fuel generated electricity in Nigeria.⁴¹⁸ The policy also, develops key techniques/strategies for the development of other sources of energy such as solar,⁴¹⁹ wind,⁴²⁰ hydropower,⁴²¹ biomass,⁴²² geothermal,⁴²³ wave and tidal energy.⁴²⁴

4.1.5 The Rural Electrification Agency (REA) 2006

The Rural Electrification Agency is another institution established by the ESPRA in 2006 in order to extend the main grid, develop isolated mini-grid systems and renewable energy for power generation.⁴²⁵ The ESPRA likewise makes the REA a body corporate with the power to sue and be sued in its own name.⁴²⁶ Since its establishment, the REA has been responsible for executing the dedication of the Federal Government of Nigeria to rural electrification as exemplified in the National Energy Policy, the Electric Power Sector Reform Act of 2005, and the Rural Electrification Strategy and Implementation Plan (RESIP).⁴²⁷ The purpose of the Agency is to promote, support and provide rural electrification programs through the establishment and administration of the rural electrification fund and the encouragement of public and private sector participation in order to accomplish even-handed regional electricity access; ensure that the environmental, economic and social benefits of rural electrification

⁴¹⁸ *Ibid.* para 1.1

⁴¹⁹ *Ibid.* para 2.3

⁴²⁰ *Ibid.* para 2.4

⁴²¹ *Ibid.* para 2.1

⁴²² *Ibid.* para 2.2

⁴²³ *Ibid.* para 2.5

⁴²⁴ *Ibid.* para 2.6

⁴²⁵ S. Ohiare, 'Expanding Electricity Access to all in Nigeria: A Spatial Planning and Cost Analysis' (2015) *Energy Sustainability and Society* 5(8) 1-18 at 1-2

⁴²⁶ s88 ESPRA

⁴²⁷ Rural Electrification Agency <<https://www.rea.gov.ng/history>> accessed 18 August 2021

subsidies are maximized, ensure the expansion of the grid and the development of the off-grid electrification, and ensure the stimulation and development of innovative approaches to rural electrification as long as no part of the fund would be used as subsidies for consumption.⁴²⁸

However, the problems with insufficient reliable electricity are generally managed by allowing the electricity grid to include off-grid areas.⁴²⁹ This technique is properly considered especially once it is more economically efficient than any other approach.⁴³⁰ This method is preferred because it has a greater reliability in regions with adequate load density.⁴³¹ However, given the state of the Nigerian ESI, promoting mini-grid solutions⁴³² would be a much more viable approach, as previous grid expansion attempts have been very slow and have produced minimal results.

4.1.6 Ministry of Power and Steel

The Ministry of Power and Steel (MPS) is in charge of guiding policy in Nigeria's power sector. The Ministry gives the NERC instructions on how to develop and organize the Nigerian Electricity Supply Industry (ESI) in a methodical way. The Ministry's instructions must, however, be implemented in conjunction with existing laws that relate to the energy sector, such as the EPSRA⁴³³ and the Federal Republic of Nigeria's Constitution.⁴³⁴ Other supplementary functions delegated to the Ministry include establishing measures designed to promote a more

⁴²⁸ s88(1) – (13) ESPRA

⁴²⁹ J.E. Elusakin & O. Ajide & O. Olufemi & J. Diji, "Challenges of Sustaining Off-grid Power Generation in Nigerian Rural Communities" (2014) *African Journal of Engineering Research* 51-57 at 53-54

⁴³⁰ S.M. Ohiare, "*Financing Rural Energy Projects in Developing Countries: A Case Study of Nigeria*" (2014) (Ph.D De Montfort University Faculty of Technology) at 45

⁴³¹ *Ibid.*

⁴³² M.Y. Roche, H. Velrome, C. Agbaegbu, T. Binnington & M. Fishedick, "Achieving Sustainable Development Goals in Nigeria's Power Sector: Assessment of Transition Pathways" (2020) *Climate Policy Journal* 20(7) 846-865

⁴³³ Electric Power Reform Act 2005

⁴³⁴ Constitution of the Federal Republic of Nigeria 1999 (as amended)

competitive electricity market in Nigeria,⁴³⁵ develop a framework for the Rural Electrification Agency,⁴³⁶ and making recommendations to the President on electricity market rules developed by system operators.⁴³⁷

4.1.7 National Council on Privatization (NCP)

The NCP's involvement in the Nigerian Electricity Supply Industry's transformation cannot be overstated. Nigeria's privatization and commercialization of public companies is the responsibility of the NCP.⁴³⁸ It also played a key role in NEPA's assets and liabilities being transferred to the Initial Holding Company.⁴³⁹ Currently, the NCP's role is carried out by the Bureau of Public Enterprises (BPE). These two organizations are focused on taking all necessary efforts to prepare public companies for privatization. With respect to the ESI, the EPSRA empowers the NCP to establish the PHCN as an initial holding company and devise measures for the transfer of assets, liabilities, functions, and staff, as well as to develop successor companies to which the PHCN's assets and liabilities could be transferred later in the Nigerian Electricity Supply Industry (ESI).⁴⁴⁰

Following an examination of the laws and institutions enacted and established for the governance of the electrical industry, as well as a study of the numerous action plans and policies developed, it is clear that, despite the recent growth in energy generation, the targets set from time to time have never been realistically realized. This suggests that more focus should be placed on institutional reforms, such as the formation of checks and balances to guarantee that purposeful

⁴³⁵ s24 ESPRA

⁴³⁶ *Ibid.* s88

⁴³⁷ *Ibid.* s26(2)

⁴³⁸ *Ibid.* s1

⁴³⁹ *Ibid.* s3(1) *Public Enterprises (Privatization and Commercialization) Act*

⁴⁴⁰ *Ibid.*

implementation tactics are executed. This must be done in accordance with the growing trend in power governance toward substituting sustainable and greener energy sources for fossil fuel power supply.

4.2 Renewable Energy and Power Supply in Ghana

Certain African jurisdictions are regarded as selected locations and international leaders in the energy transition field from fossil fuels to green economy in the generation of power supply. Ghana is prominent among these jurisdictions; the aim of this section will be to evaluate the appropriate laws, policies, and action plans of the chosen jurisdictions in order to provide structural legal and institutional recommendations for Nigeria. This is because it would be an enormous task and beyond the scope of this research to attempt an analysis of all the energy laws, policies, and action plans in the jurisdiction chosen, this section will concentrate solely on the instrumental laws for safe energy transition in these jurisdictions, taking into account Nigeria's current needs.

Thus, this section examines the Ghana electricity market's structural analysis by analyzing the history of electricity transition with specific reference to legal and institutional progression through the various laws, policies, and action plans that aided energy transition in its power sector, as well as the current Ghana electricity supply mix. Where applicable, a comparison with Nigeria is made.

4.2.1 The Jurisdiction of Ghana

Ghana's national electricity is ranked second in terms of access rate and fourth in Sub-Saharan Africa, after South Africa.⁴⁴¹ According to the World Bank Sustainable Energy for All Report,⁴⁴² 78.3 percent of Ghanaian households have access to electricity. Hydropower accounts for approximately 64 percent of Ghana's electrical power generation. Electricity is the most common kind of contemporary energy in Ghana, accounting for approximately 65 percent of energy utilized in the industrial and service sectors and approximately 35 percent in household consumption. The Ghana Energy Commission listed certain possible electricity consumption drivers, including industrial expansion, double installed generation capacity, and extended universal access to electricity.⁴⁴³

Over the last decade, Ghana's electricity demand has rapidly increased. Between 2000 and 2013, there was a 6,340 GW supply gap in lieu of demand according to the Energy Commission. Industry accounted for over 45 percent of the shortage, with the remainder going to the residential and commercial sectors. In 2020, the consumer sector's relative market share is predicted to increase to 50 percent of the maximum demand for the residential sector.⁴⁴⁴ Biomass, which mostly consists of wood fuel and, to a lesser extent, crop leftovers, accounts for half of total primary energy supply. Hydropower has been Ghana's principal source of electricity generation. In 2015, total energy generation was 11,492 GWh, with hydropower accounting for 50.86 percent, thermal power plants accounting for 49.1 percent, and other renewables

⁴⁴¹ S. Gyamfi & M. Modjinou & S. Djordjevic, "Improving Electricity Supply Security in Ghana: The Potential of Renewable Energy" (2015) 43 *Renewable and Sustainable Energy Review*, 1035-1045

⁴⁴² O. Kyekyeku, "Renewable Energy Situation in Ghana and Future Prospect" (2018) 6 *Journal of Clean Energy Technologies*, 4

⁴⁴³ Ghana Energy Commission, "Energy (Supply and Demand) Outlook for Ghana, Final Report", 2014

⁴⁴⁴ C. Caterina & S. Marisa & T. Kevin, "The Electricity Outages Leaving Ghana in the Dark" (2016) *Renewable and Sustainable Energy Review*, 98

accounting for 0.3 percent. Hydropower generation has decreased from approximately 54 percent in 2013 to approximately 43.2 percent in 2016.⁴⁴⁵

Since 2000, there has been a decrease in the availability of electricity to the industry sector, which has effectively halted the country's progress in the most recent energy crisis. The continual national power outages and load shedding in Ghana demonstrate the country's supply and demand for electricity. Ghana generated 13,071 GWh of gross transmission power in 2014, up from 12,927 GWh in 2013. Peak load for the country's supply on the transmission grid was 1,970 MW, approximately 10 percent higher than in 2013, with overall peak on the transmission grid being 2,061 MW, about 6 percent higher than in 2013. As of 2015, Ghana's comparable peak demand (including suppressed demand) and total transmission system peak ranged from 1,980-2,300 MW. The available grid electricity ranges between 15,000 and 15,200 GWh.⁴⁴⁶

In accordance with worldwide trends, the Ghanaian government established important priorities for the country's energy sector. The government planned to supply power to every household by the end of 2020. The government's vision is to ensure that all sectors of the economy have reliable, high-quality energy services and that the country can export power to neighboring countries. Renewable energy sources have been identified as a viable option for Ghana's energy security and environmental management in order to mitigate the detrimental consequences of climate change.⁴⁴⁷ Thus, the Renewable Energy Act of 2011 (Act 882) was enacted to offer a

⁴⁴⁵ *Ibid.*

⁴⁴⁶ Ghana Energy Commission, "Energy (Supply and Demand) Outlook for Ghana, Final Report", 2014

⁴⁴⁷ B. Aboagye, S. Gyamfi, E. Ofosu & S. Djordjevic, "Status of Renewable Energy Resources for Electricity Supply in Ghana" (2021) 11 *Scientific African Journal* <<https://www.sciencedirect.com/journal/scientific-african/vol/11/suppl/C>> 29 August, 2022

regulatory framework and monetary incentives to encourage private sector investment and the efficient and sustainable use of renewable energy.⁴⁴⁸

The Public Utility Regulatory Commission (PURC) is specially empowered to set the Feed-in-Tariffs (FITs) that determine the success or failure of the renewable energy sector as provided by the Act. According to the Ministry of Energy, nearly 6,000 solar systems with an installed capacity of 3.2 MW were installed in the country in 2015, primarily for off-grid purposes. The Public Utilities Regulatory Commission of Ghana established feed-in tariff rates for renewable energy generated power.⁴⁴⁹

4.2.2 Overview of Renewable Sources of Energy in Ghana

Renewable energy in Ghana is defined as non-depleting energy sources such as hydro, solar, wind, biomass, landfill gas, biofuel, sewage gas, ocean energy, geothermal energy, and any other energy source designated in writing by the Minister of Energy.⁴⁵⁰ Renewable energy resources are abundant in Ghana and could be used to achieve sustainable development. Hydro (mini/small and medium capacity), wind, solar energy, wave and tidal energy, biomass, and waste-to-energy are the most common across the country⁴⁵¹. This section provides an overview of renewable energy resources in Ghana, the status of their exploitation, and the problems encountered in deployment thus far, as well as how the Government of Ghana is addressing them.

⁴⁴⁸ Renewable Energy Act, 2022

⁴⁴⁹ *Ibid.* s.5

⁴⁵⁰ *Ibid.* s.2

⁴⁵¹ H. Essel, "Renewable Energy Policy Review: Identification of Gaps and Solution in Ghana" (2015) *Renewable and Sustainable Energy Review*

4.2.2.1 Ghana's Solar Photovoltaic (stand-alone and grid connected) and Solar Lanterns

Solar energy is abundant throughout Ghana, with a great potential for grid and off-grid power generation. It is projected that the country has 35 exajoules (EJ) of solar potential. This may be used to provide almost 100 times the nation's current power needs, which are estimated to be 53,000 MWh per year assuming an annual average of 2,670 working hours. With an annual daily solar radiation of 4.0 - 6.0 kWh/m² in Ghana, solar photovoltaic electricity generation is one of the promising renewable sources for improving the country's electrical supply security.⁴⁵²

Ghana has chosen the Ghana Energy Development and Access Project (GEDAP) solar project to enhance electricity access in rural and remote areas of the country through solar photovoltaic installations. This increase will serve to improve the quality of life in the country by improving educational services and providing income-generating opportunities. Local enterprises supply the solar lanterns and solar home systems with the goal of increasing local participation and innovation to the point where local industries can create these lanterns locally. A large number of technicians have received training in system maintenance and installation.⁴⁵³

Around 16,500 systems have been purchased and installed, consisting of 8000 solar lanterns and 8500 solar house systems.⁴⁵⁴ Ghana boasts the largest photovoltaic solar energy plant in Africa and the fourth largest in the world, thanks to the Nzema Solar Power Station Project, which is still under construction. This 155 MW facility will be able to power over 100,000 houses in the

⁴⁵² S. Sarkodie & P. Onwusu, "A Review of Ghana's Solar Energy Potential" (2016) 4 *AIMS Energy*, 481-503

⁴⁵³ *Ibid.*

⁴⁵⁴ IEA, "National Electrification Scheme, IEA/IREANA Joint Policies and Measures Data Base", 2017

country, increasing the country's electricity generating capacity by 6 percent when completely operational.⁴⁵⁵

Additionally, the BXC Solar Plant in Ghana's Central Region is the world's largest operational solar farm. It was founded in February 2016 and is owned by a Chinese corporation. The project was developed under the country's incentive program for Independent Power Producers (IPPs). It generates 20MW of power after two years of construction, adding significantly to Ghana's ambitious ambition to reach a 10 percent renewables milestone by 2020.⁴⁵⁶ The panels will aid the country in its transition to cleaner power. The country's shift to solar has been gradual, making the goal of achieving a 10 percent share of energy resources from renewables by 2020 difficult.

4.2.2.2 Ghana's Wind Energy

Wind power, in addition to hydropower and solar energy, is a renewable energy source that generates electricity in Ghana. Ghana has an abundance of wind resources that might be utilized to generate enormous amounts of power.⁴⁵⁷ In 2004, the Solar and Wind Energy Resource Assessment (SWERA) project, which was carried out in collaboration with the United States National Renewable Energy Laboratory (NREL), United Nations Environmental Programme, and the Global Environment Facility, identified specific spots along Ghana's coastline that could support wind power generation. Wind energy has a decent moderate potential estimated at 40

⁴⁵⁵ J. Ahiekpor, "Solar Lantern Projects in Ghana: An Overview" (2013) Final Draft Report Prepared for the Netherlands Development Organization

⁴⁵⁶ D. Olla, "BXC Connects 20 MW Solar Plant to Ghana's National Grid" (2016) <<https://www.pv-tech.org/new-solar-farm-launches-20mw-into-ghanas-national-grid>> accessed 29, August, 2022

⁴⁵⁷ M. Opam, "Ongoing Initiatives to Accelerate Sustainable Uptake of Renewable Energy" (2015) Ghana Energy Commission
<https://scholar.google.com/scholar_lookup?title=Ongoing%20initiatives%20to%20accelerate%20sustainable%20uptake%20of%20renewable%20energy&publication_year=2015&author=Ghana%20Energy%20Commission> accessed 29 August, 2022

6MW, suitable for grid connection, and off grid uses along Ghana's eastern coast, with a speed of more than 6m/s estimated at 50m.⁴⁵⁸ These available wind energy resources are predicted to provide 500-600 GWh/year of minimum energy. Wind energy has the ability to significantly support Ghana's energy sector. In terms of installed capacity, 5 percent of wind energy could undoubtedly be achieved.⁴⁵⁹

Ghana's tremendous wind potential has not been completely realized. Only 31 KW of wind capacity have been constructed for electricity generating in the country as at 2019.⁴⁶⁰ This includes an 11 KW mini-grid at Pediatorkope, an island village in Ghana's Dangme East District,⁴⁶¹ and a total of 20 KW off-grid systems erected in 2015 to produce power for domestic and commercial use.⁴⁶² This is as a result of the unpredictable and unreliable nature of stand-alone wind energy sources. However, a hybrid energy system comprised of wind and solar photovoltaic systems has been employed to generate electricity for household and agricultural purposes.⁴⁶³

4.2.2.3 Ghana's Hydro Energy

Since the 1960s, the Akosombo Dam has been Ghana's primary source of energy generation; however, the dam has been running at a reduced capacity due to previous droughts. Also, the dam's six turbines are failing to generate 67 percent of the country's energy as they did in prior years. Since the dam's construction, Ghana's energy demand has increased by more than 300

⁴⁵⁸ *Ibid.*

⁴⁵⁹ *Ibid.*

⁴⁶⁰ M. Nyasapoh, S. Debra, D. Twerefou, S. Gyamfi & F. Kholi. "An Overview of Energy Resource and Future Concerns for Ghana's Electricity Generation Mix" (2022) Journal of Energy <<https://www.hindawi.com/journals/jen/2022/1031044/>> accessed 29 August, 2022

⁴⁶¹ Ghana Energy Commission, National Energy Statistics Handbook, 2018

⁴⁶² Ghana Energy Commission, National Energy Statistics Handbook, 2008-2017

⁴⁶³ M. Adaramola & M. Chaab & S. Paul, "Analysis of Hybrid Energy Systems for Application in Southern Ghana" (2014) 88 *Energy Conversion Management*, 284-295

percent, reaching a peak of 1126.82 GWh as at 2015.⁴⁶⁴ Ghana's total installed capacity is currently 2,936 MW, with hydropower accounting for slightly more than half of this capacity, with a total installed capacity of 1,580 MW. This contribution is made up of three stations: Akosombo (1,020 MW), Kpong (160 MW), and Bui (400 MW).⁴⁶⁵

Although, smaller hydropower project development in Ghana remains a challenge due to a lack of a renewable energy regulatory and legal framework, as well as limited economic incentives to attract investors. The government's measures to support and accelerate hydropower development in Ghana are intended to help fulfill the country's rising electricity demand⁴⁶⁶

4.2.2.4 Ghana's Biomass and Waste-to-Energy

Biomass from plantations, agro-fuels, municipal byproducts, and residues from logging and wood processing might all be used to generate electricity. In Ghana, biomass and waste to energy have enormous potential for electricity generation.⁴⁶⁷ Every year, Ghana produces around 2 million tonnes of wood wastes, which could be used for energy generation and other reasons. Despite the abundance of this resource in the country, biomass leftovers have not been used for large-scale energy generation due to the unpredictability of continuous supply.⁴⁶⁸

4.2.2.5 Ghana's Wave and Tidal Energy

⁴⁶⁴ O. Kyekyeku, "Renewable Energy Situation in Ghana and Future Prospect" (2018) 6 *Journal of Clean Energy Technologies*, 4

⁴⁶⁵ *Ibid.*

⁴⁶⁶ C. Caterina & S. Marisa & T. Kevin, "The Electricity Outages Leaving Ghana in the Dark" (2016) *Renewable and Sustainable Energy Review*, 98

⁴⁶⁷ S. Sarkodie & P. Onwusu, "A Review of Ghana's Solar Energy Potential" (2016) 4 *AIMS Energy*, 481-503

⁴⁶⁸ H. Essel, "Renewable Energy Policy Review: Identification of Gaps and Solution in Ghana" (2015) *Renewable and Sustainable Energy Review*

Due to the vastness of the oceans, tidal energy has immense potential in Ghana. Ocean waves can be produced to meet Ghana's energy needs if the energy from the waves is harvested utilizing cost-effective, dependable, and environmentally friendly technologies.⁴⁶⁹ The technology required to generate electricity from waves, however, have yet to be proved in the country. The pilot project was successful, however due to budgetary constraints, scaling up was halted.⁴⁷⁰

4.3 Institutional Framework Regulating Electricity and Renewable Energy in Ghana

Over the last few decades, the Ghanaian government, through its various established institutions and development partners, has developed a slew of policies and strategies aimed at promoting renewable energy development in the country. This part examines the institutional framework as well as some of the most important policies, programs, and strategy documents.

4.3.1 Institutional Framework

In the renewable energy industry, a variety of institutions and stakeholders are in charge of policy formation, program implementation, monitoring and evaluation, electricity generation, transmission, and distribution. They include: Ghana Ministry of Energy, Public Utilities Regulatory Commission (PURC), Energy Commission, and Ghana Standards Authority.⁴⁷¹

4.3.2 Ghana's Ministry of Energy

⁴⁶⁹ Ministry of Power, SREP Investment Plan for Ghana, 2015

⁴⁷⁰ K. Konrankye, "TC's Energy Partner, Others to Revive Ada Foah Wave Energy Project" (2020) <<https://www.graphic.com.gh/business/business-news/tc-s-energy-partner-others-to-revive-ada-foah-wave-energy-project.html>> accessed 29 August, 2022

⁴⁷¹ O. Kyekyeku, "Renewable Energy Situation in Ghana and Future Prospect" (2018) 6 *Journal of Clean Energy Technologies*, 4

The Ministry of Energy continues its efforts to make Ghana self-sufficient in terms of sustainable energy production and export through its main goal which is to safeguard the natural environment and ensure a resilient built environment.⁴⁷² The power sector policy objectives relevant to the mandate of the ministry of energy include:

- a. Ensure availability of clean, affordable and accessible energy;
- b. Ensure efficient transmission and distribution system;
- c. Ensure energy availability and reliability;
- d. Ensure efficient utilization of energy;
- e. Enhance capacity policy formulation and coordination; and
- f. Improve financial capacity and sustainability of utility companies.⁴⁷³

Additionally, the core functions of the Ministry of Energy include:

- a. Translate government's energy development agenda and policy directives contained in the national energy policy into strategies and programmes;
- b. Ensure the reliable supply of affordable energy services to meet national demand and for export;
- c. Increase access to modern energy forms especially in rural areas;
- d. Ensure availability and security of future energy supplies; and
- e. Strengthen the capacity of energy sector institutions in planning and coordination of the sector.⁴⁷⁴

⁴⁷² National Policy Objectives Relevant to the Mandate of Ministry of Energy, 2020 Paragraph 2 <<https://mofep.gov.gh/sites/default/files/pbb-estimates/2020/2020-PBB-MoEn.pdf>> accessed 29, August, 2022

⁴⁷³ *Ibid.* para 1

⁴⁷⁴ *Ibid.* para 3

Furthermore, the policy outcome, indicators and targets of the Ministry of Energy, 2020 shows that since the commencement of the National Electrification Scheme, the national electricity access rate has improved from 84.32 percent in December 2018 to 84.98 percent in October 2019, with over 10,000 communities linked to the grid. Furthermore, there is increased penetration of renewable energy in the national energy supply mix (via the national grid), as well as an increase in the number of mini-grid electrification using renewable energy technologies installed in islands and lakeside communities, as well as a decrease in reliance on fossil fuels.⁴⁷⁵

4.3.3 Public Utilities Regulatory Commission (PURC) 1997

The Public Utilities Regulatory Commission (PURC) was founded in October 1997 as a multi-sector regulator under the Public Utilities Regulatory Commission Act, 1997 (Act 538) to regulate and oversee the provision of power and water utility services.⁴⁷⁶ The Commission was established as part of the Ghanaian government's utilities sector reform initiative. The Commission is a corporate body with perpetual succession and a common seal, and it has the authority to sue and be sued in its corporate name.⁴⁷⁷ In carrying out its tasks, the Commission is an independent entity that is not subject to the control of any authority. The Commission, on the other hand, delivers to Parliament annual operational and budgetary reports. The President's office also has administrative oversight over the Commission.⁴⁷⁸

The functions of the Commission are:

- a. Provide guidelines for rates to be charged for the provision of utility services;
- b. Examine and approve utility rates;

⁴⁷⁵ National Policy Objectives Relevant to the Mandate of Ministry of Energy, 2020

⁴⁷⁶ Public Utilities Regulatory Commission Act, 1997 (Act 538)

⁴⁷⁷ *Ibid.* s1(2)

⁴⁷⁸ *Ibid.* s4

- c. Protect the interest of consumers and providers of utility services;
- d. Monitor and enforce standards of performance for provision of utility services;
- e. Promote fair competition among public utilities;
- f. Receive, investigate and settle complaints relating to utility services; and
- g. Advise any person or authority in respect of any public utility.⁴⁷⁹

Additionally, the Ghana Grid Company (GRIDCo), the Ghana National Gas Company Ltd. (GNGC), the Electricity Company of Ghana Ltd. (ECG), Northern Electricity Distribution Company Ltd. (NEDCo), Enclave Power Company Ltd. and Ghana Water Company Ltd. (GWCL) are all directly controlled by the Commission. Other public utilities in generation are regulated by the PURC, which approves the Bulk Generation Tariffs (BGT) payable to them by distribution companies, reviews the reasonableness of pricing under Power Purchase Agreements (PPAs), and monitors their quality of service.⁴⁸⁰ However, the Public Utilities Regulatory Commission (Amendment) Act, 2010 (Act 800) amended Section 5 of the Public Utilities Regulatory Commission Act, 1997 (Act 538) in order to impose a levy on electricity and natural gas transmission services and other prescribed public utility services and to provide for related matters.⁴⁸¹

4.3.4 Energy Commission

The Energy Commission was established by the Energy Commission Act, 1997 (Act 541) in 1997 and is mandated by law to regulate and manage the development and utilization of Ghana's energy resources, as well as to provide the legal, regulatory, and supervisory framework for all

⁴⁷⁹ *Ibid.* s3

⁴⁸⁰ Public Utilities Regulatory Commission, Ghana <<https://www.purc.com.gh/who-we-are>> accessed 30 August, 2022

⁴⁸¹ Public Utilities Regulatory Commission (Amendment) Act, 2010 (Act 800)

energy providers in the country, specifically by granting licenses for the transmission, wholesale, supply, distribution, and sale of electricity and natural gas, and related matters.⁴⁸²

The functions of the Commission are:

- a. To act as the Government's energy policy adviser, recommending national energy policy to the Minister of Energy;
- b. To design and implement national strategies for the development and usage of indigenous energy resources, particularly renewable energy sources such as solar, wind, and biomass;
- c. Prepare, analyze, and update indicative national plans on a regular basis to ensure that all reasonable energy demands are satisfied.
- d. To establish performance standards and technical and operational guidelines for public utilities' supply, distribution, and sale of electricity and natural gas to consumers through legislative instruments;
- e. To uniformly enforce the provisions of such legislative instruments throughout the country;
- f. To encourage competition in the provision, marketing, and sale of renewable energy and other sources of energy;
- g. To encourage energy efficiency and the use of electricity, natural gas, and petroleum products for productive purposes.
- h. To authorize public utilities to transmit, wholesale supply, distribute, and sell electricity and natural gas; and

⁴⁸² Energy Commission Act, 1997 (Act 541)

- i. Creating a comprehensive database for national decision-making on energy resource development and utilization.⁴⁸³

The Energy Commission is committed to developing and implementing national policies and strategies for all renewable resources, including biomass, solar, geothermal, hydro, and wind, as well as technologies, demand and supply side management, and small hydro development in Ghana, including mini, micro, and small hydro; biomass/biofuel and woodfuel resource assessment. In addition to the aforementioned initiatives, the Commission is determined to address the difficult but not insurmountable problems of shifting consumption patterns and unfavorable attitudes of energy consumers, both of which result in waste and excessive energy consumption costs.⁴⁸⁴

4.3.5 Policies, Plans and Strategy Documents Regulating Renewable Energy in Ghana

Governments have developed and executed policies, programs, and strategies to enhance renewable energy technologies in the country throughout the last several decades. The Government of Ghana engaged the private sector to ensure effective deployment of possibly practicable choices in its “Issues and Options in the Energy Sector report in 1986”.⁴⁸⁵ This was followed by the “National Electrification Scheme of 1989”⁴⁸⁶, in which the government established a plan for Ghana’s electrification scheme, with the goal of achieving universal electrification by 2020.⁴⁸⁷ The Vision 2020 document was released in 1995 by the Government of Ghana to support significant research into solar energy and to establish model programs in

⁴⁸³ *Ibid.* s2

⁴⁸⁴ *Ibid.*

⁴⁸⁵ E. Essandoh, T. Atta-Darkwa, E. Kumi & G. Akolgo, “Review and Analysis of Ghana’s Power Sector Policies, Programmes and Reforms” (2021) <https://www.researchgate.net/publication/351331828_Review_and_Analysis_of_Ghana's_Power_Sector_Policies_Programmes_and_Reforms> accessed 30 August, 2022

⁴⁸⁶ National Electrification Scheme, 1989

⁴⁸⁷ Ministry of Energy, National Electrification Scheme (NES) Master-Plan Review, 2011-2020

biogas technology at the village level to reduce the use of wood fuel, enhance electricity supply in the country, and increase and rehabilitate the existing renewable energy technologies.⁴⁸⁸

The “Ghana Poverty Reduction Strategy” was released by the Ghanaian government in 2003 to create an enabling environment for private sector involvement in the energy industry. It also planned to provide funding from the national budget to develop renewable energy in the country through the implementation of programs in rural regions where they were economically viable to promote renewable energy sources in Ghana as a means of expanding the country’s energy mix.⁴⁸⁹ All renewable energy policy, plan, and strategy documents developed over the years were targeted at supporting and promoting renewable energy programs and initiatives. From the “Issues and Options in the Energy Industry” report in 1986 through the Vision 2020 strategy in 1995 to the Ghana Poverty Reduction Strategy in 2003, little progress was made in the renewable energy sector. However, the Ghana Poverty Reduction Strategy altered the country’s policy directions to support renewable energy technology in rural Ghana.

As a result, the “National Renewable Energy Strategy” of 2003 established three key programs: “Strategic National Energy Plan (SNEP)”, “Traditional Energy Development and Management Programme (TEDMP)”, and “Renewable Energy Development and Management Programme (REDP)” to increase renewable energy deployment and usage and encourage people to use energy efficiency technologies in order to achieve a 10 percent renewable energy contribution to the country’s electricity supply mix by the year 2020.⁴⁹⁰ Indeed, the Ghanaian government set a goal of increasing the percentage of renewable energy in the country’s electrical supply mix to

⁴⁸⁸ Vision 2020, 1995 <<https://www.ircwash.org/sites/default/files/Rawlings-1995-GhanaVision.pdf>> accessed 30 August, 2022

⁴⁸⁹ Ghana Poverty Reduction Strategy, 2003 <<https://www.imf.org/external/pubs/ft/scr/2003/cr0356.pdf>> accessed 30 August, 2022

⁴⁹⁰ National Renewable Energy Strategy, 2003

10 percent by 2020 through the Renewable Energy Development and Management Programme (REDP) in 2003⁴⁹¹, but only around 0.8 percent had been accomplished by 2019.⁴⁹²

The “Growth and Poverty Reduction Strategy” was established in 2006 to consolidate the successes made by the Ghana Poverty Reduction Strategy of 2003.⁴⁹³ This aimed at implementing programs in Ghana to encourage renewable energy sources such as hydro, solar photovoltaic, and wind in order to diversify the country’s energy mix. It also ensured that renewable energy technologies and energy efficiency measures were expanded in order to lessen the environmental implications of energy generation and consumption. In 2006, the “ECOWAS White Paper on Access to Energy Services” recommended that member nations invest at least 20 percent of new funding designated for rural and peri-urban electricity delivery in renewable energy sources.⁴⁹⁴ This instruction aided the “Renewable Energy Development and Management Program (REDP)”. A medium to long-term energy sector growth plan was developed under the “Strategic National Energy Plan” for the period 2006 to 2020 to provide sustainable energy supply to fulfill the country’s energy demand.⁴⁹⁵

In accordance with the “Strategic National Energy Plan”, the Ghana “Shared Growth and Development Agenda I and II” were implemented between 2009 and 2014 to increase the amount of renewable energy in the country’s electrical supply mix, develop and encourage the use of energy efficient and renewable energy technology in all public and private buildings in the country, and offer enough support, money, and regulatory framework to boost renewable energy

⁴⁹¹ N. Emodi, “Policies Enhancing Renewable Energy Development and Implications for Nigeria” (2016) 4(1) *Sustainable Energy*, 7-16

⁴⁹² Ghana Energy Commission, *Energy (Supply and Demand) Outlook for Ghana*, 2020

⁴⁹³ *Growth and Poverty Reduction Strategy, 2006-2009*

⁴⁹⁴ ECOWAS, *White Paper on Access to Energy Services, Regional Policy*, 2006

⁴⁹⁵ Ghana Energy Commission, *Strategic National Energy Plan, 2006-2020*

from small (mini) and medium hydro projects on rivers in the country, including the White Volta, River Oti and the Western Rivers (Pra, Tano and Ankobra).⁴⁹⁶

Similarly, the “National Energy Policy” was implemented in 2010 to enhance the share of renewable energy supply in the country’s energy supply mix while also ensuring that its production and use are efficient.⁴⁹⁷ The “Energy Sector Strategy and Development Plan” was also implemented the same year, with the goal of increasing the share of renewable energy in the country’s energy supply mix to 10 percent by 2020.⁴⁹⁸ It was also intended to increase the exploitation and use of renewable energy resources such as solar, small hydro, and wind energy resources, as well as to provide tax breaks for equipment imported to build renewable energy and waste-to-energy projects.⁴⁹⁹ The “Ghana Shared Growth Development Agenda” of 2009 and the “National Energy Policy” of 2010 both focused on improving the country’s renewable energy supply mix.⁵⁰⁰ The “Energy Sector Strategy and Development Plan” of 2010 reaffirmed the goal of boosting renewable energy supply in the national energy mix to 10 percent by 2020.⁵⁰¹ All of these policy, plan, and strategy documents were created to improve Ghana’s renewable energy, but very little was accomplished due to a variety of problems.⁵⁰²

In response to all these disadvantages, the “Renewable Energy Act, 2011 (Act 832)” was enacted in 2011 to provide the necessary regulatory framework and monetary incentives to boost private sector investment in developing, managing, and using renewable energy in an efficient and

⁴⁹⁶ Ghana Shared Growth and Development Agenda (GSGDA) II, 2014-2017, Vol 1: Policy Framework

⁴⁹⁷ National Energy Policy, 2010

⁴⁹⁸ Energy Sector Strategy and Development Plan, 2010

⁴⁹⁹ Renewable Energy Act, 2011 (Act 832)

⁵⁰⁰ Ghana Shared Growth Development Agenda, 2009

⁵⁰¹ Energy Sector Strategy and Development Plan, 2010

⁵⁰² Energy for Poverty Reduction Action Plan for Ghana: A Target Approach to Delivery of Modern Energy Services to the Poor, 2006

sustainable manner to mitigate environmental impacts.⁵⁰³ The “Sustainable Energy for All Action Plan/Agenda” of Ghana was executed between 2012 and 2016 in accordance with the Renewable Energy Act to provide off-grid power supply from renewable energy sources for rural communities.⁵⁰⁴ Furthermore, in 2016, “the Mini-grid Electrification Policy” was developed to ensure that mini-grid electrification is included into the National Electrification Scheme.⁵⁰⁵

Despite the Renewable Energy Law (Act 882), there was no long-term strategic plan with specific timetables for promoting and developing the country’s existing renewable energy resources. As a result, the majority of renewable energy programs and projects are pilot or short-term in nature. As a result, in 2019, the “Renewable Energy Master Plan” was designed to provide a framework for investment in developing and promoting renewable energy resources for socioeconomic growth and mitigating the negative effects of climate change by 2030.⁵⁰⁶ Meanwhile, the “Bioenergy Policy” has been developed to promote and develop bioenergy technology in a sustainable supply and to encourage its use for energy security without jeopardizing the country’s food security. It is also intended to promote the use of biomass waste for the creation of heat and power.⁵⁰⁷

4.3.6 Legal Framework Regulating Renewable Energy in Ghana

4.3.6.1 Renewable Energy Act, 2011 (Act 832)

In order to provide for the development, management and utilization of renewable energy sources for the production of heat and power in an efficient and environmentally sustainable

⁵⁰³ Renewable Energy Act, 2011 (Act 832)

⁵⁰⁴ Sustainable Energy for All Action Plan/Agenda, 2012-2016

⁵⁰⁵ Mini-grid Electrification Policy, 2016

⁵⁰⁶ Renewable Energy Master Plan, 2019

⁵⁰⁷ Bioenergy Policy, 2010

manner, the Renewable Energy Law (Act 832) was implemented in 2011.⁵⁰⁸ The object of the Act encompasses the following:

- a. The provision of a framework to support the development and utilization of renewable energy sources;
- b. Provision of an enabling environment to attract investments in renewable energy sources;
- c. Promotion for the use of renewable energy;
- d. Diversification of supplies to safeguard energy security;
- e. Improved access to electricity through the use of renewable energy sources;
- f. Building of indigenous capacity in technology for renewable energy sources;
- g. Public education on renewable energy production and utilization; and
- h. The regulation of the production and supply of wood-fuel and bio-fuels.⁵⁰⁹

The Ghanaian government established goals for the production of renewable energy in an effort to reach the 10 percent renewable energy objective by 2020. Despite the aim seemed unlikely to be met, when the Renewable Energy Law (Act 882) was passed, substantial accomplishments were made. These include the creation and publication of Feed-in-Tariffs (FiTs),⁵¹⁰ the creation of the Renewable Energy Fund's framework,⁵¹¹ the creation of the Net Metering Code and Renewable Energy Sub-Codes for transmission and distribution systems, the creation of the Licensing Manual for renewable energy service providers, and the conclusion of the draft rules for the Renewable Energy Purchase Obligation⁵¹². Additionally, programs and initiatives

⁵⁰⁸ s1(1) Renewable Energy Act, 2011 (Act 832)

⁵⁰⁹ *Ibid.* s1(2)

⁵¹⁰ *Ibid.* s25

⁵¹¹ *Ibid.* s31-32

⁵¹² *Ibid.* s26

utilizing renewable energy have lately been launched, raising the level of living for everyone, particularly in rural areas.⁵¹³

4.3.6.1.1 Development of Licensing Manual for Renewable Energy Service Producers

In order to control the technical operations of service providers in the renewable energy industry in Ghana, the Energy Commission of Ghana created a license manual in 2012. The manual was created in compliance with provision of the Renewable Energy Act, which requires utility-scale renewable energy providers in Ghana to obtain a license of authority prior to starting their activities.⁵¹⁴ The manual explains the procedures for submitting an application and getting a service provider's license to work in the renewable energy industry, as well as other connected issues. Three stages make up the manual:

Obtaining a temporary license is the initial stage, during which the applicant's legal, technical, and financial standing is evaluated. The second stage is divided into two parts: obtaining a siting clearance or permit, during which site layout, geological surveys, land conveyance agreements, health, safety, and environmental plans are evaluated; and obtaining a construction work permit, during which a construction contract, specifications for equipment, implementation agreements, and a schedule, as well as approved Feed-in Tariff and Power Purchase Agreement, are evaluated. The acquisition of an operational license is the last stage, during which the receipt of the initial license fee, a safety and technical management plan, a supply agreement for tools and other supplies, a plant drawing, operations and maintenance plan, and a commissioning report are evaluated.⁵¹⁵

⁵¹³ Energy (Supply and Demand) Outlook for Ghana, 2020

⁵¹⁴ s.8 Renewable Energy Act, 2011 (Act 832)

⁵¹⁵ License Manual for Service Providers in the Renewable Energy Industry, Ghana 2012

These measures guarantee that electricity produced from renewable energy sources is created, managed, and used in an economical and ecologically responsible way. They also aim to establish an atmosphere that will encourage financial institutions to invest money in the renewable energy industry. Report shows 130 preliminary licenses, 40 site permits, 11 building permits, and 4 operating licenses had all been awarded as of November 2019.⁵¹⁶

4.3.6.1.2 Draft Guidelines for Renewable Energy Purchase Obligation

The Feed-in-Tariff (FiT) program was established in compliance with the Renewable Energy Act. This includes the “Feed-In Tariff rate”,⁵¹⁷ the “Renewable Energy Purchase Obligation”,⁵¹⁸ and connectivity to the transmission and distribution infrastructure. The PURC received the Renewable Energy Purchase Obligation document from the Energy Commission for review and implementation in 2013. Power distribution firms or large clients are obligated, under the “Renewable Energy Acquire Obligation”, to purchase a minimum proportion of the total amount of electricity they purchase from renewable energy sources, as determined by the PURC in collaboration with the Energy Commission.

This would force the distribution corporations to modernize the current system and provide power produced by renewable energy technology preferential access. Reducing financial risks, boosting investor confidence, and expanding finance options for renewable energy projects are all benefits of the “Renewable Energy Purchase Obligation”. Additionally, it would support various renewable energy technologies and expand the nation's supply of power produced by

⁵¹⁶ *Ibid.*

⁵¹⁷ s.27 Renewable Energy Act, 2011 (Act 832)

⁵¹⁸ *Ibid.* s.26

renewable energy sources. The PURC is still figuring out what proportion of renewable power generators distribution firms or bulk consumers must buy.⁵¹⁹

4.3.6.1.3 Development and Gazetting of Feed-in-Tariffs (FiTs)

The PURC is required by the Renewable Energy Act, to set the Feed-in-Tariff (FiT) for renewable energy technologies in Ghana.⁵²⁰ Distribution firms are required to buy power produced from renewable energy sources at a price set by the PURC under the Feed-In-Tariff scheme. This rate is guaranteed for 10 years and then subject to revision every two years after that; it is often higher than that of non-renewable energy sources.⁵²¹

With the introduction of new rules for the inclusion of utility-scale variable renewable energy technologies including wind and solar PV, the initial Feed-in Tariff for renewable energy technology was set in September 2013 but updated and gazetted in October 2014. The following three major tenets served as the foundation for the new regulations:

- a. For solar PV and wind projects without grid stability/storage solutions, the maximum countrywide capacity is 150 MW and 300 MW, respectively.
- b. Any generation site may connect a maximum of 10 MW per solar PV plant, without grid stability or storage technologies, to the distribution system.
- c. Any generation site may connect a maximum of 20 MW per solar PV plant to the national transmission system (161 kV or 330 kV) without the need of grid stabilization or storage devices.⁵²²

⁵¹⁹ N. Obeng-Darko, "Renewable Energy and Power: A Review of the Power Sector Reform and Renewable Energy Law and Policy Nexus in Ghana" (2019) 11 *African Review*, 17-33

⁵²⁰ s.27 Renewable Energy Act, 2011 (Act 832)

⁵²¹ PURC Feed-in-Tariff Rates in Ghana, 2014

⁵²² *Ibid.*

Producers expressed concern that the 10 years of Feed-in-Tariff guarantee for investors in Ghana is too short, given the lifespan of renewable energy technology projects, and requested that the PURC lengthened the guaranteed duration from 10 to 20 years. While the Feed-in-Tariff Guaranteed Period in Ghana is 10 years, it is 20 years or more in industrialized nations like Spain, the United Kingdom, India, and Canada as well as emerging nations like Kenya.⁵²³ However, the PURC published the approved Feed-in-Tariff rates for utility-scale renewable energy technologies in September 2016 and the rates took effect on October 1, 2016, with the possibility of providing a range as a guide for the 20 years' review of rates that will follow the initial 10 years.⁵²⁴

Due to the reduced long-term investment risk brought about by the Feed-in-Tariff, investors were more confident in Ghana's renewable energy sector. This is because it has been realized that the Feed-in-Tariff rates are too expensive in light of the fact that the cost of renewable energy electricity, particularly from solar, keeps declining due to technological advancement and economies of scale in renewable energy electricity generation globally, the Feed-in-Tariff is not currently being implemented. A competitive tendering process is now being added to the Renewable Energy Act in order to purchase renewable energy utility-scale power plants. Competitive tendering drives costs significantly down due to competition.⁵²⁵

4.3.6.1.4 Development of Net Metering Code

The Renewable Energy Act of 2011 standards was followed in the development of the Net Metering Sub-Code in 2015. Its goal was to encourage grid-dependent power users to produce

⁵²³ T. Kenning, "Ghana to Update Feed-in-Tariffs to Last 20years" (2016) <<https://www.pv-tech.org/ghana-to-update-feed-in-tariffs-to-last-20-years/>> accessed 31 August, 2022

⁵²⁴ PURC, Publication of Feed-in-Tariffs for Electricity Generation from Renewable Energy Sources, 2016

⁵²⁵ *Ibid.*

their own renewable energy to balance out their usage.⁵²⁶ The prosumer, a customer-generator known as in net metering, is a billing system where a bi-directional electricity meter is put to measure both power generated and consumed by the prosumer. During the specified billing period, the customer-generator is given credit for the electricity it supplies to the grid and debited for the electricity it uses from the grid. The difference is given credit to the customer-generator as retail credit in kWh, which is carried over to the next billing period.⁵²⁷

In Ghana, each facility's generation capacity for net metering is limited to 200 kW, with a 1-year rollover credit. At a few chosen commercial and residential sites, 33 net meters were successfully piloted. However, the Electricity Business of Ghana (ECG), the distribution company, voiced concerns about potential income loss and the access fee that should be charged for the usage of energy credits, which led to the suspension of the net metering scheme's expansion in the first quarter of 2017. The distribution business argued that the exchange rate should take into account the investment made in the infrastructure that is utilized to store the excess power from the net metered renewable energy system. The National Rooftop Programme, which aims to relieve 200 MW of peak demand on the national grid, depends on this policy, which should be implemented quickly. The Energy Commission, PURC, and Electricity Company of Ghana are working to address the problems.⁵²⁸

4.3.6.1.5 Renewable Energy Sub-Codes for Transmission and Distribution Systems

Ghana is prepared to develop a range of renewable energy sources for the production of utility-scale power. The transmission and distribution network should be expanded to accommodate the

⁵²⁶ Ghana Energy Commission, Net Metering Sub-Code for Connecting Renewable Energy Generating Systems to the Distribution Network in Ghana, 2015

⁵²⁷ *Ibid.*

⁵²⁸ Ghana Energy Commission, Energy (Supply and Demand) Outlook for Ghana, 2018

power produced by renewable energy sources without jeopardizing the networks' ability to function securely. To facilitate the secure connection of variable renewable energy sources to the transmission and distribution networks, the Renewable Energy Act led to the development of the "Renewable Energy Sub-Codes for Transmission and Distribution Systems" in 2015.⁵²⁹

The sub-code suggests the minimal technological requirements for "Embedded Generators or Variable Renewable Power Plants" (VRPPs) to link to distribution networks. The sub-code was created in accordance with both worldwide best practices and standards and the National Electricity Distribution Code. According to the Sub-Code, all variable renewable power plants in Ghana must link to the medium voltage network with voltage levels more than 1 kV and up to 36 kV.⁵³⁰

Up until now, a number of variable renewable power plants have been linked to the transmission and distribution network without endangering the network's efficient operation. Utility-scale systems like the 2.5 MW Volta River Authority (VRA) solar power system, the 20 MW BXC Company Ghana Limited solar power system, the 20 MW Meinergy Technology Company Limited solar power system, as well as numerous distributed solar PV systems throughout the nation are among these.⁵³¹

4.3.1.6 Development of Framework for the Renewable Energy Fund

A framework for the Renewable Energy Fund was created in 2014 in compliance with the Renewable Energy Act, to offer financial assistance for initiatives to promote, develop, and utilize renewable energy resources in the nation. In addition to extending power access to

⁵²⁹ Ghana Energy Commission, Renewable Energy Sub-Code for Distribution Network Connected Variable Renewable Energy Power Plants in Ghana, 2015

⁵³⁰ *Ibid.*

⁵³¹ Ghana Energy Commission, Electricity Supply Plan for the Ghana Power System, 2020

isolated off-grid areas using renewable energy technologies, the Fund would offer production-based subsidies, capital subsidies, financial incentives, and equity participation to project developers of renewable energy projects. Additionally, funds for research and development, demonstration, and deployment of renewable energy technology would be offered through the Renewable Energy Fund.⁵³²

The Renewable Energy Act funds approved by the Board from the Energy Fund, funds generated by the Energy Commission for renewable energy activities, a levy on the export of biofuel, funds approved by parliament, donations, grants, and gifts for renewable energy activities, and any other funds approved by the Minister of Finance are the sources of funding for the Renewable Energy Fund.⁵³³

4.3.6.1.7 Establishment of Renewable Energy Authority in Ghana

A major obstacle to the successful regulation of the renewable energy sector in the nation, according to the government of Ghana, is the lack of an independent regulator for the implementation of renewable energy policy and regulatory framework. In order to regulate the renewable energy industry, the Renewable Energy Act provided for the establishment of an independent regulator which is the Renewable Energy Authority. The Renewable Energy Act requires the Renewable Energy Authority to oversee the implementation of renewable energy activities in the nation, carry out projects in which the State has a stake or initiated a renewable energy initiative, and manage the State's assets in the renewable energy sector.⁵³⁴

⁵³² ss. 31-36 Renewable Energy Act, 2011 (Act 832)

⁵³³ *Ibid.*

⁵³⁴ s.53 Renewable Energy (Amendment) Act, 2020 (Act 1045)

However, the Renewable Energy Authority has yet to be constituted eleven (11) years following the Renewable Energy Act. The Ghanaian government has not provided a justification for why the Renewable Energy Authority cannot be established. The Renewable Energy Act established the “Renewable Energy Directorate” within the Ministry of Energy, which is now responsible for carrying out the duties of the Renewable Energy Authority. The lack of the Renewable Energy Authority (an independent regulator) might have a negative impact on investment in the renewable energy sector by lowering investor trust.

4.4 Challenges in Developing Renewable Energy Systems in Ghana

In order to attain a 10 percent renewable energy inclusion in the country’s power supply mix by the end of 2020, Ghana implemented the Renewable Energy Act. However, as at the end of 2019, just approximately 0.8 percent of the nation’s electricity came from renewable sources. The following issues are among those preventing Ghana from developing its renewable energy sector:

- a. Large upfront investment costs;
- b. Inadequate, prohibitively expensive and unsustainable financial support;
- c. Lack of expertise in managing, maintaining, and using renewable energy technology; and
- d. Major part theft and significant replacement costs.⁵³⁵

The lack of widespread adoption of renewable energy technology in Ghana has been attributed to a number of factors, including a lack of a legal and regulatory framework to support it, a lack of long-term financial support, insufficient capacity on the part of Ghanaian stakeholders, exclusion from the policy on rural electrification, a lack of technical expertise to maintain renewable energy systems, an absence of appropriate technical standards, and a lack of stakeholder support,

⁵³⁵ SREP Investment Plan for Ghana, 2015

difficult investment-focused environment, uncertainty regarding renewable energy resources, insufficient technical capacity, insufficient experience in renewable energy projects, socio-cultural challenges, and a lack of accurate information and awareness are among the bottlenecks to the development of renewable energy, according to the Government of Ghana.⁵³⁶

Additionally, obstacles to the promotion of solar energy use in Ghana include high system costs, a lack of financial support for customers, service providers, and installers, government policy regarding energy, a lack of information, and a lack of awareness. The large initial capital investment has been the major obstacle to the development of renewable energy generation in Ghana and other developing nations.⁵³⁷ According to IRENA, there are no authorized feed-in tariffs to encourage private sector involvement in the renewable energy industry. However, the creation and issuance of feed-in tariffs has created a pathway for private sector involvement in the renewable energy industry.⁵³⁸

In many nations, support and financing for renewable energy technologies have increased significantly over the past ten years, which has led to a considerable decrease in the cost of producing electricity from the majority of renewable energy sources. The Ghanaian government has recognized the viability of renewable energy for the country's economic, social, and environmental growth. Recent achievements in renewable energy initiatives and programs have demonstrated the enormous potential of renewable energy technology to boost the total power supply mix and help Ghana's social and economic growth. As a result, the government's REMP

⁵³⁶ *Ibid.*

⁵³⁷ *Ibid.*

⁵³⁸ IRENA, Ghana Renewables Readiness Assessment, 2015

has made a significant commitment to supporting investment in renewable energy over the next ten years.⁵³⁹

4.4.1 Renewable Energy Master Plan (REMP) 2019

By enacting the Renewable Energy Law (Act 882) of 2011, the Ghanaian government is putting forth great effort to meet the aim of 10 percent renewable energy contribution to the nation's power supply mix. Nevertheless, a clear integrated strategy and financial commitment for the long-term growth and expansion of the nation's renewable energy resources were not provided by the Renewable Energy Law Act. As a result, a variety of renewable energy projects and initiatives were being tested out or were only being used temporarily.⁵⁴⁰

The Renewable Energy Master Plan (REMP) was created by the government in 2019 with goals and a clear roadmap to provide an investment-focused framework to develop and promote renewable energy technology in Ghana for socioeconomic growth and to minimize the harmful effects of climate change by the end of 2030.⁵⁴¹ The REMP's execution started in 2019 and is anticipated to be completed in 2030. The REMP is anticipated to achieve the following goals by the end of 2030:

- a. Increase from 42.5 MW in 2015 to 1363.63 MW the proportion of renewable energy in the nation's power supply mix (with 1094.63 MW from grid connected systems);
- b. Reduce the over-reliance on biomass as firewood for energy applications that require heat;
- c. Create renewable energy-based decentralized electricity solutions for 1000 off-grid communities; and

⁵³⁹ Ghana Renewable Energy Master Plan (REMP), 2019

⁵⁴⁰ *Ibid.*

⁵⁴¹ *Ibid.* para 1.2.2

- d. Promote the utilization of local knowledge and make sure that locals are involved in the renewable energy business.⁵⁴²

However, for the REMP to be implemented successfully, the Government of Ghana needs roughly 460 million US dollars each year or about 5.6 billion US dollars from 2019 to 2030. Similarly, Ghana needs roughly 732 million US dollars to reach the 10 percent extra electricity supply from renewable energy sources by the end of 2020 based on the present trend of renewable energy output.⁵⁴³ The Government of Ghana has proposed a number of strategies to ensure the successful implementation of the Renewable Energy Master Plan, including increasing awareness, developing capacity for renewable energy development, supporting research and development, promoting increased awareness, making Ghana the production hub for electric vehicles, and enacting regulations to minimize any adverse environmental effects that could result from the expansion of renewable energy projects. To ensure that tariffs for utility-scale renewable energy projects are reduced, prudent procurement systems should be established. Additionally, local involvement and content should be encouraged to secure the local market. The private sector should also receive financial support and on-lending facilities to enable it to invest in renewable energy.⁵⁴⁴

The Ghanaian government is aware that local production and assembly of renewable energy technologies are crucial to the overall success of the Renewable Energy Master Plan. As a result, the Ghanaian government offers a business-friendly atmosphere to encourage private sector investment in the local production of cutting-edge renewable energy technology. The

⁵⁴² *Ibid.* para 1.2.3

⁵⁴³ B. Aboagye, S. Gyamfi, E. Ofosu & S. Djordjevic, "Status of Renewable Energy Resources for Electricity Supply in Ghana" (2021) 11 *Scientific African Journal* <<https://www.sciencedirect.com/journal/scientific-african/vol/11/suppl/C>> 29 August, 2022

⁵⁴⁴ *Ibid.*

government currently offers support and incentives, including tax breaks, exemptions from import duties on plants and plant parts for electricity generation from renewable energy resources, exemptions from import duties and VAT on materials, components, equipment, and machinery that are not readily available locally, and special quota in all publicly funded projects to existing local renewable energy technology manufacturing and assembling companies.⁵⁴⁵

To encourage local production and assembly of renewable energy technology, the government did propose to gradually eliminate the exemptions from import sustain duty on certain renewable energy products where Ghana has a competitive advantage. These plans and incentives will promote the creation of environmentally friendly renewable energy technology in Ghana and support the expansion of the renewable energy industry in the West African area. Additionally, they would guarantee that small hydropower turbines, water pumps, parts for wind turbines, batteries, inverters, waste-to-energy facilities, and other home products powered by renewable energy be produced and installed in Ghana.⁵⁴⁶

Only four organizations have begun producing and assembling solar PV modules locally to date; other businesses, including Pamasonic and Deng Ghana Ltd, PowerWings Company Ltd, and Africano Electro Ltd, among others, is in various stages of setting up manufacturing and assembly facilities for renewable energy components.⁵⁴⁷

4.5 Comparative Analysis of Ghana and Nigeria's Renewable Energy and Electricity/Power Supply Models

⁵⁴⁵ N. Obeng-Darko, "Renewable Energy and Power: A Review of the Power Sector Reform and Renewable Energy Law and Policy Nexus in Ghana" (2019) 11 *African Review*, 17-33

⁵⁴⁶ N. Obeng-Darko, "Why Ghana will not Achieve its Renewable Energy Target for Electricity: Policy, Legal and Regulatory Implications" (2019) 128 *Energy Policy*, 75-83

⁵⁴⁷ *Ibid.*

The following are the comparisons between and knowledge gained from the current institutional and legal frameworks of the Ghanaian electricity industry:

First, the institutions regulating the energy sector in Ghana are the Energy Commission and the Public Utilities Regulatory Commission (PURC). The former is mandated by law to regulate and manage the development and utilization of Ghana's energy resources including renewable energy, as well as to provide the legal, regulatory, and supervisory framework for all energy providers in the country, specifically by granting licenses for the transmission, wholesale, supply, distribution, and sale of electricity and natural gas, and related matters⁵⁴⁸ while the latter is a multi-sector regulator overseeing the provision of utility services by utilities to consumers and other related matters.⁵⁴⁹ On the other hand, the institution regulating the energy sector in Nigeria is the Nigerian Electricity Regulatory Commission (NERC). The principal duty of NERC since its establishment has been to serve as the primary regulator of the Nigerian power supply sector, which includes regulating electricity pricing (electricity tariffs), performance standards compliance, licensing, and consumer protection.⁵⁵⁰

Secondly, the PURC in carrying out its tasks is an independent entity that is not subject to the control of any authority.⁵⁵¹ On the other hand, the NERC is not an independent institution as it is ultimately under the control of the Nigerian Federal Government. To an extent, the Nigerian State Governments appear to have ceded more authority to NERC, which has hampered the correct decentralization of the Nigerian electricity sector, which would have improved

⁵⁴⁸ Energy Commission Act, 1997 (Act 541)

⁵⁴⁹ Public Utilities Regulatory Commission (Amendment) Act, 2010 (Act 800)

⁵⁵⁰ Ibid. s32

⁵⁵¹ Ibid. s4

administration, progress, and efficiency of the energy sector contrary to the provision of the Constitution of the Federal Republic of Nigeria, 1999.⁵⁵²

Thirdly, Ghana has a wealth of renewable energy resources, including solar energy, small (mini) and medium capacity hydro, wind, wave, and tidal energy, biomass, and waste-to-energy, which could be developed and promoted to enhance the living conditions of the populace and lessen the negative effects of climate change. However, only a small portion of the renewable energy potential has been developed into the energy supply mix till date⁵⁵³ as opposed to achieving 10 percent renewable energy into the energy supply mix.⁵⁵⁴ Since the Renewable Energy Act was passed in 2011 to attain 10 percent power supply from renewable energy sources by the end of 2020, on-grid electricity output from renewable sources (mostly from solar PV systems) still stand at roughly 0.8 percent of the country's electricity supply mix. This is primarily due to the failure to fully execute the various laid-out regulations, incentives, and initiatives. On the other hand, Nigeria is yet to achieve any form of the production of renewable energy in an effort to reach adequate supply of electricity and reduction of negative impacts of from the utilization of fossil fuels on the environment.

Additionally, numerous initiatives/project plans for renewable energy are currently underway in Ghana, focusing particularly on the distribution of solar photovoltaic systems. These initiatives/project plans are in various stages of development, including provisional license stage, siting permit stage, construction permit stage, and project construction stage. They include; "National Rooftop Solar Programme",⁵⁵⁵ "Solar Lanterns Promotion Programme"⁵⁵⁶ and

⁵⁵² Paragraphs 13 & 14, Part II Second Schedule Constitution of the Federal Republic of Nigeria, 1999 (as amended)

⁵⁵³ Renewable Energy Act, 2011 (Act 832)

⁵⁵⁴ Renewable Energy Master Plan, 2019

⁵⁵⁵ National Rooftop Solar Programme, 2016

⁵⁵⁶ Solar Lanterns Promotion Programme, 2013

“Hydropower Sustainability Assessment Project”⁵⁵⁷ among others. On the other hand, Nigeria is yet to carry out any renewable energy project plans except for the new establishment of the Nigerian National Petroleum Company (NNPC) Renewable Energy which is yet to record any success.⁵⁵⁸

The Renewable Energy Masterplan (REMP) was created by the Ghanaian government with goals and a defined pathway to develop and promote renewable energy technologies in Ghana for social and economic development as well as to decrease the adverse consequences of climate change by the year 2030.⁵⁵⁹ The difficulties that prevent the widespread adoption of renewable energy technologies in Ghana include the high initial capital costs, the difficult investment-focused environment, the uncertainty surrounding the availability of renewable energy resources, insufficient technical capacity, insufficient experience with renewable energy projects, the limited ability to operate, maintain, and manage renewable energy technologies, socio-cultural difficulties, and a lack of accurate information and awareness-raising. The government of Ghana must invest roughly US\$ 732 million in renewable energy technologies before the 2020 objective of 10 percent power generation from renewable sources can be met, notwithstanding improvements in the production of electricity from renewable sources. For the REMP to be implemented successfully, it also needs around US\$ 460 million each year, which equates to roughly US\$ 5.6 billion from 2019 to 2030. On the other hand, Nigeria also suffers from the same problem of implementation of laws as Ghana. Although Nigeria has established deadlines in its laws and regulations by which it wants a specific proportion of its electricity supply mix to come from renewable energy sources. For instance, “setting national targets for successes in

⁵⁵⁷ Ghana Grid Company, Electricity Supply Plan for the Ghana Power System, 2020

⁵⁵⁸ S. Elom, “NNPC Ready for Global Excellence, Creates Renewable Energy Division” (2022) Orient Energy Review <<https://www.orientenergyreview.com/power-sector/nnpc-ready-for-global-excellence-creates-renewable-energy-division/>> accessed 1 September, 2022

⁵⁵⁹ Renewable Energy Master Plan, 2019

power from renewable energy and energy efficiency capacity addition by 2020 and beyond” is one of the main goals of the NREEEP. In order to achieve this goal, the strategy set Nigeria’s aim at 40,000 MW, which would require 4.3 GW of annual renewable energy starting in 2015.⁵⁶⁰ It also forecasts that its long-term objective is for renewable energy to account for 20 percent of its electricity supply mix.⁵⁶¹

Furthermore, with the addition of renewable energy to the mix of energy sources for power production, neither Ghana nor Nigeria has laws, plans, or policies that aim to exclude fossil fuels from the mix of energy sources for electricity production in the analysis of this research.

Lastly, the key legislations clearly governing the generation, transmission, and distribution of renewable energy in Ghana are the Renewable Energy Act, 2011 (Act 832) and the Renewable Energy (Amendment) Act, 2020 (Act 1045) which is to establish a competitive procurement scheme and a net-metering scheme for electricity produced from a renewable energy source, and address other related issues and to give the Minister the authority to name a public organization to carry out specific duties in the field of renewable energy and other clean energy alternatives. On the other hand, the key legislation for the Nigerian electricity supply industry, which is the EPSRA only provides for the development of a competitive electricity market and did not concisely include the generation of renewable energy into the electricity generation mix. Hence, changes are required to the EPSRA. The proposed Electricity Bill 2021 aims to provide the legal and regulatory changes required to stimulate the contribution of renewable energy to Nigeria’s electricity generation mix.

⁵⁶⁰ Paragraph 1.9 National Renewable Energy and Energy Efficiency Policy, 2015

⁵⁶¹ *Ibid.* para 6

The Electricity Bill aims to, among other things, repeal the EPSRA, combine all NESI-related legislation, implement regulatory measures to foster the growth of Nigeria's electricity supply business, and encourage the use of renewable energy sources as part of the country's energy mix. The Electricity Bill has several provisions on renewable energy, both for on-grid and off-grid renewables, in contrast to the EPSRA.

The Electricity Bill's primary goals include, among other things, the creation of an environment that will encourage investment in renewable energy sources,⁵⁶² the enhancement of the use of renewable energy off-grid and mini-grid solutions for electrification, and the promotion of domestic renewable energy technology capacity. The Electricity Bill includes certain steps that might help reach these high goals. Unquestionably, the adoption of the policies outlined in the Electricity Bill will fundamentally alter Nigeria's market for renewable energy. The proposed measures of the Electricity Bill include:

- a. Renewable energy as a key part of the National Integrated Elementary Policy and Strategic Implementation Plan:

To direct the entire growth of the Nigerian power industry, the Electricity Bill requires the creation of an Integrated Electricity Policy and Strategic Implementation Plan (the "Integrated Plan"). The Integrated Plan is essential to planning because it predicts future power demands and develops a strategy to meet them. The Integrated Plan would essentially serve as a growth road plan for the Nigerian electricity sector. The Electricity Bill mandates that the Integrated Plan include particular measures, such as exemptions and subsidies, to encourage the growth of

⁵⁶² Section 1(i) – (o) Electricity Bill, 2021

renewable energy sources.⁵⁶³ Hence, the Ministry of Power is tasked with recommending exemptions (like customs, levies, and duties exemptions) and financial incentives required for the development, production, and utilization of renewable energy in order to ensure that the sector for renewable energy is driven by relevant policies as well.⁵⁶⁴

b. Express duty of NERC:

NERC is specifically mandated to encourage the development and exploitation of renewable energy services and boost the contribution of renewable energy to Nigeria's energy mix by the Electricity Bill.⁵⁶⁵ As a result, the NERC is specifically mandated to implement the best legislative initiatives targeted at encouraging the use of renewable energy for electricity generation in Nigeria.⁵⁶⁶ NERC is required to implement a number of regulatory measures, some of which include standard power purchase agreements, simplified licensing for companies that provide renewable energy services, commercial and technical regulations to ensure connection to the grid and distribution networks, unrestricted access to the grid and distribution networks, the award of mini-grid concessions to renewable energy companies, the issuance of net-metering guidelines, and regulation on energy efficiency.⁵⁶⁷

c. Renewable energy generation obligation:

According to the Electricity Bill, electricity generating license holders are required to satisfy any renewable generation requirements that NERC may impose. As a result, electricity producing firms will be required to either produce power using renewable energy sources, buy power

⁵⁶³ *Ibid.* s3

⁵⁶⁴ *Ibid.*

⁵⁶⁵ *Ibid.* s35(j)

⁵⁶⁶ *Ibid.* Part XV

⁵⁶⁷ *Ibid.*

produced using renewable energy, or acquire any instrument that represents the output of renewable energy.⁵⁶⁸ Fundamentally, the goal is to establish a market for renewable energy and encourage financial investment in the field.

d. Renewable energy purchase obligations:

The Electricity Bill also requires that distribution or supply licensees be required to make renewable procurement commitments.⁵⁶⁹ In other words, those who possess distribution or supply licenses will be required to buy a certain percentage of their energy needs from renewable sources or invest in equipment that simulates the production of renewable energy. A big customer may also be obliged to pay NERC a premium or acquire a predetermined proportion of its entire power requirements from renewable energy sources.⁵⁷⁰ In order to encourage the consumption of energy produced from renewable energy sources and consequently support the expansion of the renewable energy market in Nigeria, renewable purchasing requirements are being placed on distribution licensees, supply licensees, and bulk consumers.

e. Connection to and upgrade of transmission and distribution system:

The Electricity Bill stipulates that providers of electricity from renewable energy sources have priority access to transmission and distribution systems.⁵⁷¹ However, specified dispatch protocols must be followed in order to connect to such systems with priority. Specifically, if asked by a renewable energy producer interested in putting electricity into the system, an operator of a transmission or distribution system will be compelled to adapt its infrastructure at reasonable economic expenditure to feed-in power from renewable energy sources. According to the

⁵⁶⁸ *Ibid.* s81

⁵⁶⁹ *Ibid.* s89

⁵⁷⁰ *Ibid.* s144

⁵⁷¹ *Ibid.* s148

Electricity Bill, the renewable energy generator will only be responsible for the expenses involved with connecting installations to the metering point, while the operator of the system and the renewable energy generator will split the costs of upgrading the system equally. A connection agreement between the parties will regulate the relationship/interaction between the operator of a transmission or distribution system and the renewable energy source.

f. Feed-in-Tariffs:

As a means of promoting investment in renewable energy power generation, the Electricity Bill requires NERC to draft and publish feed-in tariff rates for electricity generated from renewable energy sources.⁵⁷² The tariff rate will be guaranteed for 10 to 15 years after which it will be reviewed every two years. The price difference between the purchase price of electricity generated from renewable energy sources and the price of power obtained from other sources must be taken into account by NERC when establishing the tariff.

g. Local content support:

It is impossible to emphasize the advantages of a strong local content policy¹². The Electricity Bill mandates NERC to review the current National Content Development Regulations for the power sector in order to address local content requirements for local skills acquisition, local production and assembly of solar PV components, deep cycle batteries, electro-mechanical components of SHP technology, wind power, boilers and turbines for cogeneration of less than 30MW, and other items. This is in line with the need to ensure indigenous development in all sectors of the Nigerian economy. Additionally, all organizations operating in the renewable

⁵⁷² *Ibid.* s145-147

energy sector (including licensees, contractors, and subcontractors) are required to make sure that local content is a part of their operational renewable energy activities.

- h. Creation of the Rural Electrification and Renewable Energy Agency to replace the Rural Electrification Agency:

The Rural Electrification Agency (REA) was created by the current EPSRA to act as the implementing body in charge of electrifying rural and underserved areas.⁵⁷³ The Electricity Bill, however, broadens the REA's use to support renewable energy projects in Nigeria. The Electricity Bill suggested the establishment of the Rural Electrification and Renewable Energy Agency (REREA) as a substitute organization to support the REA's broadened mandate. The REREA is required to support carbon taxes to discourage the use of fossil fuels, promote the use of renewable energy sources, and set off a gradual transition to clean energy as part of its duties. It is also required to support tax incentives, investment capital allowances, and low-interest loans for local producers of renewable energy products.

Given that the recently enacted Climate Change Act, 2021 mandates that the Council work with the Federal Inland Revenue Service (the Federal tax authority) to develop a mechanism for carbon tax in Nigeria and grants the Council the authority to make regulations to oversee market-based mechanisms and instruments, it is anticipated that the REREA (if established) will consult with the Council when advocating for carbon tax.⁵⁷⁴

- i. Creation of the Rural Electrification and Renewable Energy Fund:

⁵⁷³ *Ibid.* Part IX

⁵⁷⁴ Climate Change Act, 2021

The Rural Electrification and Renewable Energy Fund (REREF) will be created under the Electricity Bill, which also seeks to broaden the purview of the Rural Electrification Fund (REF) established under the EPSRA, in a manner similar to the proposed expansion of the REA's purview with the planned creation of the REREA. The REREF's expanded mandate will include funding for, among other things, technological advancement research and development in the Nigerian renewable energy sector, project execution for non-electricity uses of renewable energy, infrastructure development for renewable energy, and production-based subsidies for renewable generation, and equity participation in renewable energy projects. While the Electricity Bill's proposed clarity is unquestionably important, NERC has the authority and ability to establish additional regulatory measures targeted at increasing the use of renewable energy in Nigeria. This is done by drawing on the EPSRA that already exists.⁵⁷⁵

⁵⁷⁵ Electricity Bill, 2021

Chapter Five

Conclusion

5.1 Summary

The aim of this research is to examine how the effective implementation on renewable energy legal regime will serve as a mitigator to climate change and improvement of electricity supply in Nigeria. An overview of how the Nigerian government is blessed with unlimited resources and still generates more income from one source, which is the production and utilization of fossil fuels which has gained global attention because of the negative impacts it has to the environment. As Nigeria is known to be the oil giant in Africa, it is still one of the poorest countries in the world. Energy is one of the main components of life and the adequate supply of energy brings about how a country is developed. Still, a great percentage of the Nigerian population still lives without electricity. Despite the fact that Nigeria has adopted and ratified the provisions of international treaties as provided for in Section 12 of the Constitution, electricity supply is still poor in Nigeria. Nigeria is blessed with unlimited natural resources and yet, the production and development of renewable energy sources which is cheaper and environmental friend has not been tapped into.

This research reviewed several literatures in line with the nature of the topic which include the legal aspect, scientific and socioeconomic aspect of energy systems in Nigeria. However, two theories were examined – the theory of resource curse which elaborates on the ironical situation of Nigeria that is blessed with unlimited natural resources and still underperforms economically compared to countries that lack natural resources and are part of developed countries in the world, while the theory of sustainable development served as a turning point in the development of international environmental policies.

This research gives a detailed review on the legislative and institutional framework that has been developed to address electricity problems and the production and development of renewable energy in the Nigeria. Although the ESPRA brought about several reforms which include the establishment of NERC, licensing and electricity tariff, the reality is that there is no uniformity in these laws and this has made the Nigerian energy sector to be inefficient which has become a significant barrier to the economic growth of the country and the social wellbeing of her citizens. The gap in the current framework was identified as the absence of an effective legal framework that embodies not only Nigeria's obvious potential for renewable energy, but also provides legal mechanisms for investment and implementation strategies. The key functional institutional bodies were further highlighted and examined.

Renewable sources of energy in Nigeria were discussed which include solar, wind, biomass, hydro, geothermal, wave and tidal energy. This research further identifies current electricity problems, the challenges on the development of renewable energy in Nigeria, and ways in which these challenges can be surmounted in order to include renewable energy in Nigeria's energy mix. The research examined the importance and potentials of renewable energy to guarantee sustainable electricity in Nigeria with emphasis on legal and policy framework that needs to be enacted to promote energy sufficiency and security through renewable energy.

Based on the not so perfect energy transition adopted in other countries, the legislative and institutional framework on renewable energy in Ghana was examined. The framework was reviewed through historical analysis. Comparisons were made between this jurisdiction and Nigeria's electricity models, by identifying the strength and weaknesses of the provisions and implementation of the frameworks for the purpose of recommendation.

The national power grid's expansion is a very expensive alternative, and even while this has long been the government's aim, all attempts to do so have been ineffective, particularly given the growing population of the country. Currently, there are over 200 million people living in Nigeria, according to scientific projections, this number will quadruple by the year 2050. As a result, the methods previously used to address Nigeria's electrical crisis must be updated to reflect the situation as it stands now.

5.2 Conclusion

The government's actions play a significant role in the success or failure of any national interest initiatives, including those that aim to improve people's quality of life by introducing novel lifestyles. Most African nations have a deployment program in place to implement renewable energy systems. The rate of expansion of the program may only rise or reduce in relation to the interests of the government. In Nigeria, there was no public policy on renewable energy until 2005. This makes the appropriate coordination of renewable energy operations in Nigeria all but impossible and prior to 2005, the growth was mostly based on people, societies, and a small number of business interests. Government instability and inconsistency in policy formulation, as well as personal interests at the decision-making level taking precedence over national goals, were identified as the root causes of Nigeria's lack of functional government fiscal policies and integrated planning on renewable energy. As a result, the deployment of renewable energy in Nigeria may grow slowly, with system costs remaining relatively high and a high percentage of Nigerians not being willing to pay for it.

Centralized conventional sources of electricity generation have consistently been the focus of national strategy. To encourage investments in conventional electricity generation, a number of

incentives were introduced. Until now, grid power subsidies have hurt investments in alternative energy sources. This absence of development of alternative power services has been hampered by the lack of a fair playing field for all energy sources and technologies.

It is crucial that society accepts renewable energy technologies since doing without might be quite difficult. There would not be a need for the technology's services if the local community rejects it. This is because, the choice to deploy the energy systems to the beneficiaries was made without their input, and the majority of renewable energy installations have failed. Engaging the end users may increase interest since they tend to gain more from the opportunity to voice their specific needs or be persuaded by the services being offered. Nigeria has a bright potential for widespread deployment of renewable energy technologies, if the proper political and statutory framework can be established. Since the technology is alien, it is necessary to put appropriate regulations in place to stop the technologically sophisticated nations from using the country as a disposal site. With the right laws, Nigeria may tax renewable items at zero percent since, with no taxes and high subsidies, the poorest of the poor are the main targets.

Thus, this research shows that the demand of electricity is higher than the supply which is poor and not sustainable in Nigeria, both in the rural and urban areas. This has made the larger population and business organizations rely solely on the usage of private owned generators even though the usage and maintenance of these generators are neither cheap nor environmental friendly because of emissions of greenhouse gases into the environment which has impacted climate change. As a country that is blessed with unlimited natural resources, Nigeria is yet to implement energy policies and activities of same.

Unless sufficient enforcement measures are in place to guarantee that the legislations are implemented, it is nothing more than a piece of paper. The present Nigerian electrical laws and policies, for example, include provisions dealing with enforcement mechanisms such as permits, licenses, tests, inspections, and certificates, as well as punitive sections dealing with suspension or revocation. However, none of these have made a significant difference in terms of access to or supply of electricity. As a result, in addition to lobbying for a modified legislative framework, institutional restructuring should be highlighted as well, in order to guarantee that the updated laws are correctly implemented and improved outcomes are achieved.

Although, Nigeria is ready to achieve the improvement of accessible and sustainable energy, and as we speak, Nigeria has the National Energy Policy with the aim of substantial usage of the nation's energy resources, the Renewable Energy Master Plan, the biofuel incentives with the aim of establishing an industry that will bring together the agricultural and energy sector in Nigeria. Nigeria is also in partnership with the Clean Technology Fund which supports the low-carbon policies which will serve as a path to the reduction of carbon emissions and the "Electricity Bill, 2021". Nigeria is one of the recipients of the Global Energy Facility which is at the present moment embracing reliable transportation and establishment of mini-grids on renewable energy.

The growth, production and development of renewable energy sources will become a mechanism of reliable development in mitigating the existence and negative impacts of climate change on the environment. Also, the utilization of renewable energy in Nigeria's energy mix will give more grounds on preservation of fossil fuels in a way that it will help the continuation of oil exportation which will serve as a source of revenue generation for now and in the future.

Lastly, in order to achieve the promotion, development and utilization of renewable energy the Federal government should mandate the reinforcement of the regulatory institutions of the energy sector that are in charge of sustainable energy promotions. The federal government also needs to involve organizations at local government and state level that will be mandated to ensure the implementation of renewable energy projects. Incorporating the techniques, legislative and institutional frameworks of renewable energy in Ghana, although not perfect, into that of Nigeria will empower the existing regulatory and institutional framework on renewable energy in Nigeria.

5.3 Recommendations

To achieve the growth and development of renewable energy into Nigeria's energy mix, certain factors need to be addressed. Political, technical, administrative, cultural and social factors that obstruct the growth of renewable energy must be addressed at first instance. Nigeria's readiness for renewable energy innovation is questionable. For instance, friendly investment environments for renewable energy projects will be created where the administrative departments have improved in areas of competency and transparency. Thus, this research recommends as follows:

1. The Nigerian electricity supply should incorporate the utilization of renewable energy into the electricity generation mix as the potentials and benefits of renewable energy, particularly solar energy are unlimited and are deemed to be inexpensive and environmentally friendly compared to the utilization of fossil fuel and its allied products in electricity generation which are deemed to have negative impacts on the environment. Renewable energy is unquestionably a crucial component of environmental, social and governance and the effort to lower greenhouse gas emissions.

2. The Nigerian Electricity Supply Industry should explicitly and diligently harness renewable energy into the electricity generation mix. Nigeria is blessed with renewable energy. Hence, if renewable energy is included into the energy mix, it can close the gap of Nigerians who has little or no access to electricity supply.
3. There should be a great dependence on renewable energy in Nigeria's electricity generation mix. This is because, if there is an increase in the generation of renewable energy, there will be more increase in electricity supply, there will be increase in energy mix, there will be increase in energy access (having reliable and affordable access to electricity), and there will be increase in energy security (uninterrupted availability of energy sources at an affordable price).
4. The Nigerian government, particularly the Nigerian electricity supply industry should implement "an effective legal framework on renewable energy in Nigeria for the sole purpose of the generation, transmission and distribution of renewable energy and electricity in Nigeria. As there is no single framework currently governing renewable energy in Nigeria, except the "Electricity Bill" which has just been passed.

2.2 Contribution to Knowledge

This research has identified the potentials and benefits of renewable energy into the energy generation mix in Nigeria. The lack of an efficient legal structure to support renewable energy policies, insufficient technology transfer laws, licensing issues, the lack of a robust energy mix, Nigeria's faulty liberalization scheme and the lack of proper implementation of enabling laws are among the issues identified. Thus, this research will enable policy makers in Nigeria to enact and enforce a law governing renewable energy into the Nigerian energy generation mix which will close the gap of Nigerians who do not have access to electricity and also reduce the

negative impacts of the utilization of fossil fuel and its allied products in electricity generation on the environment.

2.3 Suggested Areas for Further Research

1. Analysis of State laws governing renewable energy and electricity supply in Nigeria
2. The Nigerian National Petroleum Company Renewable Energy 2022

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Multi-Year Tariff Order 1 & 2

National Energy Policy, 2003

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Renewable Energy Feed-in Tariff Regulatory Guidelines 2009

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Olu Ojedokun and Matilda Adedoyin Chukwuemeka, “Legal and Ethical Issues in Nigerian Surrogacy Practice: A Comparison with South Africa and United Kingdom” (2020) 2(4) *RAGA, Journal of Social Inclusion and Educational Advancement*, 288-309

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This is to certify that this thesis by Matilda Adedoyin CHUKWUEMEKA in the Department of Private and Business Law, Faculty of Law, Lead City University, Ibadan is in full compliance with the approved University Format and Style.

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Date

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