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Renewable Energy as an Alternative to Fossil Fuel Use: A Legal Framework for Advancing Low Carbon Energy Transition in Nigeria

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ABSTRACT AND KEYWORDS

This thesis posits that small-scale renewable electricity is no longer merely an option for Nigeria, but a necessity in order to achieve the desired energy transition. The research also shows how the Nigerian electricity sector can be reformed through three mechanisms namely: decentralization, deregulation and a low carbon foot print. It proposes legal and institutional reforms to cure the intermittent availability problems inherent in renewable energy sources. This is achieved by drawing a comparative lesson from the Ontarian and South Australian electricity models. This thesis adopts a historical, analytical and interdisciplinary approach to conclude that there is need for a mandatory restructured platform which substitutes the national approach to electricity matters for a state-based approach solely based on injecting the prominent renewable energy sources in Nigeria (solar, wind and hydro) into the grid.

Keywords:

Electricity, Renewable Energy, Small Scale Generation Grids, Nigeria, Ontario, South Australia

SUMMARY FOR LAY AUDIENCE

Electricity is a type of energy that involves the flow of electrons usually generated from either renewable or conventional energy sources. Renewable sources include: solar; wind; hydro power; wave; tidal; and geothermal. Conventional energy sources include fossil fuels –oil, natural gas, coal– as well as nuclear power. The Nigerian Electricity Supply Industry utilizes fossil fuels, which are emitting sources, and this has led to serious negative consequences for the environment and the economy.

The three main activities in the electricity sector include: electricity generation (this is the production of power carried out in the generating plants); electricity transmission (this involves the bulk transfer of electricity through long distances using transmission lines from the power station where it was produced); and electricity distribution (this involves transferring the electricity transmitted from the substation to the end users).

This thesis shows how safe transition from over dependence on conventional energy sources in the generation of power to cleaner energy sources can be made in the Nigerian power sector through the use of smaller grid outlets in underserved and un-served areas in the nation. Nigeria does not have nuclear capacity, meaning that nuclear power does not pose an option. The possibility of the proposed transition is shown through two forms of small-scale electricity generation that include grid connected mini grids that would be attached to the main grid or off-grid outlets that would be developed in areas far from the grid.

In developing a unique model for Nigeria, the thesis considered two prominent jurisdictions that have recorded strategic success in the energy sector, namely, Ontario and South

Australia. Comparing these two jurisdictions reveals that adopting a smaller units perspective will address the problem of inadequate access to electricity, while also mitigating the environmental problems associated with overdependence on conventional energy sources. It concludes that instead of striving to provide electricity for the entire nation through a single grid, diversification should be encouraged. This can be achieved by incorporating renewable energy sources in the power sector, increasing the resilience of the existing grid through laws that encourage technological investments and establishing five more grids in addition to the existing grid. However, all these outcomes require deep changes to the legal framework that presently governs Nigeria's Electricity Supply Industry. This thesis therefore analyzes the existing Nigerian legislative framework and proposes several amendments to it that will enable the above practical outcomes to take shape.

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LIST OF ABBREVIATIONS

AEMC	Australia Energy Market Commission
AER	Australian Energy Regulator
CERA	*Canadian Energy Regulator Act*
CFRN	*Constitution of the Federal Republic of Nigeria*
CSA	Canadian Securities Administrators
COAG	Council of Australian Government
DisCos	Distribution Companies
ECN	Energy Commission of Nigeria
EIA	Environmental Impact Assessment
EPIC	Electric Power Implementation Committee
EPSRA	*Electric Power Sector Reform Act* (Nigeria)
ESI	Electricity Supply Industry
ETSA	Electricity Trust South Australia
GenCos	Generation Companies
GHG	Greenhouse Gas
GVE	Green Village Electricity
GW	Gigawatts
IAA	Impact Assessment Act
ICRE	Implementation Committee on Rural Electrification
IEA	International Energy Agency
IESO	Independent Electricity System Operator
IMO	Independent Marketing Operator

IPP	Independent Power Projects
kWh	kilowatts per hour
MO	Market Operations
MPS	Ministry of Power and Steel
MRET	Mandatory Renewable Energy Target
MW	Megawatts
MYTO	Multi Year Tariff Order
NBET	Nigeria Bulk Electricity Trading
NCP	National Council on Privatization
NEB	National Energy Board
NEM	National Electricity Market
NEMP	National Energy Master Plan
NEMSA	National Electricity Management Services Authority
NEPA	National Electric Power Authority (Nigeria)
NEPP	*National Electric Power Policy*
NERC	Nigerian Electricity Regulatory Commission (Nigeria)
NESCO	Nigerian Electricity Supply Company
NESI	Nigerian Electricity Supply Industry
NIPPs	National Independent Power Project
NNPC	Nigerian National Petroleum Corporation
NREEEP	*National Renewable Energy and Energy Efficiency Policy*
OEB	Ontario Energy Board
OPA	Ontario Power Authority
PHCN	Power Holding Company of Nigeria

PPA	Power Purchase Agreements
PV	PhotoVoltaic
PVRP	PhotoVoltaic Rebate Program
PWD	Public Works Department
RE	Rural Electrification
REA	Rural Electrification Agency
REDP	Renewable Energy Demonstration Program
REFIT	Renewable Feed in Tariff
REMP	Renewable Energy Master Plan
RESIP	Rural Electrification Strategy and Implementation Plan
RETF	Renewable Electricity Trust Fund
RRPGP	Renewable Remote Power Generation Program
SA	South Australia
SCADA	Supervisory Control Data Acquisition
SE4ALL	Sustainable Energy for All
SO	System Operations
SPDC	Shell Petroleum Development Corporation
TCN	Transmission Company of Nigeria
TSP	Transmission Service Provider
UNCLOS	*United Nations Convention on the Law of the Sea*
UNFCCC	*United Nations Framework Convention on Climate Change*
VPP	Virtual Power Plant

Chapter One

1. INTRODUCTION

1.1 Introduction: The Research Problem

1.1.1 Background to the Study

It is no longer news that one of the major problems facing Nigeria is inadequate access to electricity. This inadequacy has affected virtually all sectors of the Nigerian economy.[1] For example, hardly any establishment such as schools, hospitals, companies or industries can thrive properly in Nigeria without the aid of an external source of power like generators that make use of diesel.[2]

Nigeria is rich in natural resources such as oil, natural gas, and coal; it also has potential in renewable energy sources such as hydropower, wind and solar.[3] In the Nigerian National Petroleum Corporation (NNPC) Report of 2019, it was posited that Nigeria has a maximum production capacity per day of 2.5 million barrels of crude oil, which makes Nigeria Africa's largest oil producer and the sixth largest producer of oil in the world.[4] This report also shows that Nigeria has greater potential for gas than oil, considering the level of secondary gas products that are produced daily by the industry.[5] However, as a result of the clamor to employ more sustainable measures in the Nigerian Electricity Supply Industry (ESI), the attitude of the government and policymakers has shifted profoundly. This has created the need for substantial research into the ESI, so as to ensure a proper transitional framework that would provide for the addition of electricity sourced from

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[1] Godswill A Agbaitoro, "Is Having a Robust Energy Mix a Panacea for Resolving the Energy Crisis of Nigeria?" (2017) 7:4 RELP at 12 and 13; Fred Beck & Eric Martinal, "Renewable Energy Policies and Barriers", online: <http://www.martinot.info/Beck_Martinot_AP.pdf> 366 at 374.

[2] *Ibid.*

[3] Shehu Usman Yamusa II & Abdul Haseeb Ansari, "Renewable Energy Development in Two Selected African Countries: An Overview and Assessment" (2013) 2 RELP 151at 151.

[4] "Oil Production", online: <Nnpcgroup.com/NNPCBusiness/UpstreamVentures/OilProduction.aspx>.

[5] *Ibid.*

renewable energy into the grid, in a manner that would not negatively affect the integrity of grid balancing or the accessibility of electricity.[6]

Furthermore, research carried out by the Central Intelligence Agency[7] shows that a total of 77 million people –constituting 42 percent of the total Nigerian population– do not have access to electricity: access in urban areas amounts to 86 percent, while rural areas comprised a mere 41.1 percent, making for a population average access of only 59.3 percent. 80 percent of the total installed capacity of 10.52 million kilowatts is derived from fossil fuels and 19 percent of the total installed capacity comes from hydroelectric plants.[8] Finally, Nigeria has no installed nuclear fuel capacity and no other renewable energy sources.[9] From the statistics provided, it can be inferred that there is an overdependence on fossil fuels in the Nigerian energy sector in Nigeria, which gives rise to negative health and environmental impacts. It should further be noted that while nuclear power might theoretically provide a cleaner option, Nigeria does not at present have capacity for a nuclear plant.[10]

Nigeria has great energy potential, which if appropriately harnessed, could fully solve problems pertaining to insufficient access to electricity in the country.[11] The Nigerian electricity industry urgently needs a legislative framework capable of addressing the country's energy insecurity issues, its inadequate environmental standards, and its inadequate quality of supply and energy conservation standards. More so, Nigeria has international obligations through its ratification of treaties such as the *Amendment to the*

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[6] Balkisu 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 J Energy & Nat Resources L 1 at 1.

[7] "Africa: Nigeria-The World Fact Book", (June 25, 2019) *Central Intelligence Agency-CIA*, online: <https://www.cia.gov>publocations>geos>.

[8] *Ibid.*

[9] *Ibid.*

[10] Nigeria Tribune, "We Have No Capacity for Nuclear Power Plant Now – Federal Government" (23 August 2018), Nigeria Electricity Hub, online: <http://www.nigeriaelectricityhub.com/2018/08/23/we-have-no-capacity-for-nuclear-power-plant-now-fg/>.

[11] Yemi Oke, "Beyond Power Sector Reforms: The Need for Decentralized Energy Options (DEOPs) for Electricity Governance in Nigeria" (2012) 18:1 Nigeria Journal Contemporary Law, University of Lagos 67 at 68-71.

Montreal Protocol on Substances that Deplete the Ozone Layer,[12] the *International Convention on Oil Pollution Preparedness, Response and Cooperation*,[13] the *United Nations Framework Convention on Climate Change*,[14] the *United Nations Convention on the Law of the Sea*,[15] the *Convention for the Protection of the Ozone Layer (Vienna Convention)*,[16] the *International Convention for the Prevention of Pollution of the Sea by Oil*,[17] the *Constitution of the World Health Organization*,[18] and the *Charter of the United Nations*.[19] All of these impose standards pertaining to the pollution of the environment and healthy living in the nation.

A prominent example that details the non-compliance of Nigeria with both its domestic and international obligations is the recent 'Port Harcourt incidence'. Port Harcourt city is at the heart of Nigeria's oil-producing region, and there have recently been illicit refining activities leading to a very low air quality as a result of the production of black smoke being pumped out by the refineries. This has caused the city's residents to inhale black soot, leading the media to rage about it for the past few months.[20] To cap it all, the World Bank stated in another report that it estimated all Nigerians to be exposed to polluted air at a level of four times above the global health limits for safe air.[21]

It has been proposed that adequate legal reforms could improve access to electricity by focussing on the viability of dividing the country into smaller segments for purposes of

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[12] *Montreal Protocol on Substances that Deplete the Ozone Layer* 1522 UNTS 3; 26 ILM 1550 (1987), online: <http://www.unep.org/OZONE/pdfs/Montreal-Protocol2000.pdf>.

[13] *International Convention on Oil Pollution Preparedness, Response and Cooperation* 30 ILM 733 (1991).

[14] *United Nations Framework Convention on Climate Change* 1771 UNTS 107.

[15] *United Nations Convention on the Law of the Sea* 1833 UNTS 397.

[16] *United Nations Vienna Convention for the Protection of the Ozone Layer* 26 ILM 1516 (1987).

[17] 1954 as amended in 1962 and 1969. *International Convention for the Prevention of Pollution from Ships* 327 UNTS 3; 1962 ATA 7; 9 ILM 1 (1970).

[18] *Constitution of the World Health Organization* 14 UNTS 185.

[19] "Center for Laws of Nigeria", online:<https://www.treatiesLawnigeria.com/Treaties/Environmental-Law-Regulations-Treaties.php>.

[20] Anna Cunningham "Nigeria has some of the world's most polluted cities and that isn't about to change" Quartz Africa, (October 23, 2018).

[21] *Ibid.*

fostering small-scale renewable electricity generation and accessibility.[22] There are three prerequisites to be addressed before this could be viably done. First, recognition of the fact that Nigeria's status as one of the countries with the greatest oil reserves could be a militating factor and therefore requires both legal and institutional transitioning to enable the adoption of the recent trends of renewable energy generation.[23]

Second, the legal framework has to adequately encourage both foreign and local investments in the electricity industry, and to portray the Nigerian electricity market as a viable one where both long term and short term profits could be achieved; there is furthermore a need to deal with the social and community barriers to investors in the market.[24]

The third prerequisite would be to deal with Nigerian government corruption, as this would inadvertently impede the progress of the investments that would be attracted by the modifications of laws to enable small-scale renewable electricity generation.[25] The progress and success of any form of investment in a nation is largely dependent on the kind of economic progression in place and to a large extent this is dependent on the government at the helm of affairs at a particular point, because the government has a direct impact on the type of policies to be made.

1.1.2 Problem Statement

Generally speaking, the problem is inadequate access to electricity as a result of the fact that the existing legal framework in Nigeria does not sufficiently encourage small-scale renewable generation to ensure competition and proper decentralization of the Nigerian

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[22] ML Ahmadu, "Renewable Energy: Challenges and Prospects of Adopting a New Policy and Legal Paradigm in Nigeria" (2012), online: <https://ases.conferenceservices.net/resources/252/2859/pdf/SOLAR2012_0040_full%20paper.pdf>, cited in Nnaemeka Vincent Emodi & Nebedum Ekene Ebele, "Policies Enhancing Renewable Energy Development and Implications for Nigeria" (2016) 4:1 Sustainable Energy at 7-16 at 14, n 61.

[23] Chitzi C Ogbumgbada, "Developing an Effective Legal Framework for Renewable Energy Utilization in Nigeria" 2018 8:3 RELP 1 at 1.

[24] Yemi Oke "Manitoba Hydro and Electricity Undertakings in Developing Countries: The Case of Nigeria", (2012) 36:1 Man L J 37 at 46.

[25] *Ibid* at 47.

electricity market. For a proper understanding of the problem, a division of the problem into various aspects would be pertinent. These aspects include: the problem in the legal framework, inadequate implementation strategies, environmental problems and investment barriers.

1.1.2.1 The Problem in the Legal Framework

In the Nigerian electricity industry, there is a legal contradiction, symbolized by the provisions of the *Constitution* vis-à-vis the *EPSRA*.[26] The *Constitution,*[27] in paragraph 13 and 14, Second Schedule, permits both the federal and the state governments to legislate for the improvement of the supply of electricity in Nigeria. The *Constitution* enables the National Assembly to make laws for the establishment of power stations and the generation and transmission of electricity in or to any part of the federation and from one state to another; the same *Constitution* provides that the State House of Assembly is to make laws for the establishment of electric power stations in States and for the generation, transmission, distribution, and management of electricity not duly covered by the national grid system. However, the power of the State governments appears to have been usurped with the enactment of the *EPSRA*, which in section 31[28] creates a new body known as the Nigerian Electricity Regulatory Commission (NERC). NERC bears the responsibilities of[29] ensuring the "optimal utilization of resources for the provision of electricity services",[30] maximizing access to electricity, ensuring adequate supply of electricity,[31] ensuring fair prices are charged for the purpose of licenses,[32] ensuring the safety and reliability in the generation of transmission of electricity to consumers,[33] and the

[26] *Electric Power Sector Reform Act* of 2005.

[27] See Paragraph 13 and 14 Part II Second Schedule *Constitution of the Federal Republic of Nigeria 1995 as amended.*

[28] *Supra* note 26, see s 31.

[29] *Ibid,* see s 32.

[30] *Ibid,* see s 32(1) a.

[31] *Ibid,* see s 32 (1) b.

[32] *Ibid,* see s 32 (1) d.

[33] *Ibid,* see s 32 (1) e.

presentation of quarterly reports on their activities to the president and the National Assembly as required.[34] In short, NERC seems to have been granted more of the power that originally belonged to the State governments, and this has prevented a proper decentralization of the Nigerian electricity industry which would have made for better management, advancement, and efficiency of the industry.

The rural areas of Nigeria have also been considered by the *EPSRA* in section 88.[35] The Act establishes the Rural Electrification Fund for the purpose of promoting, supporting and providing rural electrification programs through public and private sector participation in order to:

> achieve more equitable regional access to electricity; maximize the economic, social and environmental benefits of rural electrification subsidies; promote expansion of the grid and develop off-grid electrification and stimulate innovative approaches to rural electrification.[36]

Also, section 62 of the *EPSRA*[37] provides for the licensing structure of Nigeria's electricity industry.

In the author's opinion this section does not promote small-scale renewable energy generation because it limits the scope of how much electricity persons can generate and distribute without the need for a license.[38] Furthermore, as identified by previous scholarly research in this area, there is lack of a clearly defined legal framework aimed at tackling the problem of the limited injection of renewable energy sources into the Nigerian grid system to cater for the areas of the country that are off-grid.[39] Hence, there is a need for a

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[34] *Ibid,* see s 32 (1) f.

[35] *Ibid,* see s 88.

[36] *Ibid,* see s 88 (13).

[37] *Ibid*, see s 62.

[38] The writer is not advocating that the licensing procedures be removed completely from the governing laws. However, more room could be made to entertain and enlarge the scope of small-scale renewable electricity generation, bearing in mind the use for which it is advocated for. The writer believes this is what necessitated the enactment of the *Mini Grid regulations* by the NERC, the implications of which would be discussed in detail in subsequent chapters.

[39] Ogbumgbada, *supra* note 23 at 1.

more robust renewable energy law that properly interacts with the existing policies and legislation.[40]

1.1.2.2 Inadequate Implementation Strategies

The law is not more than a mere written piece unless there are proper enforcement mechanisms put in place to ensure its implementation.[41] For instance, the existing Nigerian electricity laws and policies have sections that deal with certain enforcement mechanisms like permits,[42] licenses,[43] tests, inspections and certifications,[44] and punitive sections dealing with suspension or revocation.[45] However, these have not improved access to or availability of electricity in any substantive way. Therefore, it is of great importance that – in addition to advocating for a modified legal structure– institutional restructuring should also be emphasized, so as to ensure that the modified laws are properly implemented and that better results are attained.[46]

1.1.2.3 Environmental Problems

A third reason why this research is necessary is due to the environmental issues that arise as a result of the dependence on fossil fuels as a major source of energy in the country. Some of the resultant environmental problems include oil spillage, air pollution, water

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[40] *Ibid*.

[41] Hakeem Ijaiya & OT Joseph, "Rethinking Environmental Law Enforcement in Nigeria" (2014) 5 Beijing Law Review, 306 at 308, online:<http://www.scirp.org/journal/blr; http://dx.doi.org/10.4236/blr.2014.540.29>.

[42] By virtue of ss 7-10 of the *EPSRA*, no electrical installation can be commenced unless a written permit has been duly obtained from the appropriate authority.

[43] By virtue of ss 62-76 of the *EPSRA*, there are various licensing requirements and failure to comply with them attracts the respective fines and penalties. There also different types of licenses that govern different activities such as the general licenses, the transmission licenses, the system operation licenses, the distribution licenses and the trading licenses.

[44] By virtue of ss 189-212 of the *EPSRA*, there are certain tests such as the verification of polarity, the tests of effectiveness of earthing, the insulation resistance tests and the test of ring-circuit continuity, various inspections and certifications that are required prior to the commencement of the particular project.

[45] S 33 of the *EPSRA* provides for punitive measures such as suspension and revocation, which gives the minister the power to suspend or revoke a license where he is satisfied that the electrical installation has not been carried out, operated or maintained in accordance with the regulations of the Act.

[46] Oke, *supra* note 24 at 45.

pollution, climate change and harm to vegetation and the animal world.[47] A plethora of cases deal with these environmental problems.[48] For instance, in *SPDC v Edamkue and others*,[49] the plaintiffs/respondents instituted action in court for damages resulting from an oil spillage that had occurred in the course of the oil exploration activities of the appellant. Judgment was given in favour of the plaintiff/respondents both at the Trial Court and at the Court of Appeal. However, the appellants further appealed to the Supreme Court on the basis that the plaintiffs/respondents had the onus to prove that the spillage occurred because of the negligence of the appellants. In upholding the judgements of the lower courts, the Supreme Court relied on the principle of *res ipsa loquitur*[50] as established in the case of *Rylands v Fletcher*[51] in positing that the fact that a spillage occurred speaks for itself and therefore the burden shifts on the appellants to prove otherwise. Therefore, their failure to discharge the burden resulted in the courts upholding the previous judgments.

In SPDC v Chief Joel Anaro,[52] Shell had laid its pipelines carrying crude oil across the land occupied by the respondents. In the course of its oil exploration activities, oil spilled and crops and vegetation were damaged. The Supreme Court upheld the application of the principle of *res ipsa loquitur*[53] by the lower courts, in view of the spillage that had taken place. Therefore, special and general damages that had been awarded to the plaintiff/respondents by the lower courts were upheld.[54]

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[47] *Ibid.*

[48] These cases are mostly from a region in Nigeria known as the Niger Delta, which is home to about 31 million people and comprises the following states: Bayelsa, Delta, Rivers, Abia, Cross river, Edo, Ondo and Imo. It is about 70, 000 km^2 and is known mostly for the presence of large oil deposits which constitute about 80 percent of the revenue of the Nigerian government: see online<https://naijaquest.comniger-delta-states.html>. Also prominent among the Niger Delta region's peoples is the Ogoni – a minority ethnic group who have lost their source of livelihood, fishing rights, green vegetation, and good sources of air and water through the recent activities of the oil exploration companies. The land of Ogoni contains more than 100 oil wells, mostly owned by the Shell Petroleum Development Company. See "Facts Sheet of the Ogoni Struggles", online: <http://ww.ratical.org/corporations/OgoniFacts.html>.

[49] (2003) 11 NWLR (Pt 832) at 533.

[50] *Ibid,* P.593-594 Paras G-A.

[51] UKHL 1, (1868) LR 3 HL 330.

[52] (2002) FWLR 1654 17.

[53] *Ibid,* P.279, Paras C-D.

[54] *Supra* note 52, P.277, Paras D-E.

In the case of SPDC v Farrah[55]the plaintiff sued in representative capacity, requesting that damages be paid by Shell to them because of an oil blow-out from the "Bomu well" owned and operated by the SPDC. The blow-out lasted for weeks and substances like crude hydro carbon, sulphur or toxic materials were emitted. These substances formed thick layers over the surface of the adjoining lands and destroyed farm land crops, trees with an economic purpose, and rural vegetation. The court gave judgement in favour of the plaintiff by awarding damages that comprised loss of source of income, social effects/general inconvenience and rehabilitation of the land.[56]

In *SPDC v Ambah*,[57] the plaintiff/respondent by a writ of summons filed for himself and on behalf of the *wasewese* family of Ojobo in the Burutu Local Government Area claimed both special and general damages suffered by them when the defendants through their agents destroyed the fish ponds, creeks, lakes and channels situated near Beniseide Oilfields in Burutu Local Government Area, Bendel State of Nigeria. The defendants (SPDC) refused to negotiate and/or pay adequate compensation to the plaintiff despite repeated demands. The court, after considering the facts, awarded special damages in favour of the plaintiff.

SPDC v Isaiah:[58] in this case, an old tree fell on the appellant's oil pipeline and dented it. This obstructed the free flow of the crude oil. In the course of repairing the pipeline, the crude oil spilled onto the respondent's swamp land and also onto the surrounding land, streams and fish ponds. In the trial court and the Court of Appeal, the plaintiff/respondent got judgement in the form of damages. However, on further appeal to the Supreme Court, where the appellant challenged the issue of jurisdiction of the trial court that entertained the matter, the Supreme Court set aside the previous judgements on the basis that the trial court had lacked jurisdiction. The writer is in total agreement with the decision of the Supreme Court because the fundamental rules that preserve orderliness in seeking remedies

[55] (1995) 3 NWLR (Pt 382) at 148.

[56] P.192 Paras E-F.

[57] (1996) 66 LRCN 390.

[58] (2001) 11 NWLR (Pt 723) 168.

in court such as ensuring that the court has jurisdiction to entertain a matter must not be contravened in a bid to enforce environmental rights.

These cases demonstrate instances where the foreign multi-national corporation in question has destroyed the natural resources of communities such as their sea life, water, air, and land in the course of oil exploration activities. This has shaped the mindset of host communities to abhor investments by such multinational corporations because of the fact that there would inevitably be disparities between their expectations and corporate social responsibility.[59] This means that before a new methodology such as renewable electricity generation could therefore successfully be implemented, a more reassuring approach would likely therefore be needed to sensitize these host communities to the potential benefits of such generation. In addition, strict adherence to the provisions of the law that governs these investments, will be essential to ensure sustainability.[60]

1.1.2.4 Investment Barriers

The power sector is at the heart of economic progression in Nigeria. Over time, as a result of the poor access to electricity in Nigeria, many industries have either folded up or are relocating to other economically friendly jurisdictions that would foster their business growth. This reflects the high cost of doing business in Nigeria.[61] Also, the economic, political and social instability inherent in Nigeria and conflicts of interest between investment parties have in turn made investments largely unpredictable, complex and expensive, thereby discouraging potential investors. A further investment barrier is constituted by the significant hostility of host communities in relation to energy projects.[62]

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[59] Oke, *supra* note 24 at 47.

[60] *Ibid.*

[61] Olatunji Obafemi et al, "Electric Power Crisis in Nigeria: A Strategic Call for Change of Focus to Renewable Sources" (2018) IOP Conf. Series: Materials Science and Engineering 413, online:<http://www.doi: 10.1088/1757-899x/41/1/012053>.

[62] George S Akpan, "Host Community Hostility to Mining Projects: A New Generation of Risk?" in Elizabeth Bastuida, Thomas Walde & Janeth Walden-Fernanadez, eds, *International Comparative Mineral Law and Policy: Trends and Prospects* (2005) Kluwer Law International 311, cited in Oke, *supra* note 24 at 7, n 54.

1.1.3 Objectives of this Research

Drawing an inference from the legal issues highlighted above, the objectives of this research –to be addressed through a study of the legal and regulatory framework of the Nigerian Electricity Supply Industry– are as follows:

i. To investigate the historical development, legal framework and structure of the Nigerian Electricity Supply Industry in order to determine whether it is effective at providing Nigerians across the board with an affordable and quality supply of electricity.
ii. If not, to investigate to what extent rural electrification efforts have been successful, notably with reference to laws and polies implemented.
iii. If not, to determine whether a greater reliance on renewable energy in the electricity generation mix would contribute to greater energy security and equity of supply.
iv. If so, to establish how, practically speaking, such renewable energy technologies could be implemented in the Nigerian ESI with a real likelihood of success, and to make recommendation for such amendments to the Nigerian legal, regulatory and policy framework as might create the necessary environment within which such implementation could feasibly take place.

1.2 Scientific Contribution

1.2.1 Gaps in the Existing Literature

A critical review of the existing literature on the legislative and regulatory framework of the Electricity Supply Industry of Nigeria demonstrates that individual writers have identified various problems with the existing legislative framework and have dealt with them through a range of approaches. Problems identified include the lack of an efficient legal structure to back renewable energy policies,[63] inadequate technology transfer laws,[64]

[63] Peter Kayode Oniemola "Powering Nigeria through Renewable Electricity Investments: Legal Framework for Progressive Realization" (2015) 6 J Sustainable Dev L and Policy 83 at 83.

[64] Damilola S Olawuyi, "Renewable Energy Sources", (2013) 43 Envtl Pol'y and L 233 at 236-238.

issues with the licensing procedure,[65] the lack of a "robust energy mix",[66] Nigeria's faulty liberalization scheme,[67] and the lack of proper implementation of enabling laws.[68]

While a clear picture arises of the difficulties faced by the Nigerian ESI, the existing literature offers less in the way of concrete solutions. Thus, it appears that not much work has been done on the implementation of the enabling law for small scale generators in Nigeria to produce their own electricity with the ability to feed into the grid.

The objective of the present research is twofold: to investigate the legislative and regulatory framework of the electricity supply industry in Nigeria, and to propose practical reformative legal steps that would boost the performance of the Nigerian power sector through the instrumentality of small-scale electricity generation.

1.2.2 Scholarly Significance

Although the importance of energy is widely acknowledged in Nigeria, the challenges facing small scale generation of electricity in Nigeria has not received extensive scholarly analysis. The ultimate significance of this research is to propose legal and policy reforms aimed at transitioning Nigeria's energy sector from overdependence on fossil fuels to renewable energy generation after a careful comparative analysis of the legal methods adopted by other jurisdictions to solve similar problems. Second, a contextual study is made to ensure that the proposed legal and policy reforms will be practically realizable, thereby enabling small-scale renewable electricity generation in terms of generation, transmission and off-take potential.

This suggested legal and policy reform will inform government officials in the energy sector, international legal analysts, the ministries of natural resources, energy, environment

[65] Oluseye Arowolo "Nigeria Power Sector Reform: Why Distribution Requires a Clear Strategy" (2005) 7 IELTR, 163 at 163.

[66] Agbaitoro *supra* n 1.

[67] Oniemola *supra* note 63.

[68] *Ibid*.

and justice of various countries. This research will also be valuable to researchers in the fields of international, energy, health and environmental law.

1.3 Justification of Choice of Study

Having established that there has been no dedicated scholarly research specific to enhancing small-scale renewable generation in Nigeria and the investigation of their viability as to grid connection, transmission, and off take potential thus far, a clear need for this research has been established. In recommending a model, certain factors will be considered in order to arrive at a good fit for Nigeria. First, because Nigeria is a developing country that seeks to improve the state of its economy, it would be useful to recommend a model that has been adopted by a more advanced country, detailing how such a country has transitioned its electricity sector to align with recent trends. The writer is taking an aspirational approach because in the writer's opinion it is not a safe approach to look at other developing countries like South Africa and Brazil as their electricity systems are not stable and do not represent a system that Nigeria should strive for.[69]

Second, it needs to be a country with a strong fossil fuel background. As stated earlier, the Nigerian economy is strongly dependent on the advancement of the oil and gas industry, given its high oil reserve. However, there is an urgent need for an energy transition which necessitates a change in the attitude of the Nigerian electricity sector towards renewable electricity. This therefore reasonably implies that a good model to be recommended would be a country with high fossil reserves that has recorded success in the energy sector through the transition from overdependence on fossil fuels to a sustainable approach for energy provision. Third, given the emphasis on renewable generation in this thesis, the model country needs to have electricity legislation with provisions for the promotion of renewable energy generation. Finally, the political/governmental structure of the model jurisdiction must be such that the model is viable for adaptation to the Nigerian context.

[69] See: Lucy Baker and Jon Phillips, "Tensions in the Transition: The politics of electricity distribution in South Africa", (2019) 37:1 Environment and Planning C. Politics and Space 177-196; Hassan Haes Alhelou et al "A Survey on Power System Blackout and Cascading Events: Research Motivations and Challenges" (2019) 12 Energies 1-28.

With the aforesaid four factors in mind, two main jurisdictions have been identified for comparative study:[70] Canada and Australia. In the first instance, both are developed countries with the kind of strong economies that Nigeria ultimately aspires to. Secondly, both are renowned for their fossil fuel reserves. Thirdly, both jurisdictions have specific legislation of the kind targeted and, lastly, both are common law jurisdictions, like Nigeria, meaning that there is a sound basis for legal comparison.

Because the thesis is restricted in length, one jurisdiction will be studied in each of the two countries: the province of Ontario in Canada, and the state of South Australia. The reason behind studying the models adopted by two different jurisdictions is to carefully understand which aspect of the models adopted by each country would provide the best fit for purposes of enhancing the legal and policy aspects of Nigeria's electricity reform and what ideas would be transferrable as far as the Nigerian system is concerned, considering the structure of the nation, its developing nature, its strong fossil fuel background and the need for a green energy transition.

1.4 Theoretical Framework/Research Methodology

The writer will begin the research by tracing the history of Nigeria's Electricity Supply Industry and showing how the previous laws had no enabling provision for small-scale renewable generators. In addition, the practical portion of the research problem will be addressed by looking into renewable generation of electricity in Nigeria.

Subsequently, Ontario's Electricity Supply Industry will be examined with emphasis on how the industry supports small-scale renewable generation of electricity. The benefits and drawbacks of the approach will also be considered. One of the justifications for the comparison is that first, Ontario is situated in Canada which is a developed country. Therefore, it will be relevant to understand how Ontario's electricity industry developed. Second, Ontario's electricity is derived from various sources of energy such as nuclear

power, hydroelectric power, thermal power, biomass and wind.[71] Therefore, it will be interesting and more attainable to study how Ontario developed its electricity supply industry through renewable energy sources despite its previous strong fossil fuel background signified by its large dependence on coal as a source of energy before its recent transition to a mix of nuclear and renewable energy.[72]

The writer will be considering the *Green Energy Act*[73] for this purpose. The justification for the use of the *Green Energy Act*[74] is that it was a comprehensive Act that was "committed to fostering the growth of renewable energy projects, and to remove barriers to and promoting opportunities for renewable energy projects and to promoting a green economy."[75]

However, because the Act was repealed pursuant to the recent provincial election that saw another political party take power, a more viable jurisdiction for recommendation purposes might be found in South Australia. It appears to have a more sustainable model for renewable energy, given the recent victory of the Tesla battery initiative in the region.

As a result of the legal, academic and practical nature of the chosen research topic, the methodology to be adopted includes the empirical, historical, doctrinal and comparative approaches. This is founded on the understanding that using different approaches will enhance the outcome of the research.

The empirical approach will provide the required statistical data detailing the availability of electricity in Nigeria; the historical approach will be adopted to show how the electricity industry in Nigeria has evolved over time; the doctrinal approach will help analyze the relevant principles, concepts, doctrines and legal propositions; and the comparative

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[71] The most prominent sources in the jurisdiction are nuclear and hydro: "How it works, Electricity Generation", *Ontario Power Generation*, online:- <https://www.opg.com>. As previously noted, nuclear power is not pertinent for purposes of Nigeria. However, renewable generation sources such as hydro and wind generation are.

[72] *Ibid.*

[73] *Green Energy and Green Economy Act*, 2009, SO 2009, c12.

[74] *Ibid.*

[75] *Ibid*, Preamble.

approach will be employed to review the models applied in other jurisdictions (in this instance Ontario and South Australia) and recommend the same for the improvement of Nigeria's Electricity Supply Industry. Primary sources such as case studies, judicial decisions and statutes and secondary sources such as textbooks, journals, magazines, the internet, international instruments, and reports will largely be relied upon.

1.5 Research Boundaries

The scope of this research is a detailed study of the legislative framework of the Nigerian electricity industry focusing on the principal legislation, which is the *EPSRA* and other ancillary laws and policies, including the *NREEEP*, the *NERC Feed-in Tariff Regulation for Renewable Energy Sourced Electricity* and the *NERC Mini Grid Regulation*. This research will also consider the policies, action plans and programs adopted in Ontario and South Australia, to make relevant comparisons strictly for the purpose of providing recommendations.

It does not make any political argument in relation to the various changes introduced by the governments in the regions selected for examination. For example, the political reasons behind the repeal of Ontario's *Green Energy Act* or political decisions made in relation to the Ontario Hydro Company will not be examined.

Finally, as a result of the fact that this research is restricted in length, in view of the enormity of the task involved in canvassing the electricity laws and policies adopted in all of the Canadian provinces and all of the Australia states, the writer has chosen the province of Ontario and the state of South Australia as viable jurisdictions for consideration.

1.6 Thesis Structure/ Organization of Chapters

This thesis is divided into five chapters. Chapter one provides a theoretical framework of Nigeria's electricity industry by discussing the research problem, background to the study, problem statement, objectives of the research, justification of choice of study, scholarly significance, the research boundaries, and the research methodology. Chapter two furnishes a contextual analysis of Nigeria's electricity industry by making a detailed

analysis of the history of the industry, the Nigerian economy and all laws, policies and institutions developed in the Nigerian power sector to tackle the inherent problem of accessibility to electricity. Chapter three reveals the renewable energy potentials in Nigeria and considers the viability of small-scale renewable electricity generation, grid connection, transmission/wheeling and off-take potential. Chapter four provides a study of the legal and institutional framework of the Ontarian electricity industry and the South Australian power sector with the aim of making a comparative analysis of these two systems with the Nigerian power sector and then making relevant recommendations for Nigeria. Chapter five gives a detailed conclusion on the issues previously discussed and proffers pragmatic legal and institutional reforms for the Nigerian Electricity Supply Industry.

Chapter Two

2 Contextual Analysis of Nigeria's Electricity Industry

2.1 Introduction

In line with the historical context and pragmatic nature of the subject of renewable electricity, it would be pertinent to give an overview of the Nigerian economy. Nigeria is the country with the largest economy in Sub-Saharan Africa; its main source of government revenue and foreign exchange is its oil and gas sector.[76] Despite the recent acknowledgement of the need for diversification of the economy to promote stability, the country is still largely dependent on oil production and exportation.[77] Nigeria is often referred to as the 'giant of Africa' because of the prominent presence of oil and gas in the country.[78] Between them, Libya and Nigeria possess two-thirds of Africa's crude oil reserves; when it comes to the production of natural gas, Nigeria ranks second.[79] The country also boasts significant bitumen and lignite reserves, as well as other forms of both renewable and non-renewable energy reserves.[80] Yet, Nigerian electricity production derives from a relatively conventional set of sources: gas-fired, oil-fired, hydro-electric power stations and a combination of coal-fired with hydro-electric power systems.[81] Deriving electricity from these sources is premised on the readily available nature of the sources and their abundance.[82]

Notwithstanding the abundance of resources highlighted above, the poverty level of Nigerian citizens is on the rise, with over sixty-two percent (62%) of the total population

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[76] Africa:Nigeria- <https://www.cia.govpublicationsgeos> *supra* note 7.

[77] *Ibid.*

[78] Abubakar Sambo et al, "Electricity Generation and the Present Challenges in the Nigerian Power Sector" (2012) 6 :7 Journal of Energy and Power Engineering 1050, at 1052.

[79] *Supra* note 1.

[80] *Ibid.*

[81] *Supra* note 1 at 2.

[82] *Ibid* at 4.

of Nigeria living in extreme poverty.[83] It furthermore is obvious when contemplating the demand and supply ratio of electricity that, despite the series of reforms[84] that has been introduced into the Nigerian electricity supply industry, the demand for electricity still exceeds its supply by far.[85] Jointly considered, these observations imply that the government has not properly executed its obligation as enunciated in section 14(b) of the *Constitution of the Federal Republic of Nigeria*,[86] which states that the primary purpose of the government is to ensure the security and welfare of the people.[87]

In the past, the Nigerian economy has been known for its challenges, such as an inadequate power supply; a lack of proper infrastructure development; a delay in the approval of legislative reforms; a slow-paced judicial system; fickle dispute resolution mechanisms; official corruption; insecurity; and political instability. All these factors dissuade investors from investing in the country and negatively affect the advancement of various sectors of the economy.[88] Therefore, although one of the major problems that necessitated research into the adoption of renewable sources of energy in Nigeria is the emitting source from which electricity in Nigeria is derived, it would be important at this stage to point out that even with the proven abundance of oil in Nigeria, inadequate access to electricity is still a major problem yet to be resolved because Nigeria has not been able to generate enough electricity to cater for the needs of both the rural and urban areas of the country and the Nigerian grid has insufficient delivery capacity to cover the whole of the country.

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[83] *Ibid.*

[84] The reforms here refers to the various laws and policies that have been developed to improve the Nigerian electricity supply industry; especially the recent liberalization of the industry and the unbundling of the monopolistic structure NEPA.

[85] RU Ezenekwe et al, "Efficiency of Nigeria's Electricity Market: Emerging Issues, Prospects and Challenges" (2014) 6:1 Nigerian Journal of Energy and Environmental Economics 1-21 at 6.

[86] See Section 14 of the 1999 *Constitution of the Federal Republic of Nigeria as amended.*

[87] One of the major ways established to achieve the above mandate is the creation of the national minimum wage, which to a large extent has not improved the poverty margin of Nigerians but has increased it, leading to the continuous rise in economic instability, evidenced by strikes by the Labor Union; E Chike Nwude, "The Politics of Minimum Wage in Nigeria: the Unresolved Issues" Online 3:4, Asian Journal of Empirical Research at 477 -492<http://aesswen.com/journal-detal.php?id=50>. With the recent bill passed by the senate to increase the minimum wage, it would be interesting to see how the economy of Nigeria improves. <https://www.premiumtimesng.com>.

[88] *Ibid.*

Nigeria has since dealt with the monopolistic nature of the structure of its electricity supply industry and has also introduced prepaid meters to deal with problems associated with estimated billing and meter reading and to regulate the system so as to ensure that the monetary value attached to the amount of power used is justifiable.[89] However, other problems still remain to be dealt with in the industry. These include establishing appropriate mechanisms to ensure that the parts of the country that are off-grid can be put onto the grid or, alternatively, promoting mechanisms that will ensure the promotion of small-scale renewable electricity generation in areas of the country that are off-grid. These include the cost effectiveness and accessibility benefits of this alternative approach; the issue that there is no constant supply of power, as is evidenced by brownouts and blackouts; the concerns raised by GHG emissions caused by the fossil fuel sources from which electricity is currently derived; the economic, health, and environmental consequences associated with the energy mix of the Nigerian electricity sector; and problems inherent in the existing structure of the Nigerian electricity supply industry.

The Nigerian electricity market has undergone various types of legal and policy reform since 1998, when the first attempt to remove the then monopoly National Electric Power Authority (NEPA) came in the form of the *National Electric Power Authority (Amendment) Decree*[90] and the *Electricity Amendment Decree*.[91] This was followed by amendments to the *National Electric Power Act*[92] and the *Electricity Act*.[93] In 2004, the government adopted the *Public Enterprises (Privatization and Commercialization Act),*[94] the objective of which was to retain 40 percent of the public utility, sell off a further 40 percent to a strategic investor, and sell off the remaining 20 percent to the public.[95] The actual intent of

[89] PE Orukpe and FO Agnontaen, "Prepaid Meter in Nigeria: The Story So Far and the Way Forward", (2013) 824 Advanced Materials Research, pp.114-119. Although the prepaid meters have not been properly circulated to get to all consumers, so some consumers are still using the estimated bill system.

[90] *National Electric Power Authority (Amendment) Decree* No 29 of 1998 (now repealed).

[91] *Electricity Amendment Decree* No 28 of 1998 (now repealed). See Bayo Aderalegbe, "Foreign Private Participation in the Electricity Sector of Developing countries: What Works – An Examination of Nigeria's Reformed Electricity Sector" (2009) 10 J World Investment &Trade, 269 at 272.

[92] *National Electric Power Act* Cap 256 Laws of the Federation of Nigeria (1990) (now repealed).

[93] *Electricity Act* Cap 106 Laws of the Federation of Nigeria (1990) (now repealed).

[94] Laws of the Federation 2004 Cap P38.

[95] Aderalegbe, *supra* note 91 at 273.

the law was to provide for private sector participation and liberalization.[96] However, these amendments were not holistic enough, and so they still did not achieve the intent of the lawmakers. This necessitated the enactment of the *Electric Sector Power Reform Act (ESPRA)* in 2005,[97] which signified the beginning of the restructuring process for Nigeria's electricity industry. In the process, NEPA, previously a state-owned monopoly, was unbundled, and a new body known as the Nigerian Electricity Regulatory Commission (NERC) was established. The objectives of NERC are to regulate the electricity market with the primary aim of providing a reliable supply of power that ensures maximum access to electricity; to provide for private sector participation in Nigeria's electricity industry; to protect the interest of consumers through effective dispute resolution methods; and to properly enforce the existing regulations.[98] The net effect of the new arrangement was that principal electricity market supply activities such as generation, transmission and distribution had become activities that can be licensed.[99]

This chapter will discuss the Nigerian economy with reference to how the Nigerian electricity industry has evolved over time. The history will be discussed in three phases: the colonial regime, the regime of the monopolistic entity known as NEPA, and the liberalization regime. A detailed discussion will also be made of the legal, policy and institutional frameworks that have in the past been developed in Nigeria to tackle the problem of electricity, with more reference to renewable electricity generation. Their successes will be highlighted, and their shortcomings identified.

2.2 History of Electricity in Nigeria

A historical background is furnished in order to trace how Nigeria's Electricity Industry has evolved. In the process, problems facing small-scale generators are highlighted. On the whole these have not been considered by previous scholars in the field.

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[96] *Ibid.*

[97] *EPSRA*, *supra* note 26.

[98] *Ibid,* s 31.

[99] *Ibid,* s 62.

2.2.1 The Colonial Regime

The history of Nigeria's Electricity Supply Industry dates back to 1886, when two small generating sets were introduced to serve the then colony of Lagos.[100] In 1896, when Nigeria was still under the colonial regime, electricity was generated in the Ijora area of Lagos by the British colonial government.[101] In 1929, an electric utility known as the Nigerian Electricity Supply Company (NESCO), was established.[102] It constructed a hydro-electric power station at Kuru, near Jos in central Nigeria, that mainly served the Northern part of the country.[103]

In 1946, the colonial government took over the governance of the electricity supply industry through the establishment of the Public Works Department (PWD). In 1950, another central body known as the Electricity Corporation of Nigeria (ECN) was established and took over full responsibility for the development of the electricity supply industry.[104] The colonial era came to an end in 1960 when Nigeria gained her independence.

In 1972, generation and transmission were fused through the enactment of the *National Electric Power Authority Decree No 24*,[105] to form an organization known as the National Electric Power Authority (NEPA) that replaced the ECN and the NDA. This made NEPA a monopoly, vested with the responsibility of regulating the generation, transmission and distribution of electricity.[106] A major subsequent reform of the Nigerian electricity industry

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[100] AS Sambo et al, *supra* note 78; See also, Bolanle Onagoruwa, "Nigerian Power Sector Reforms and Privatization (Bureau of Public Enterprises)" 2011, 8 <http://www.sec.gov.ng/files/Bolanle%20Onagoruwa%20Presentation%20to%20DG%20SEC.pdf> cited in Osaretin Aigbovo and Ebiton Ogboka "Electric Power Sector Reform Act 2005 and the Development of Renewable Energy in Nigeria", (2016) 20:7 Renewable Energy L. Policy Rev. 20-29 at 21 n 8.

[101] Niger Power Review: "Development of Electricity Industry in Nigeria (1960-1985)," 1985, 1-6 cited in Oke, *supra* note 24 at 38 n 7.

[102] Operating pursuant to the *Electricity Ordinance Act.*

[103] CM Nkiruka, "Unbundling and Privatization of the Nigerian Electricity Sector: Reality and Myth?" (LL.M Paper, CEPMLP, University of Dundee), 2010 at 2 cited in Oke, *supra* note 24 at 38 n 8.

[104] The Electricity Corporation of Nigeria (ECN) was established by the Electricity Corporation Ordinance No. 15 of 1950.

[105] *National Electric Power Authority Decree* No. 24 of 1972.

[106] *Ibid.*

began in 1998 under the supervision of the Bureau of Public Enterprises (BPE)[107] in the form of the *Electricity (Amendment) Decree* 1998 and the *NEPA (Amendment) Decree* of 1998.[108]

2.2.2 The Monopolistic Regime of the National Electric Power Authority

Next, NEPA was listed as one of the state bodies to be commercialized. A new *NEPA Act*[109] replaced the old one as a result of the activities of the *Technical Committee on Privatization and Commercialization*, also known as the *Committee on Privatization*. Under the amended legislation, all assets of the existing institutions and bodies vested in NEPA and it was responsible to ensure the efficiency, effectiveness and viability of electricity supply throughout Nigeria. Thus, the generation, supply, installation, and consumption of electricity were now all governed by the new Act and four Regulations made pursuant to it.[110]

Three other Acts were also pertinent to the electricity industry in this era: the *Energy Commission of Nigeria Act*,[111] the *Utilities Charges Commission Act*, and the *Environmental Impact Assessment Act.* The first of these established the body known as the Energy Commission of Nigeria with the sole aim of coordinating and generally maintaining the development of the various energy resources in Nigeria; the second vested the Commission with the power to regulate the tariffs charged by public utilities like NEPA; and the third prescribed an environmental impact assessment to be carried out in respect of such projects prior to commencement.

Towards the end of the twentieth century, there was a major shift to embracing global trends in electricity supply industry governance towards a more liberalized system that

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[107] A government agency with the sole responsibility of supervising privatization reforms in the electricity sector.

[108] Sola Arifayan and Chukwubuike Ozurumba, 'Nigeria's Power Sector Privatization Reaches Final Act' <http://www.mondaq.com/Nigeria/x/294720/Oil+Gas+Electrcity/Nigerias+Power+Privatisation+Reaches+Final+Act>.

[109] *NEPA Act* Cap 106, Laws of the Federation of Nigeria (LFN) 1990.

[110] *Ibid*, The four regulations made pursuant to the repealed *NEPA Act*

[111] *Energy Commission of Nigeria Act*, Cap E 10, Laws of the Federation of Nigeria (LFN), 2004.

would enable private sector participation and end the monopolistic status of NEPA. Thus, the *Electricity Act of 1990* was amended to dissolve NEPA as a monopoly and to make room for more competition in the electricity market. This gave way to further reforms and the establishment of a new body known as the Power Holding Company of Nigeria (PHCN), through the enactment of a new law known as the *Electric Power Sector Reform Act.*[112]

2.2.3 The Liberalization Regime

Under this regime, deliberate efforts were made by the government to increase foreign participation in the Nigerian Electricity Supply Industry through the commissioning of Independent Power Projects (IPPs) for the purpose of generating electricity and selling it to the PHCN. Some of these IPPs include: the Agip 450 MW plant developed in Kwale Delta State; the 276 MW Siemens station in Afam; Exxon Mobil's 388 MW plant in Bonny; Eskom's 388 MW plant in Enugu; and ABB's 450 MW plant in Abuja.[113]

In the Nigerian electric power sector, the liberalization regime commenced in the year 2000 with the implementation of the recommendations of the Electric Power Implementation Committee (EPIC). EPIC provided a blueprint of the *National Electric Power Policy* (*NEPP*) in September 2001,[114] and this eventually gave rise to the 2005 *Electric Power Sector Reform Act* (*EPSRA*).[115]

The major difference between the two earlier regimes (the colonial regime and the monopolistic regime) and the current liberalized regime is that the Nigerian Electricity Supply Industry has now embraced the trends of market liberalization, allowing for more Independent Power Producer (IPP) participation in the country — thereby promoting competition and creating a level playing ground in the Nigerian power sector. Although

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[112] *Electric Power Sector Reform Act* 2005, Cap E7, Laws of the Federation of Nigeria (LFN), 2004.

[113] Emmanuel C Chinwuko et al "Electricity Generation and Distribution in Nigeria: Technical Issues and Solutions" online: (2011) 3 International Journal of Engineering Science and Technology (IJEST) <https://www.researchgate.net/publication/267029542> page 7934-7941 at 7934-7935.

[114] Aigbovo *supra* note 100 at 22.

[115] EPSRA *supra* note 26.

the current regime has gotten rid of the monopoly, a new problem has been created in the process. This is due to the fact that a new regulatory body (NERC) has emerged by virtue of section 31 of the *EPSRA*:[116] NERC is vested with the responsibility of licensing of power companies, establishment of electricity tariffs, enforcement of the required standards and the protection of the rights of consumers in the electricity industry.[117] The new Act[118] has therefore replaced both the *NEPA Act* and the *Electricity Act* by strategically removing the regulation of the Nigeria power sector from the Federal Government of Nigeria through the establishment of ostensibly autonomous new institutions.[119]

By way of summary, the Nigerian electricity sector can be said to comprise six generating companies, one transmission company, and eleven distribution companies.[120] The Generating Companies (GenCos) include the following companies:[121]

Generating companies	**Installed Capacity**
The Afam Power Plc	776MW
The Sapele Plc	414 MW
The Egbin Power Plc	1,020MW
The Ughelli Plc	900MW

[116] *Ibid*, s 31.

[117] *Ibid.*

[118] *Ibid*; see also Emeka Okafor, "Reforms in the Power Sector and Implications for Industrial development in Nigeria: The Case of Difference between Six and Half Dozen" (2014) 12: 1 Ibadan Journal of the Social Sciences at 5.

[119] Apart from the Nigerian Electricity Regulatory Commission which is the new major body vested with the utmost responsibilities in the Nigerian Power Sector, other institutions established under the restructured power sector is the Rural Electrification Fund and the Consumer Assistance Fund, established under s 88(1) and s 83(1) of the *EPSRA* respectively.

[120] I Akin et al, "Towards Sustainable Universal Electricity Access in Nigeria" (2014) 1:2 Centre For Petroleum, Energy Economics and Law Monograph Series 115.

[121] "Gencos", online: -<https://www.nercng.org>. The two types of electricity generation sources for the Gencos are gas and hydro. Worthy of note is also the fact that the federal government has almost fully divested its interest in all the generating companies.

The Kainji Power Plant	760MW
The Jebba Power Plant	578MW
The Shiroro Power Plc	600MW

Although there have been recent improvements in the level of generation of electricity in Nigeria, the generating capacity is still largely below the required amount.[122] In a bid to increase the level of generation of electricity, the Niger Delta Power Holding Company (NDPHC) was furthermore incorporated by the Federal Government of Nigeria in 2004 as an emergency intervention scheme, funded by the public sector to manage the National Independent Power Projects (NIPP).[123] This scheme was meant to increase the level of power by adding 4,774 MW to the national grid.[124]

The transmission of electricity in Nigeria is handled primarily by a government-owned company known as Transmission Company of Nigeria.[125] Nigeria's transmission system does not provide coverage for all parts of the country.[126] A recent report by the NERC has identified some of the causative factors relating to transmission capacity limitations, including the lack of funds to expand and maintain the network, the low level of electricity

[122] Nigeria's Power Generation increases in January 2019-TCN-<https://www.premiumtimesng.com> Nigeria's electricity industry recorded an improvement in the level of generation of electricity by 1,811.3 megawatts (MW) in January 2019 as the Transmission Company of Nigeria transmitted 127, 157 MW as opposed to 125, 346.4 MW which was transmitted in December, 2018. The statistics provided by the Nigerian Electricity System Operator (SO) by the News Agency of Nigeria (NAN), also posited that Nigeria generated 1257, 157 MW of electricity between January 1-31 of 2019 indicating a decent improvement. The Transmission Company of Nigeria stated that the national peak demand is 19, 100 MW while the installed capacity is 11, 165.40MW.

[123] The NIPP stations include the Laoji (I,074 MW) in Abia state, Benin (Ihovbor) (451MW) in Edo State, Calabar (563 MW) Cross River state, Egnema (338) MW in Imo state, Gbarain (225 MW) in Bayelsa state, Geregu (434 MW) in Kogi state, Olorunsogo in Ogun state, Omotosho (451Mw) in Ondo State, Omoku (225MW) in Rivers State, Sapele (Ogorode).

[124] *Supra* note 26.

[125] "Transmission Company of Nigeria", online: -<https://www.nercng.orgtransmission>.

[126] *Ibid.*

security exacerbated by vandalization activities, the use of outdated technologies, and the fact that transformers were being overloaded.[127]

The eleven Distribution companies (Discos) are: the Kaduna Distribution Company,[128] the Kano Distribution Company,[129] the Yola Distribution Company,[130] the Jos Distribution Company,[131] the Abuja Distribution Company,[132] the Ibadan Distribution Company,[133] the Eko Distribution Company,[134] the Ikeja Distribution Company,[135] the Benin Distribution Company,[136] the Port Harcourt Distribution Company,[137] and the Enugu Distribution Company.[138]

To foster the proper implementation of the reforms embodied in the new legal and institutional framework, the *Road Map for Power Sector Reform*[139] was launched in 2010. It initiated a number of policies geared towards expanding the accessibility and supply of electricity in the country, including:

i. The encouragement of inflow of private sector participation/investments, with the goal of divesting a minimum of 51 percent of the ownership interest of seventeen out of the eighteen successor companies. This referred to the

[127] "Discos", online: -<https://www.nercng.org>.

[128] This distribution company covers the states of Kaduna, Zamfara, Sokoto and Kebbi.

[129] This distribution company caters for the states of Jigawa, Kano and Katsina.

[130] This company was privatized officially in 2013 and it covers the states of Taraba, Adamawa, Borno and Yobe states.

[131] This distribution company covers the states of Bauchi, Benue, Gombe and Plateau.

[132] This distribution company covers the states of Niger, Nasarrawa, Kogi and the Federal Capital Territory.

[133] This distribution company covers the states of Kwara, Oyo, Osun and Ogun.

[134] This distribution company is smaller in size and covers the states of Lagos, Ogun and the Agbara area.

[135] This is a major distribution company that caters for over seven hundred thousand 700, 000 customers.

[136] This is also a major distribution company that covers the states of Delta, Edo, Ondo and Ekiti States.

[137] This is a distribution company that caters for the states of Cross River, Akwa Ibom, Rivers, Bayelsa.

[138] This is another major distribution company that caters for the entire eastern part of the nation. It provides services for the states of Abia, Enugu, Ebonyi, Anambra and Imo.

[139] The Road Map for Power Sector Reform was launched in August 2010 by the then President Goodluck Ebele Jonathan in response to the demand by the populace for an immediate improvement to the supply of power.

divestiture of generation and distribution assets, while the transmission company would remain state-owned, though private-sector managed.

ii. The identification of the problematic nature of the then tariff system and the establishment of a more suitable pricing regime by the NERC.

iii. The establishment of a bulk purchaser who would have the central role of purchasing power from the successor generating companies, the existing Independent Power Producers (IPP) and all other licensed generators, in order to resell to the distribution companies.

iv. A plan to encourage the construction of more power plants, through investments in the sector by the federal government.

v. Clarification and strengthening of the licensing regime to enable the licensing period to become commensurate with the time it would take the investors to recover the funds that they have invested.[140]

The *Road Map for Power Sector Reform* set a generating target of around 40,000 MW by the year 2020. Its attitude to foster investments through private sector participation as encapsulated in the *EPSRA* constituted a major change.[141]

2.3 The Existing Nigerian Electricity Supply Industry

2.3.1 Nigeria's Electricity Framework

This section will discuss the relevant laws, policies and institutions that have been developed to address electricity issues in Nigeria.[142] The Nigerian legal framework on electricity comprises the following laws, policies and action plans: The *Renewable Energy*

[140] *Ibid.*

[141] *Ibid.*

[142] See Ogbumgbada, *supra* note 23 at 47–52; see also OV Ojo, "An Overview of the Legal and Regulatory Framework for Renewable Energy Projects in Nigeria: Challenges and Prospects" (2017) 1:1 Unilag Law Review 22 at 30.

Policy of 2003 and 2005,[143] The *Electric Power Sector Reform Act*,[144] The *Renewable Energy Policy of 2006*,[145] and the *National Renewable Energy and Energy Efficiency Policy* (*NREEEP*).[146] Pertinent institutions include the Energy Commission of Nigeria (ECN), the Nigerian Electricity Regulatory Commission (NERC), the Rural Electrification Agency (REA), the Ministry of Power and Steel (MPS), the National Council on Privatization (NCP) and the Bureau of Public Enterprise (BPE). Other key players in the industry comprise the Nigeria Electricity Bulk Trading Plc (NBET), the Gas Aggregation Company Nigeria Limited (Gas Aggregator), the Nigerian Electricity Management Services Authority (NEMSA), the National Power Training Institute of Nigeria, and the Nigeria Electricity Liability Management Company.

2.3.1.1 The 2003–2005 Renewable Energy Policy

The Energy Commission of Nigeria, in accordance with its mandate as provided under its enabling law,[147] developed a *National Energy Master Plan* in 2003. It contained a National Energy Policy with the objective of ensuring the enforcement of the relevant provisions relating to energy sources and utilization; manpower development; the financing of energy projects; an energy data bank; and the planning, monitoring, evolution and implementation of energy projects.[148] However, as a result of an increased movement towards advocating for cleaner energy sources in Nigeria's electricity supply mix, the Commission developed the *Renewable Energy Master Plan* (REMP), a "three-tier time framed" plan of 20 years[149]

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[143] *The Renewable Energy Policy* of 2003–2005.

[144] Supra *note 26.*

[145] *The Renewable Energy Policy* of 2006.

[146] *National Renewable Energy and Energy Efficiency Policy (NREEEP),*2015.

[147] *Energy Commission of Nigeria Act supra* note *111*.

[148] MT Ladan, "Policy, Legislative and Regulatory Challenges in Promoting Efficient and Renewable Energy for Sustainable Development and Climate Change Mitigation in Nigeria" paper delivered at the 3rd symposium and 2nd Scientific Conference of ASELAU, Nairobi, March 2009),;See also, Temilade Sesan, "Status of Renewable Energy Policy and Implementation in Nigeria" online: (2008) 12 Institute for Science and Society, University of Nottingham, online:<http://www.gbengasesan.com/temidocs/REP Status Nigeria.pdf>.

[149] The *Renewable Energy Master Plan* is a 20-year period plan with the tripartite aim of increasing the percentage of what renewable energy contributes to the electricity production in Nigeria from 13% of total contribution in 2015 to 23% of total contribution in 2025, to 36% of total contribution by 2030. This would

in 2005. The REMP's objective was a concerted move towards the achievement of reliance on cleaner, affordable and reliable energy supply and to establish a mechanism for showcasing the viability of private sector participation in the electricity sector. [150]

Unfortunately, little progress was made towards achieving the renewable energy goals set out in the *Renewable Energy Master Plan* because of the limited power granted by its enabling law to the then regulatory institution, the Energy Commission of Nigeria.[151]

2.3.1.2 Reforms Brought about by the Electric Power Sector Reform Act

The enactment of the *Electric Power Sector Reform Act* (*EPSRA*)[152] took place in 2005, after which the Nigerian power sector witnessed the liberalization of the industry.[153] The *EPSRA* is the current legislation that governs all the activities responsible for the reform of Nigeria's Electricity Supply Industry. It was enacted primarily for the establishment of initial and successor companies and the transfer of the assets and liabilities of the National Electric Power Authority.[154]

The Act is divided into 13 parts containing 101 sections that deal with matters relating to the creation of the initial holding company;[155] its shareholding;[156] the transfer of assets and employees;[157] the limitation of suits against the transferee;[158]and other procedural matters consequential to the liberalization of the Nigerian Electricity Supply Industry. It contains guidelines for the introduction of competition into the Nigerian Electricity Supply Industry and is geared towards the development of a market that encourages the participation of the

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make the contribution of renewable sources in the entire energy sector amount to 10%, online: <http://www.iea.org>.

[150] Yemi Oke, *Nigeria Electricity Law and Regulation* (University of Lagos, 2013) at 59.

[151] *Energy Commission of Nigeria* Act *supra* note *111*.

[152] *EPSRA supra* note 26.

[153] Ezenekwe R. U et al, *supra* note 85 at 12- 13.

[154] *EPSRA supra* note 26.

[155] *EPSRA supra* note 26, s 1.

[156] *EPSRA supra* note 26, s 2.

[157] *EPSRA supra* note 26, ss 3 and 5.

[158] *EPSRA supra* note 26, s 14.

private sector industry players. Another significant change made by the Act is the establishment of a new body known as the Nigerian Electric Regulatory Commission (NERC) by virtue of section 31,[159] tasked with the key objective and functions of fostering the electricity supply industry, such as ensuring that there is optimal utilization of resources. NERC is also endowed with the power to regulate the Nigerian Electric Supply Industry.

The Nigerian power sector is currently liberalized in nature[160] and its assets are distributed to an initial holding company.[161] An analysis of the *EPSRA* especially as it relates to the liberalization scheme, the reaction of the participants in the Electricity Supply Industry and the level of application and shortcomings reveals that the goal of the restructuring process was to reduce the level of government participation in the power sector.[162]

2.3.1.2.1 The Establishment of the Nigerian Electricity Regulatory Commission (NERC)

A major structural reform introduced by the enactment of the *EPSRA* is the establishment of the NERC.[163] NERC is a body corporate with the right to sue and be sued in its own name.[164] Also, as exemplified in the case of *Nigerian Electricity Regulatory Commission v Abuja Electricity Distribution Company*,[165] the NERC has the jurisdiction to resolve disputes that occur in the industry, except those matters involving the courts.

Since its establishment, its main responsibility has been to be the chief regulator of the Nigerian electricity supply industry, performing duties such as licensing, regulating electricity tariffs, ensuring that performance standards are adhered to and protecting the rights of consumers in the industry. As indicated by its vision and mission, the primary aim

[159] *EPSRA supra* note 26, s 31.

[160] Bayo Adaralegbe, *supra* note 91 at 269.

[161] Oluseye Arowolo *supra* note 65 at 163-164.

[162] Saidu *supra* note 6 at 1.

[163] *EPSRA supra* note 26, s23.

[164] *EPSRA supra* note 26, s23(2).

[165] Case no NERC/01/000002/2008.

of the NERC is to "keep the lights on".[166] Scholars have argued that the NERC is not truly independent.[167]

Furthermore, scholars have suggested that the NERC be given more objectives because the current objectives are not robust enough to tackle the challenges predominant in the Nigerian ESI. [168] The suggested objectives include:

> ensuring the preferential prices for renewable electricity to cover cost due to the special challenges of cost, location and other difficulties associated with renewable energy generation; ensuring that appropriate environmental impact assessments are conducted prior to award of licenses; reporting specifically on the status of the renewable electricity industry in its quarterly report to the president and National Assembly and ensuring that renewable energy investors enjoy concessional taxation.[169]

Other suggested additional functions include:

> the development of simplified licensing procedures for renewable energy investment; lowering licensing charges for renewable electricity licenses, reducing the regulatory compliance and reporting burden on renewable energy investors, developing a framework for power purchase agreement that ensures: access to grid-based renewable electricity, long term contracts that guarantee price and market for renewable electricity; developing and maintaining quality standards for renewable electricity equipment and installation, and guaranteeing financing for renewable energy investors.[170]

2.3.1.2.1.1 Goals and Objectives of the NERC

The NERC aligned its business objectives with four major goals:

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[166] NERC, "Nigerian Electricity Regulatory Commission, Mission and Vision"- the main aim of the commission is to keep the lights on; it also has four core values of operation which are leadership, professionalism, teamwork and good governance. The key question however is to what extent these mandates can be said to have been accomplished since the establishment of the new body 14 years ago.

[167] Osasemede Osasu "Is the Nigerian Electricity Regulatory Commission Truly Independent?" (2014) 7 I.E.L.R, 261-265.

[168] Aigbovo and Ogboka *supra* note 100 at 28.

[169] *Ibid.*

[170] *Ibid.*

1st Goal: Uninterrupted Electricity

- Ensuring the constant and reliable power supply because this is essential for the growth of the Nigerian economy.
- Ensuring that the power supply has coverage of a wide national footprint to ensure maximum access to electricity in Nigeria.
- Ensuring that through appropriate guidelines, Nigeria gets a safe, sufficient and affordable service as it relates to transmission, distribution and trading of electricity.

2nd Goal: Private Sector Participation

- Encouraging private sector participation in the Nigerian electricity supply industry.
- Ensuring that proper legal guidelines are created to foster competition by market players in the electricity supply industry.
- Ensuring the enforcement of the rules of engagement and codes of conduct in the electricity market.
- Preventing the abuse of the market by monitoring operators in the industry.

3rd Goal: Consumer Protection

- Ensuring the development of fair pricing rules.
- Facilitation of proper communication with consumers in the industry to ensure they comprehend their rules and obligations.
- Ensuring the ready accessibility and availability of materials on consumer rights.
- Establishment of dispute resolution mechanisms and ensuring the enforcement of same.

4th Goal: Fair Regulation

- Ensuring the even-handed regulation of the electricity industry by overseeing the electricity industry.
- Ensuring a common playing ground in relation to the enforcement of rules and regulations.

The major issue that arises with the establishment of the NERC is whether it has significantly improved the administration of the Nigerian Electricity Supply Industry. Another source of concern is the degree to which the Commission is independent.[171]

2.3.1.2.2 Rural Electrification Agency

The provision of electricity in rural areas of Nigeria that do not have sufficient access to the main grid has been a major source of concern over the past decades. One of the innovations introduced by the *EPSRA*[172] is the establishment of the Rural Electrification Agency (REA).[173] The Act[174] makes the Agency a body corporate with the authority to sue and be sued in its own name.[175] Since its establishment, REA has been responsible for executing the dedication of the Federal Government of Nigeria to Rural Electrification (RE) as exemplified in the *National Energy Policy*, the *Electric Power Sector Reform Act* of 2005, and the *Rural Electrification Strategy and Implementation Plan* (*RESIP*).[176] 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 subsidies are maximized.
- Ensure the expansion of the grid and the development of the off-grid electrification.
- 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.

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[171] Osamede Osasu, "Is the Nigerian Electricity Regulatory Commission Truly Independent?" (2014) 7 I.E.L.R 161-265 at 263-264.

[172] *EPSRA supra* note 26

[173] Sanusi Ohiare "Expanding Electricity Access to all in Nigeria: a Spatial Planning and Cost Analysis, Energy Sustainability and Society" (2015) 5:8, 1-18 at 1-2.

[174] *EPSRA supra* note 26.

[175] *Ibid,* section 88.

[176] Rural Electrification Agency- <https://www.rea.gov.ng/history>.

Problems of inadequate access to electricity are usually addressed by extending the grid to cater for areas that are off-grid.[177] This approach is considered especially in circumstances where it is more cost effective than any other approach.[178] It is also the preferred approach because it is more reliable where there is adequate load density.[179] However, given the state of the Nigerian Electricity Supply Industry, a more viable approach would be the promotion of mini-grid solutions because several past grid expansion attempts have been very slow and have produced minimal results.[180]

2.3.1.2.3 Mini-Grids- NERC Mini Grid Regulation

The International Energy Agency (IEA) defines mini-grids 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.[181]

A mini grid can also be defined as—

> A stand-alone power system or an integrated local generation and distribution system with installed capacity below 1MW, capable of serving numerous end-users independent of the national grid. A mini-grid can provide constant and affordable electricity in remote places where the population density is too low to economically justify connecting that community

[177] Elusakin Julius E, Ajide O. Olufemi and Diji J Chuks, "Challenges of Sustaining Off-grid Power Generation in Nigeria Rural Communities" (2014) 2(2) African Journal of Engineering Research, 51-57 at 53-54.

[178] Sanusi Mohammed Ohiare, *Financing Rural Energy Projects in Developing Countries: A Case Study of Nigeria* (Ph.D De Montfort University Faculty of Technology, 2014)[unpublished] at 45.

[179] *Ibid.*

[180] *Supra note 26*.

[181] International Energy Agency, "PVPS Task 11-PV Hybrids and Mini-Grids", online:<https://www.iea-pvps-task11.org/id34.html>.

> to the national grid and represents a viable and cost-effective solution for the electrification of Nigerian communities through a decentralized energy system.[182]

According to the NERC there are two forms of mini-grid: an **isolated mini-grid** and an **interconnected mini-grid**.[183] Isolated mini-grids are autonomously existing grids that are structured to produce electricity for a limited number of persons — usually in rural areas, where connection to the main grid proves difficult.[184] Interconnected mini-grids, on the other hand, are grids that have been developed in such a way that interconnection with the central grid is possible.[185] An analysis of the sociological impact of the development of mini-grids as a viable strategy to resolve electricity problems in various countries shows that mini-grids create a sense of involvement in rural communities and affect the political structure positively.[186] The *NERC Mini Grid Regulation* of 2016[187] is a regulation specifically enacted to devise a strategic platform for electricity access through mini grids.

2.3.1.2.4 Rural Electrification Policy and Programs in Nigeria

The first Rural Electrification Program was initiated by the Federal Government in 1981 with sole aim of expanding the national grid to accommodate the existing local government headquarters at the time.[188] This initiative was developed in order to provide electricity for the smaller towns and communities that were situated close to the headquarters, resulting in the provision of electricity to a wide range of rural dwellers.[189] The former monopoly NEPA was saddled with the responsibility of executing the above program, on behalf of

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[182] "The NERC Mini-Grid Regulations and the Nigerian Mini-Grid Market: Opportunity for Investment", online:<https://www.mondaq.com/Nigeria/x/781960/Renewables/The+Nerc+MiniGrid+Regulations+And+The+NIgerian+MiniGrid+Market+Opportunity+For+Investment>.

[183] *Ibid.*

[184] *Ibid.*

[185] *Ibid.*

[186] *Ibid.*

[187] *Ibid.*

[188] CJ Diji, "A Critical Assessment of the Nigerian Rural Electrification Policy" (2014) 2:1 International Journal of Advanced Studies in Engineering and Scientific Inventions 1118-130 at 120-122 <http://www.internationalpolicybrief.org>.

[189] *Ibid.*

the Federal Government.[190] However, due to political instability and the huge financial implications of the program, the implementation process became slow. In 1989, the program was restructured.[191] The Federal Government established the Implementation Committee on Rural Electrification (ICRE) comprising officials of NEPA, the Federal Ministry of Power and Steel, and the Electrical Inspectorate Services Department. Despite the collaboration between the local, state and federal government in the restructured system, only 300 projects were finished and connected to the national grid within a span of 10 years (1989-1999), a further 800 projects being abandoned.[192] Over the course of the next regime between 1999 and 2001, another 189 projects were completed and connected to the grid. However, as a result of the slow-paced reform in the rural electrification sector of the electricity industry, it became essential that a drastic change be made. This led to the introduction of the Rural Electrification Agency (REA) under Section 88 of the *EPSRA.*[193]

To achieve the mandate of the Rural Electrification Agency, the *Rural Electrification Policy* was enacted to ensure that the correct plans be put in place to ensure the increase of rural electrification to 60% by 2020, and the making of 1.1 million rural household connections on an annual basis from 2015–2020. In relation to the Tariff policy, the Rural Electrification Agency is to ensure cost reflective tariffs for the rural electricity service and to make sure that the rural tariff model allow for a higher margin when compared to that of the urban areas in order to strategically attract investment in renewable energy projects. The agency is also to foster the making of affordable technology, the development of the Nigerian economy and tackling such challenges as may arise in relation to rural electrification.[194]

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[190] *Ibid.*

[191] *Ibid.*

[192] *Ibid.*

[193] *Supra* note *26*.

[194] *Ibid.*

A prominent example of an ongoing rural electrification project is the Nigerian electrification project with project ID-P161885, approved on 27 June 2018. It has four components —

> [First component,] the solar hybrids mini-grids for rural economic development will be implemented under market-based private sector-led approach to construct, operate and maintain economically viable mini-grids, supported by subsidies to reduce initial capital outlays…the second component, stand-alone solar systems for homes and MSMEs goal…the third component, energizing education objective is to provide reliable, affordable and sustainable power to public universities and associated teaching hospitals. The fourth component, technical assistance is designed to build a framework for rural electrification upscaling, support project implementation as well as broad capacity building in Rural Electrification Agency, Nigeria Electricity Regulatory Commission (NERC), Federal Ministry of Power, Works, and Housing (FMPWH), and other relevant stakeholders.[195]

2.3.1.2.5 A Historical Overview of Renewable Energy Policies in Nigeria

The most detailed provision of the *Electric Power Sector Reform Act* pertaining to the generation of electricity from renewable sources is section 88(9) of the Act[196] but this is not sufficient to tackle the problem.[197] To promote investments in renewable energy and address environmental issues, Nigeria has to tackle all existing legal and institutional impediments in its power sector.[198] Some of these legal and institutional impediments include the narrow scope of Nigeria's technology transfer laws, shortcomings in the *Electric Power Sector Reform Act* of 2004 and the lack of intergovernmental linkages.[199] Nigeria should, despite its richness in oil and gas, utilize and promote investments in

[195] Nigeria Electrification Project- <https://www.projects.worldbank.org/P161885?lang=en>. The status of the above project is active. The approval date as of the board presentation is June 27, 2018. The total cost of the project as highlighted in its relevant document is 765.00 million USD. However, the commitment amount is 350.00 million USD.

[196] *EPSRA supra* note 26.

[197] Aigbovo & Ogboka *supra* note 100 at 26.

[198] Oniemola *supra* note 63 at 83. See also, Peter Kayode Oniemola, "Commercializing Renewable Energy in Nigeria through a Legal Framework for Competitive Bidding Scheme" (2016) 19 Nigerian L.J.94.

[199] Olawuyi, *supra* note 64 at 236-238; see also Lekan Salami & Afolabi Elebiju, "Investment Incentives for Electricity Business in Nigeria", (2004) 22 J. Energy & Natural Resources L. 94.

renewable energy.[200] Investments like off-grid solar electricity would, to a large extent, increase the country's access to electricity.[201] The problems of energy insecurity and lack of access need to be addressed, in addition to environmental and economic concerns.[202] Nigeria also needs to transition its electricity supply mix to foster the utilization of renewable energy sources in the generation of its electricity because the contribution of renewable energy to electricity production in Nigeria is acutely insufficient at present.[203] The various sources of renewable energy may have their problems but their benefits outweigh their peril.[204] Therefore, "supportive legal frameworks and schemes" should be enacted to promote renewable energy by introducing tariff methodologies and tradable quota schemes that oblige utilities to produce or utilize a specific amount of electricity from renewable energy sources,[205] strategies to improve electricity licensing, environmental impact assessments and planning approval/permits, grid connection and access, as well as land use rights should also be adequately implemented.[206]

The "lack of a streamlined legislation to tackle the issue of injecting renewable energy resources into the grid" is one of the major issues to be dealt with in the Nigerian power sector.[207] The main reason for the adoption of renewable energy sources for electricity generation in Nigeria may be viewed from two angles;[208] first, renewable energy guarantees sustainable access to energy for the development of any nation. Second, it is a "veritable tool for addressing the global problem of climate change".[209] The problems facing the progress of renewable energy include cost, legal and regulatory inadequacies,

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[200] Peter Kayode 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.

[201] Oniemola *supra* note 63.

[202] *Ibid.*

[203] *Ibid* at 31.

[204] *Ibid* at 42.

[205] *Ibid.*

[206] *Ibid.*

[207] *Ibid* at 24.

[208] Ogumgbada, *supra* note 23 at 48-62.

[209] *Ibid at 57.*

market performance, and poor standards.[210] The strategies needed for the introduction of a "robust energy mix" in Nigeria are a stronger legal structure, financial solutions, private sector participation, technology transfer measures, cost reduction policies and tax-based incentives.[211]

2.3.1.2.6 *Structural licensing reforms*

Section 62 of the *NPSRA*[212] determines that any person who wants to construct, own or operate a project in electricity generation, transmission, operation, distribution and trading, is required to have a license. However, the general rule has an exception created in section 62(2) in relation to persons who intend to construct, own or operate a project for generating electricity of no more than 1 MW or for distribution not exceeding an aggregate of 100 kW.[213] The appropriate licensing body as established by the Act is the NERC. The *EPSRA* also contains requirements for obtaining the various types of licenses such as general,[214] transmission,[215] system operation,[216] distribution,[217] and trading licenses.[218] It further provides the relevant guidelines for the application,[219] restriction,[220] renewal,[221] amendment,[222] cancellation,[223] and enforcement of licenses.[224]

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[210] *Ibid* at 61-62 .

[211] Agbaitoro, *supra* n 1 at 13–15.

[212] *Supra* note *26* s 62.

[213] *Supra* note 26 s 62(2).

[214] *Supra* note 26, s 64.

[215] *Supra* note 26, s 65.

[216] *Supra* note 26, s 66.

[217] *Supra* note 26, s 67.

[218] *Supra* note 26 s 68.

[219] *Supra* note 26, s 70.

[220] *Supra* note 26, s 69.

[221] *Supra* note 26 s 72.

[222] *Supra* note 26 s 73.

[223] *Supra* note 26, s 74.

[224] *Supra* note 26, s 75.

The overall objective of restructuring the Nigeria electricity supply industry is to encourage competition, and in any restructured industry, the process of licensing plays a key role in determining how even-handed the market will be.[225] However, the new licensing arrangement under the *EPSRA* raises certain peculiar issues; prominent among these is the duration of the license granted by the Commission under the Act and its viability pertaining to the sufficiency of the time granted to enable the investors in the electricity industry both recover their investment and make a profit. Thus, attempts have been made by the NERC through public notices to assure potential investors in the company that so long as the obligations under their licenses have been met with strict compliance, the renewal of their license for a second term would be automatic.[226] It is, however, highly recommended that the intention of the Commission be inserted into the Act through an amendment.

Scholars have also recommended capacity expansion and development,[227]the proper training of personnel,[228] reduced government interference,[229] the enactment of a competition law and national energy law,[230] and a united method to policy application in order to address the shortcomings contained in the *Electric Power Sector Reform Act*.[231]

2.3.1.2.7 The Nigerian Electricity Tariff System

A tariff is a duty imposed on a service provided. The tariffs for the Nigerian electricity supply industry are regulated by the NERC.[232] Section 76(1)[233] provides as follows:

> The following activities are subject to tariff regulation-

[225] Arowolo, *supra* note 65 at 163.

[226] The NERC representatives stated this during the Nigeria power sector investment forum in London.

[227] Saidu, *supra* note 6 at 15–16.

[228] *Ibid* at 16.

[229] *Ibid*.

[230] Saidu , *supra* note 6 at 17.

[231] *Ibid*. See also Sam Amadi, "The Rule of Law Approach to Regulating Electricity Supply in Nigeria" (2017) 8 J Sustainable Dev L Pol'y 26.

[232] The NERC by law in section 76 (2) of the *EPSRA* is saddled with responsibility of developing the methodologies to be adopted in the regulation of electricity tariffs as it relates to electricity generation, trading, transmission, distribution and system operations.

[233] *Supra* note 26.

(a) Generation and trading, in respect of which licenses are required pursuant to this Act, and where the commission considers regulation of prices necessary to prevent abuses of market power, and
(b) Transmission, distribution and system operation, in respect of which licenses are required under this Act.

Consequentially, in accordance with the powers vested in the NERC by section 76(1) and section 76(2),[234] the Multi-Year Tariff Order (MYTO) was introduced in 2008 by the NERC.[235] The MYTO is a fifteen-year tariff path for the electricity industry.[236] A subsequent amendment was made to the MYTO in 2012. The main reason for the introduction of this pricing model was to ensure satisfactory end-user tariffs without compromising adequate return on investment so as to attract viable investors into the Nigerian Electricity Supply Industry.[237] The Act also mandates the NERC to take certain factors into consideration when determining tariff methodologies and differentiating among consumers of electricity. Some of the factors in question are: the entire amount of electricity consumed, the time of such consumption, load factors, power factors, the level of voltage and the location of the consumer.[238]

The tariff methodology has been controversial in the Nigerian power sector, leading to disputes. Examples of such disputes are to be found in the notable cases of *Funke Adekoya, SAN v VGC Management and Maintenance Co Limited and Eko Electricity Distribution Company*,[239] where the petitioner filed a petition to determine the correctness of the arrangements for power supply in the Victoria Garden City (VGC) Estate, which operated without a proper license from the NERC and charged an amount exceeding the officially accepted tariff. The NERC ruled that such electricity supply arrangement was contrary to the provisions of *EPSRA*, that tariffs payable by residents in the estate could not be

[234] *Ibid.*

[235] NB Anosike, "Analysis of Nigeria Electricity Generation Multi Year Tariff Order Pricing Model" (2017) 9 Model Energy and Power Engineering, 541, online: <https://doi.org/10.4236/epe.2017.910038>;

[236] *Ibid.*

[237] *Ibid.*

[238] *Supra* note 26, s 76 (5).

[239] *Funke Adekoya, SAN v VGC Management and Maintenance Co. Limited*, Order No. NERC/H/061.

increased unilaterally by the distribution company, and that all excess funds already charged should be returned to the affected residents. The writer is in agreement with the decisions reached because it confirms the superiority of the NERC in determining the price of electricity. It also ensures the universality of prices and distribution agreements entered into by distribution companies. As well, it reaffirms the principle of consumer protection and fairness entrenched in the *EPSRA* — this forms part of the functions of the NERC.

In *Petadis Enterprise v HFP Properties Limited* [240] a petition was brought on behalf of the residents of the Ikota shopping complex in Lagos, Nigeria, because of illegal power supply arrangements by a delegate (HFP Properties Limited) of the local distribution company (Eko Electricity Distribution Company (EEDC)) in charge of the area. The NERC declared that the EEDC contravened the terms and conditions of their license as they were prohibited from transferring the rights entrenched in their license without the consent of the NERC; it also ordered that the EEDC comply with the prescribed billing formats. The writer is in agreement with the decision reached by the NERC in this case as well, because it serves as a precedent to ensure that delegates not duly recognised by the NERC through a proper consent process may not represent distribution companies — this also prevents inflation of prices.

Finally, as will be discussed in further detail in the next chapter, the Federal Government of Nigeria introduced the 'Feed-in-Tariffs' (FIT) in order to guarantee price stability for electricity generated from non-emitting sources such as renewable sources (solar, wind, biomass, geothermal, wave and tidal energy) in order to ensure adequate return on investments for investors in renewable electricity generation infrastructure.[241]

2.3.1.3 Renewable Energy Policy 2006

Following the enactment of the *EPSRA*, in 2005, the Federal Government of Nigeria, developed a new policy known as the *Renewable Energy Policy* of 2006 which gave rise

[240] *Petadis Enterprise v HFP Properties Limited*, Case No NERC/ 10/0011/08.

[241] By virtue of the power vested in the NERC in section 32(1) and 96 of the *EPSRA*, the Commission made the Regulations on Feed-in Tariff for Renewable Energy Sourced Electricity in Nigeria in 2015.

to *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 guideline set certain objectives for the NERC: to develop simpler licensing techniques for investments in renewable energy, to develop a framework for power purchase agreements that ensures access to grid-based renewable electricity; to lower the licensing charges; to develop and maintain the equipment and installations of renewable electricity; to ensure the proper conduct of the requisite environmental impact assessment before the award of a license; and to update the President and the National Assembly on the status of the renewable sector of the electricity industry through a quarterly report.[242] The policy guidelines further provide for the development of the Rural Electrification Agency (REA) and the Renewable Electricity Trust Fund (RETF) with the sole aim of financing renewable electricity.[243]

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

This policy is a very detailed guideline, strategically designed with the aim of tackling the barriers that have put the renewable energy sector at a disadvantage when compared to the other forms of energy.[244] The policy acknowledged the multi-faceted nature of energy and therefore developed implementation strategies geared towards addressing the diverse issues inherent in the energy sector, such as –

> renewable energy supply and utilization, renewable energy pricing and financing; legislation, regulation and standards; energy efficiency and conservation; renewable energy project implementation issues; research and development; capacity building and training; gender and environmental issues; planning and policy implementation.[245]

One of the key initiatives provided for by the policy is the issue of energy efficiency, which to a large extent is geared towards promoting energy conservation and ensuring the

[242] *Renewable Energy Policy Guidelines*, 2006 Para 7.3.

[243] Aigbovo, *supra* note 100 at 25.

[244] *National Renewable Energy and Energy Efficiency* Policy 2015 (NREEP), Para 1.4.

[245] *Ibid*, para 1.1.

reduction of the waste that is occasioned in the consumption of fossil-fuel generated electricity in Nigeria.[246] The policy develops key strategies for the development of other sources of energy such as hydropower,[247] biomass,[248] solar,[249] wind,[250] geothermal,[251] wave and tidal energy.[252] It recognizes that up to 70 percent of persons living in the rural areas are estimated not to have access to electricity. These include —

> the far north east and the far north west, up to the border with Niger Republic and Cameroun, the coastal areas of the Niger Delta, the high lands of the south west, up to the border with the Republic of Benin, the mountainous regions of the south-east, up to the borders of Cameroun[253]

and that this has affected economic growth in Nigeria.

2.4 Other Players in the Nigerian Electricity Supply Industry

2.4.1 The Ministry of Power and Steel

The Ministry of Power and Steel (MPS) is generally mandated with the responsibility of directing policies in the Nigerian Power Sector. The Ministry issues relevant directions to the NERC relating to the systematic planning and organization of the Nigerian Electricity Supply Industry (NESI). However, the directions given by the Ministry are required to be followed in tandem with existing laws that apply to the industry such as the *EPSRA*[254] and the *Constitution of the Federal Republic of Nigeria*.[255] Other ancillary functions given to the Ministry include establishing measures geared towards promoting a more competitive

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[246] *Ibid.*

[247] *Ibid*, para 2.1.

[248] *Ibid*, para 2.2.

[249] *Ibid*, para 2.3.

[250] *Ibid*, para 2.4.

[251] *Ibid*, para 2.5.

[252] *Ibid*, para 2.6.

[253] *Ibid*, para 2.6.2.

[254] *Supra* note 26.

[255] *Constitution of the Federal Republic of Nigeria 1999*, as amended.

electricity market in Nigeria,[256] developing a framework for the Rural Electrification Agency,[257]and providing recommendations to the President relating to the rules of the electricity market as developed by the system operators.[258]

2.4.2 National Council on Privatization

The role of the NCP in the reformation of the Nigerian Electricity Supply Industry cannot be overlooked. The NCP is responsible for the privatization and commercialization of public enterprises in Nigeria.[259] It also played an important role in the transfer of NEPA's assets and liabilities to the Initial holding Company.[260] In practice, the function of the NCP is exercised through the Bureau of Public Enterprises (BPE). These two entities focus on taking all necessary steps to prepare public enterprises that have been scheduled for privatization. In relation to the Nigerian Electricity Supply Industry, the *EPSRA* empowers the NCP through its relevant sections to establish the PHCN as an initial holding company and to devise measures for the transfer of assets, liabilities, functions, and staff, and also to develop successor companies to which the PHCN's assets and liabilities could be transferred afterwards.[261]

2.5 Summary and Conclusions

In conclusion, this chapter has traced the history of the electricity industry of Nigeria, from the colonial regime to the current liberalized regime that paves the way for increased private sector participation and a more robust competitive market structure.

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[256]*Supra* note 26, s24.

[257]*Ibid*, s88.

[258]*Ibid*, s26 (2).

[259] This function is exemplified in *supra note* 26, section 1 which states that "The National Council on Privatisation shall, not later than six months after the coming into force of this section of this Act, take such steps as are necessary under the Companies and Allied Matters Act to incorporate a company, limited by shares, which shall be the Initial holding company for the assets and liabilities of the authority".

[260] *Supra note* 26, section 3 (1). *Public Enterprises (Privatization and Commercialization)* Act, Cap. P13, Laws of the Federation of Nigeria, 2004.

[261] For the general functions of the NCP and BPE see *Public Enterprises (Privatization and Commercialization)* Act, Cap P13, Laws of the Federation of Nigeria, 2004.

Issues in the Nigerian economy relating to its energy (electricity) sector have also been highlighted, comprising of its large population, its main means of subsistence (its oil and gas sector), the imminent environmental and economic dangers of the continuous overdependence by the Nigerian economy on the production of fossil fuels, and the need for a more sustainable approach to liberate the Nigerian Electricity Supply Industry (NESI). The contributions of the various laws, policies, action plans and institutions to the development and regulation of the Nigerian power sector have further been discussed. More so, the reforms introduced by the *EPSRA,* such as the structural licensing reforms, the establishment of the NERC, the establishment of the Rural Electrification Agency (REA) and Rural Electrification Fund (REF) have been discussed.

After an analysis of the laws and institutions enacted and established respectively for the governance of the electricity industry, and a study of the various action plans and policies created, it is apparent that despite the recent increase in the generation of electricity,[262] the targets as set from time to time have never been realistically met. From this it is clear that more emphasis should be placed on institutional reforms through the development of checks and balances to ensure that deliberate implementation strategies are adopted. This must be done in line with the ongoing trend in electricity governance towards substituting fossil fuel generation with sustainable and greener sources of energy. For this reason, the next chapter will contemplate renewable energy generation from closer up.

[262] *Supra* note 35.

Chapter Three

3 Renewable Energy Generation

3.1 Introduction

3.1.1 Key Concepts

Electricity Supply Industry (ESI): This refers to the power sector of any economy which consists of regulatory and institutional frameworks that govern the generation, transmission, distribution and sale of electricity.

Electricity Generation: Electricity generation is the first stage of the electricity production that involves obtaining electricity from primary sources of energy such as fossil fuels (oil, gas and coal) biomass, nuclear power or other renewable energy sources such as: solar, wind, , geothermal, wave and tides. There is usually an installed capacity for generation in any plant and this is measured by gigawatt hours.[263]

Electricity Transmission: Electricity transmission is the second process in the electricity supply system that entails the use of devices like transformers to deliver electricity generated through power lines over long distances to the grid system in order to serve the areas that need it.[264]

Electricity Distribution: Electricity distribution is the third process in the electricity supply system which involves delivering electric power from the transmission system to the end users.[265]

[263] Definition of "electricity generation", online: <httpa://data.oecd.org>.

[264] Definition of "electricity transmission", online: <https://data.oecd.org>.

[265] Definition of "electricity distribution", online: <https://data.oecd.org>.

Off taker: The *Nigerian Electricity Regulatory Commission Regulations on Feed-in Tariff for Renewable Energy Sourced Electricity in Nigeria*[266] defines an off taker as "the buyer of electrical energy for the purpose of selling the electricity to customers connected to the national grid or off-grid (mini-grid) systems."[267]

3.1.2 Overview

The increased clamour for renewable energy in the 21st century is a direct response to the problems of the century. Some of these problems include the exhaustible nature of crude oil;[268] global warming resulting from the burning of fossil fuels for energy production, and the detrimental effects of climate change.[269] Prior to the rise in advocacy for the injection of renewable energy into the power sector, energy sources were selected based on convenience, availability and the urgent need for energy.[270] Yet, the energy choices of the past –such as coal, crude oil and gas– have resulted in the need for energy sector advancement through the exploration of cleaner energy options.[271]

As a world trend, the first form of energy was fire: for thousands of years, humans generated energy through the use of burning wood.[272] This was linked to the abundance of forest reserves from which the timber was derived.[273] With the rise of the human population on earth and the need to provide shelter for them, the price of wood became inflated and the energy sector transitioned from wood to coal as a source of energy.[274] Although the

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[266] *Regulations on Feed –In Tariff for Renewable Energy Sourced Electricity in Nigeria* made pursuant to the power conferred on the NERC by ss 32(1) and 96 of the *Electric Power Sector Reform Act* of 2005.

[267] *Ibid*, c 1 s 2.

[268] Bruce Usher, *Renewable Energy* (Columbia: Columbia University Press, 2019) at 7-9.

[269] EI Efurumibe et al, "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.

[270] *Ibid.*

[271] Usher, *supra* note 268 at 10-53.

[272] Gian Andrea Pagnoni & Stephen Roche, *The Renaissance of Renewable Energy* (Cambridge: Cambridge University Press, 2015) at 26

[273] *Ibid*.

[274] U Aswathanarayana, T Harikrishnan & KM Thayyib Sahini, *Green Energy Technology, Economics and Policy* (CRC Press Taylor & Francis Group, 2010) at 7-10.

burning of wood emits roughly twice as much carbon into the atmosphere as coal does,[275] two points need to be borne in mind about this initial phase: the wood was harvested from naturally sustainable forests,[276] and the numbers of the polluting humans were still rather limited.

The use of coal gave rise to new problems because it is a GHG emitting source of energy and it negatively affects the environment. Other conventional, GHG emitting, sources of energy such as crude oil and natural gas also formed part of the energy mix in this era.[277] However, as time progressed, the effects of pollution could no longer be negated. In the 21st century, a transitioning phase was launched to alternative energy sources with a lesser environmental impact.[278]

The key considerations before assenting to any energy sector transition are usually the issues of the cost, consequences, and the sustainability of the technologies to be utilized in the process.[279] Due to the abundant and cheap nature of the conventional form of energy in use, the case for transitioning into renewable energy is normally weak in economic terms.[280]

Sociological responses to energy transition are largely dependent on the perceptions of the groups of persons involved. For instance, to the environmentalist any strategy to save the earth and prevent the threats that climate change poses for the world is worthwhile.[281] The economist, on the other hand, seeks to first consider the cost implications of new

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[275] PFPI, "Carbon Emissions from Burning Biomass for Energy", online: <https://www.pfpi.net/wp-content/uploads/2011/04/PFPI-biomass-carbon-accounting-overview_April.pdf>.

[276] Meaning that it is an environmentally friendly source of generation, since the wood does not emit long-hidden greenhouse gases (GHGs).

[277] Aswathanarayana, Harikrishnan & Thayyib Sahini, *supra* note 274, at 11-63.

[278] Usher, *supra* note 268. Note that nuclear energy is not delved into because Nigeria does not have nuclear capacity, and the ultimate objective of this thesis is to propose workable solutions for the Nigerian legislative and practical context.

[279] Anthony Patt, *Transforming Energy: Solving Climate Change with Technology Policy* (Cambridge: Cambridge University Press, 2015) at 151.

[280] Usher, *supra* note 268.

[281] *Ibid.*

technologies necessary for any energy sector transitioning despite the presence of clear environmental implications.[282]

Despite purely economic arguments to the contrary, there is an urgent need for shaping and restructuring the Nigerian legal framework, policies and institutions to embrace the energy sector changes, because the technologies used to produce renewable electricity are low in emissions when compared to the fossil-fuel based electricity.[283]

Therefore, this chapter will give a general overview of renewable electricity with specific focus on the sources of renewable energy that have the greatest potential for use in Nigeria. The benefits and challenges of using these sources will be highlighted. This chapter will also consider whether the law governing the Nigerian electricity sector allows for small-scale renewable electricity generation, as well as the viability of small-scale renewable electricity generators connecting to the grid and transmitting electricity. The factors that militate against the promotion of small-scale renewable electricity in Nigeria will further be discussed. To effectively achieve the above objectives, this chapter will be divided into two main sections. The first section will deal essentially with the potential for renewable energy in Nigeria, while the second section will examine the existing laws and policies so as to determine the viability of small-scale renewable electricity in Nigeria.

3.2 Contextualizing the Research Problem: Renewable Energy Generation

3.2.1 The Potential for Renewable Energy in Nigeria

Renewable energy, as defined by the *Nigerian Renewable Energy and Energy Efficiency Policy* (NREEP),[284] is:

> 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

[282] *Ibid.*

[283] National Academy of Sciences, National Academy of Engineering& National Research Council of the National Academies, *Electricity from Renewable Resources Status Prospects and Impediments*, (National Academies Press, 2010) at 8-9.

[284] *National Renewable Energy and Energy Efficiency Policy*, 2015 Para 1.3. As pointed out in Chapter 1, nuclear energy does not come into the equation.

> 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.[285]

As detailed in the Background to the Study of this thesis,[286] Nigeria has an insufficient supply of electricity to serve all of its residents. The country has both conventional[287] and renewable sources of energy. To a large extent, these could reasonably be co-explored to satisfy the needs of both the urban and rural areas of the country or, at the very least, to increase the electrification level of the country in order to boost the nation's economy.[288] Some of the conventional sources of energy that Nigeria possesses include crude oil, natural gas, tar sands, and coal.[289] Presently, crude oil is the major source of energy for the nation. However, research shows that Nigeria is also rich in renewable sources of energy such as wind, solar, hydro, biomass, geo thermal, wave, and tidal energy.[290] Renewable energy is an inescapable choice for the Nigerian energy sector as a result of three primary factors: the global climate change problem; the unstable price of crude oil in association with its negative effects on the environment; and the social crisis that the host communities of oil and gas projects experience as a result of the negative impacts that oil and gas exploration brings to their regions.[291]

Although Nigeria shows potential for multiple types of renewable energy sources, the focus here will be on renewable energy sources that show the highest potential, namely solar, wind, and hydro. This selection results from Nigeria's geographical location: the Northern

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[285] *Ibid.*

[286] 1.1.1 above ("Background to the Study").

[287] Conventional energy sources are sources of energy such as natural gas, oil and coal that have limited capacity, online: <https://wwwsciencedirect.com>.

[288] Obafemi et al, *supra* note 61.

[289] *Ibid*.

[290] *Ibid*; *NREEEP, supra* note 146, Para 2.1 -2.6.

[291] Obafemi et al, *supra* note 61; A. A Idowu et al, "Impact of Climate Change in Nigeria" (2011) 2:2 Iranica Journal of Energy and Environment 145 at 146-148.

part of the country[292] has abundant sunlight, which could effectively be utilized as a source of electricity to power the Northern part of the country, while the Southern part of the country has a plenitude of water because of the presence of rivers, dams and heavy rainfall.[293] That creates an obvious potential for hydro. Both the North and South of Nigeria furthermore show potential for wind generation.

These three sources of renewable energy will now be discussed in further detail.

3.2.1.1 Solar

Solar energy is energy derived from sunlight. It is generally used for a number of activities such as drying crops for food purposes, drying cloths, solar cookers, solar chick brooders, and solar manure dryers, and providing hot water for domestic use. Commercially, it is used as a veritable source of energy to power companies and industries. Interestingly, even plants depend on it for photosynthesis.[294] Research further shows that solar energy could be an effective renewable energy source used to power smaller grids in order to cater for areas that are not presently connected to the national grid. One way of achieving this is to use "photovoltaic equipment and heating water to drive turbines in thermal electric generators."[295]

Photovoltaic (PV) equipment can be categorized into two types: grid connected systems and stand-alone systems. As the name implies, grid connected systems are usually interconnected with the national grid; they are "composed of PV arrays connected to the grid through a power conditioning unit and are designed to operate in parallel with the electric utility grid";[296] stand-alone PV systems, on the other hand, are not dependent on

[292] The northern part of Nigeria comprises the following states: Adamawa, Bauchi, Benue, Borno, Gombe, Jigawa, Kaduna, Kano, Katsina, Kebbi, Kwara, Nassarawa, Niger, Plateau, Sokoto, Taraba, Yobe, and Zamfara.

[293] The southern part of Nigeria comprises of Abia, Anambra, Akwa Ibom, Bayelsa, Cross River, Delta, Ebonyi, Edo, Enugu, Ekiti, Imo, Lagos, Ogun, Ondo, Osun, Oyo, and Rivers states.

[294] Matthew P Johnson, "Photosynthesis" (2016) 60 Essays in Biochemistry, 255 at 264.

[295] Tunde Olaoye et al, "Energy Crisis in Nigeria: Need for Renewable Energy Mix", (2016) 4:1 American Journal of Electrical and Electronics Engineering 1 <https:www.doi10.12691/ajeee-4-1-1> cited in Agbaitoro, *supra* n 1 at 3 n 11.

[296] Grid Connected Photovoltaic Systems, online:<https://www.sciencedirect.com>.

the electric grid to function. Rather, they are built to function independently and autonomously and are programmed to provide electricity to designated areas. They operate directly in the presence of sunlight and may or may not have batteries for energy storage purposes.[297]

Furthermore, Nigeria has copious amounts of sunlight with the capacity to generate an average of at least 5,535 kWh per day,[298] especially in the Northern part of the country.[299] Solar energy is considered the most promising form of renewable energy because of its radiant rate, which is roughly 3.8*1,023 kW per area.[300] The effectiveness of any solar structure is largely dependent on the magnitude of the available sunlight. Yet there have been limited attempts to harness this source of renewable energy.[301]

The challenges facing the implementation of solar energy as an alternative to the conventional fossil fuel generation systems in Nigeria include poor analysis of local consumption needs, a lack of defined strategies to attract investment to the sector, inadequate security measures, and technical and maintenance problems.[302] The first step to resolving this problem lies in realizing that it would be cheaper to provide power for Nigerians by using solar mini-grids than through the current practice of using fossil fuel generators.[303]

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[297] *Ibid.*

[298] *Ibid.*

[299] *Ibid.*

[300] O Ohanakin, M.S Daramola, O.M Oyewola, & R. O Fagbenle, "Solar Radiation Variability in Nigeria based on Multiyear RegCM3 Simulations" (2015) 74 Renewable Energy, 195, cited in O Kehinde, "Renewable Energy in Nigeria- A Review" (2018) 9:10 International Journal of Mechanical Engineering and Technology, 1085 at 1089, n 24.

[301] Olusola Bamisile, Mustafa Dagbsi, Akinola Babatunde & Oluwaseun Ayodele, "A Review of Renewable Energy Potential in Nigeria: Solar Power Development over the Years", (2017) 44:4 Engineering and Applied Science Research, 242, online:<https://www.researchgate.net/publication/321384759>.

[302] *Ibid.*

[303] Amy Yee, "Solar Mini-Grids Give Nigeria a Power Boost", online: <https://www.nytimes.com>.

Some of the more prominent solar projects that have been carried out in Nigeria are street lighting in several States, the electrification of Iheakpu- Awka village in Enugu State, and the electrification of the Kwalkwalawa village in Sokoto State.[304]

Nigeria aims to have solar mini grids for providing electricity to more than 100,000 people by the year 2020, and an installed electricity capacity of 30,000 MW by the year 2030, one-third of that estimation being derived from solar and hydropower energy sources.[305] To the writer these objectives set very ambitious targets that are not in tandem with the realities of the current electricity sector. A lot of strategies laid out in the *NREEEP* to boost solar are yet to be implemented and legal and other institutional strategies still need to be devised so as to ensure that these targets are met.

3.2.1.1.1 Advantages of Solar Energy

Solar energy has some advantages over other sources of energy which include: interminable availability, non-emitting Nature, job creation and economically beneficial, easy maintenance requirements.

3.2.1.1.1.1 Interminable Availability

Solar is a naturally derived source of energy. Therefore, so long as nature exists and there is sun, its availability is assured. Unlike some other alternative sources of energy that are seasonal in nature, sunshine is not seasonal in Nigeria and could be a properly harnessed form of energy.[306]

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[304] CA Awogbemi &O Komolafe "Potential for Sustainable Renewable Energy Development in Nigeria" (2011) 12:1 Pacific Journal of Science and Technology 161; D Abdullahi, S Suresh, S Renukappa & D Oloke, "Solar Energy Development and Implementation in Nigeria: Drivers and Barriers" IEA SHC International Conference on Solar Heating and Cooling for Buildings and Industry 1 at 3. Other solar projects in Nigeria include: Anjeed Kafanchan Solar ltd in Kaduna with 50 MW capacity, PV generator system in Osun state with 50 MW capacity, the Ever power solar power plant in Kaduna with 50 MW capacity, the solar farms project.

[305] *Ibid.*

[306] "Pros and Cons of Solar Energy, What Are the Advantages and Disadvantages of Solar Energy?" online:<https://www.greenmatch.co.uk/blog/2014/08/5-adavantages-and-5-disadvantages-of-solar-energy>.

3.2.1.1.1.2 Non-Emitting Nature, Job Creation and Economically Beneficial

Solar power is a non-emitting source of energy. It does not release environmentally harmful greenhouse gases or carbon.[307] It is a very clean and green source of power. It creates green jobs, thereby boosting the green economy.[308] 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.[309]

3.2.1.1.1.3 Easy Maintenance Requirements

Solar panels are usually associated with low maintenance costs. Usually all that is required is the proper cleaning of the panels. The inverters may need to be changed after a limited period of time, but the cost of refurbishing the solar system is usually minimal.

3.2.1.1.2 Disadvantages of Solar Energy

Although solar is one of the major sources of renewable energy, it is still fraught with drawbacks which would enable consumers to make informed decisions on how sustainable the source of renewable energy is. These disadvantages include: high initial capital and climatic variations

3.2.1.1.2.1 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.[310] This informs the negative attitude of countries with strong fossil fuel background towards exploring renewable energy as an alternative source.[311] However, once the equipment has been successfully installed and the energy sources are properly harnessed, it becomes a very cost effective

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[307] "Solar Power Advantages and Disadvantages", online: –<https://www.sepco-solarlighting.com>.

[308] *Ibid.*

[309] *Ibid.*

[310] Zoya Aslam, "Pros and Cons of Solar Power", online: <https://siemenssolar.com/solar-panels.html>.

[311] *Ibid.*

model. Hence, venturing into 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".[312] 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.

3.2.1.1.2.2 Climatic Variations

The amount of energy to be derived from solar is largely dependent on the atmospheric conditions of each day.[313] 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 same as that on sunny days. This has led to the addition of batteries to store solar energy for readiness purposes.

3.2.1.1.2.3 Problems Associated with the Battery Storage

Despite the fact that solar is interminably 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[314] and batteries could be very complicated and costly.[315]

3.2.1.1.2.4 Eventual Recycling Issues

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.

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[312] *Ibid.*

[313] James Bradley, "Pros and Cons of Solar Energy", online:<https://www.clean-energy-ideas.com/solar/solar-energy/pros and cons-of-solar-energy>.

[314] "Grid Tied, Off-grid and Hybrid Solar Systems-Energy Informative", online: <https://energyinformative.orggrid-tied>.

[315] *Ibid.*

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.[316] 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.[317]

3.2.1.2 Wind

Wind is another source of renewable energy from which electricity can be derived.[318] Wind power is derived by using a wind turbine and other elements to transform kinetic energy of mobbing air into electricity or other forms of energy as required.[319] 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. 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 plateau and Sokoto.

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

[316] "What is the Lifespan of a Solar Panel", online: - <https://www.engineering.com>.

[317] "Solar Panel Waste: Solar Energy not so Green After All", online:-< https://naturalgasnow.org>.

[318] Ogbonnaya I Okoro, E.Chikuni& P Govender, "Prospects of Wind Energy in Nigeria" (2007), online: <https://www.researchgate.net/publication/228827644>.

[319] Henrik Lund, *Renewable Energy System: A Smart Energy Systems Approach to the Choice and Modeling of 100% Renewable Solutions* (Academic Press Elsevier Inc 2014, 2 ed) at 3-9; 12-14.

positive that it will provide the surrounding areas with adequate light without the need to depend on the national grid.[320]

3.2.1.2.1 Two forms of wind power

There are two forms of wind power which include: offshore wind power and onshore wind power. Offshore wind power is usually constructed in water bodies like the oceans. It is a more attractive form of wind energy because it has lesser topographical interactions and constraints, higher wind speed and more reliability. However, it also has disadvantages due to high initial construction costs and impacts on sea life.[321] On the other hand, onshore wind power refers to wind turbines that are situated on land. They are relatively inexpensive when compared to offshore wind turbines and other forms of green energy such as solar farms and nuclear power reactors, and they foster local economies. Their disadvantages lie in limited efficiency and unpredictability resulting from optimizing the turbines to function at a specific speed, noise pollution, the danger it poses to birds and bats, and their ineffectiveness where obstructions are caused by buildings and hills situated on the land surface.[322]

3.2.1.3 Hydropower

Nigeria's current electricity supply mix shows that hydropower accounts for about 19 percent of the entire electricity grid.[323] Statistics as provided by the International Hydropower Association also shows that as of 2017, the total installed hydropower capacity was 2,062 MW and the actual hydropower generated for the year amounted to 7,310 GWh.[324] Nigeria has large rivers and natural waterfalls. Prominent among these are

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[320] NA Idris et al, "Nigeria's Wind Energy Potentials: the Path to a Diversified Electricity Generation- Mix" (2012) 2:4, International Journal of Modern Engineering Research (IJMER) 2434, online: <https://www.ijmer.com>.

[321] David Elliot, *Renewables: A Review of Sustainable Energy Supply Options* (IOP Publishing Ltd 2013) at 2-1-2-5.

[322] "Offshore and Onshore Wind Farms", online: <https://www.azocleantech.com>.

[323] "Africa: Nigeria-The World Fact Book", *Central; Intelligence Agency- CIA supra* note 7 .

[324] "Nigeria/ International Hydropower Association", online: <https://www.hydropower.org/country-profiles/nigeria>.

the famous Niger and Benue rivers and also the Lake Chad basin, with a good amount of water resources being available in them.[325] 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.[326] 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,[327] 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.[328] 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 power 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.

3.2.2 Other Sources of Renewable Energy that has Potential in Nigeria

3.2.2.1 Biomass

Biomass energy sources include agricultural crops, charcoal, shrubs and grasses, wood, dead leaves, nut shells, coconut husks, corn cobs, wood chips, straw, poultry litter, sugarcane bagasse, rice husks, residues and wastes (industrial, municipal and agricultural)

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[325] *Ibid.*

[326] *Ibid.*

[327] "SEforALL", online:<https://wwwseforall.org>.

[328] In order to boost the level of supply of electricity in Nigeria to equate it with its demand, the Transmission System Provider of Nigeria (TSP) was handed over to Manitoba Hydro International of Canada under a 3-5 year management agreement. Another significant investment in the Hydropower potential of Nigeria is the USD 100 million, invested by the African Development Bank for investment, maintenance and repair of all structures necessarily incidental for the improvement of the sector. The rehabilitation of the Kainji and Jebba projects with an installed capacity of 760 MW and 578 MW each can be attributed to this investment. Other forms of partnerships have also been formed, to the performance of the existing hydropower plants and to construct more; examples of these partnerships are the partnership between the Ministry of Power and the Ministry of Water Resources and the preparations being made by the Minister of Power, Works and Housing of Nigeria to construct the Mambilla plant through the consortium with China.

and the aquatic ecosystem.[329] In Nigeria the average waste generated is estimated at 0.43 kg/head per day and the majority of this derives from organic waste.[330] 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.[331] 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)[332] by developing technology[333] 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 % 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.[334]

3.2.2.2 Geothermal

This 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.

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[329] B.A Edirin & A.O Nosa, "A Comprehensive Review of Biomass Resources and Biofuel Production Potential in Nigeria", (2012) 1:3 Research Journal in Engineering and Applied Sciences, 149, Emerging Academy Resources <https://www.emerging source.org>.

[330] MKC Sridhar & GO Adeoye, "Organo-Mineral Fertilizers from Urban Wastes: Developments in Nigeria" (1996) 68 The Nigerian Field 91; TC Ogwuleka, "Municipal Solid Waste Characteristics and Management in Nigeria" (2009) 6:3 Iran J Environ Health Sci & Eng 173, cited in MKC Sridhar & TB Hammed, "Turning Waste to Wealth in Nigeria: An Overview" (2014) 46:2 J HumEcol 195.

[331] Mohammed K Khallaf, "Air Pollution in the Niger Delta Area: Scope, Challenges and Remedies" in *The Impact of Air Pollution on Health, Economy Environment and Agricultural Sources,* online:<https://www.intechopen.com>.

[332] a United States-based company in collaboration with the Bio-energy and Envirocycles Nigeria Ltd.

[333] The technology is known as power pallets and is described as "medium sized generating sets and are available in 10KW/25KVA and 20KW/38 KVA sizes this description is found in .<http://www.allpowerlabs.com>.

[334] Adelana Olajide, "One Man's Trash: Could Garbage Solve Nigeria's Energy Crisis?", online:<https: www//the discourse.ca/energy/garbage-solve-Nigeria's-energy-crisis>.

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".[335] 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;[336] the Ikogosi warm spring in Ekiti State located in the South Western part of Nigeria;[337] 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,[338] 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.[339]

3.2.2.4 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.[340] Surface waves are produced by the wind that blows across the surface of

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[335] GM Ngala, MB Oumarpu & FA Oluwole, "Review of Geothermal Energy Technology and its Potential for Power Generation in Borno Basin, Nigeria" (2015) 14 Annals of Borno, 91 at 95-96.

[336] N K Grant, D C Rex D&S J Freeth, "Potassium- Argon Ages and Strontium Isotope Ratio Measurements from Volcanic Rocks in Northern Nigeria" 35 Contr. Mineral and Petrol, 277 and 292; Turner D.C Volcanoes of the Biu Basalt Plateau, Northeastern Nigeria 15:2 J Mining and Geology, 49-63 cited in Dorcas S et al "An Overview of Geothermal Energy Resources in Nigeria" (2016) 12:13 Environtropica 61-71 at 65-66 nn 7 and 16.

[337] EE Abraham &EE Nkitnam, "Review of Geothermal Energy Research in Nigeria: The Geo-science Front" (2017) 3:015 Int. J Earth Sci Geophys 1 at 7.

[338] L Rybach, "Geothermal Sustainability", Proceedings European Geothermal Congress, Unterhaching Germany, (2007) 5 cited in Dorcas S et al *supra* note 336 at 64 n 14.

[339] S Dorcas et al *supra* note 336 at 65-66 nn 7 and 16.

[340] RM Young, "Requirements for a Tidal Power Demonstration Scheme", (1995) Journal of Power & Energy 209 at 215, cited in Collins Nwaokocha and Abayomi Layeni, "Estimation of Tidal Power Potential of Nigeria Coastal Area" (2015) Journal of Power & Energy, 163 at 164.

the 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. 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 rages and velocity flows needed for energy production.[341] But there is hope that with favorable 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.[342] 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.

3.3 Small-Scale Renewable Electricity in Nigeria

In any nation economic advancement depends on electricity generation, transmission and distribution.[343] Small-scale renewable electricity refers to electricity generated, and owned by individuals, small businesses and communities. It is mostly of small or medium scale and has proved to be a viable strategy for meeting the energy needs of a nation.[344] Some of the benefits include a significant reduction in greenhouse gas emissions and the promotion of environmentally friendly sources of energy; improved economic stability through

[341] "What is Tidal Energy", online:<https://www.tcenergy-gh.com>.

[342] CN Nwaokocha & A T Layeni, "Ocean Wave Energy- an Option for Nigerian Power Situation" (2013) 8:25 Scientific Research & Essays Academic Journals, 1547, online: <https://www.academicjournals.org/SRE>.

[343] Mercy O Erhun & Daniel O Johnson, "A Legal Framework for Sustainable Electrical Energy Industry in Nigeria", 2018 8:2 Energy and Environment Research, 45 at 45.

[344] "The Case for Small- Scale and Community Owned Renewable Energy in Alberta", online: <http://www.peoplepowerplant.ca/community-energy-models/>.

energy security;[345] the creation of a level playing ground (fair and competitive market);[346] and the creation of a conducive environment for investments in the energy sector;[347] the establishment of a sense of economic belonging and fairness for rural communities; and the establishment of well-designed, smart, durable grids that decrease the losses that occur in the cause of transmission.[348] The principal provisions of the *EPSRA*, which governs the issues of licensing for renewable energy and the development of rural electrification, are sections 31, 32, 62, 64–70 and 88–92.

A combined analysis of the above sections reveals that the *EPSRA* established the Nigerian Electricity Regulatory Commission with the key objectives of ensuring proper regulation of the Nigerian electricity industry through appropriate licensing measures; fair pricing; an emphasis on consumer satisfaction and protection; the fostering of competition and private sector integration and contributions where possible. Therefore, to be engaged in any sector of the Nigerian electricity industry that involves the core activities of "electricity generation, excluding (captive generation),[349] electricity transmission, system operation, electricity distribution and electricity trading", [350] the required license must be obtained as provided for in section 62 of the *EPSRA*.

However, there is an exception to the general rule stated above as it relates to the generation and distribution of electricity. The Act provides that up to 1 MW of electricity may be generated and up to 100 kW may be distributed without a license.[351] Generally speaking, the holder of a generation license has the requisite authority to construct, own, operate and maintain an electricity generation company and also to sell power and perform other additional duties in accordance with the terms of the license and the provisions of the

[345] *Ibid.*

[346] *Ibid.*

[347] *Ibid.*

[348] *Ibid.*

[349] Sic

[350] *EPSRA*, s 62.

[351] *Ibid*, s 62(2) and the Commission reserves the right to extend this where they consider it to be in the interest of the public.

Act.[352] This form of license is given to a "Successor Generation Company" or an "Independent Power Producer" (IPP)[353] as described in section 8 of the *EPSRA*.[354]

The holder of a transmission license is permitted to construct an electricity grid and operate and maintain transmission systems according to the terms of his license and the provisions of the Act. Also, the system operation license enables the licensee to operate the electricity system through activities like—

> generation scheduling, commitment and dispatch, transmission scheduling and generation outage co-ordination; transmission congestion management; international transmission co-ordination; procurement and scheduling of ancillary services and system planning for term capacity; administration of the whole sale electricity market, including the activity of administration of settlement payments, in accordance with the market rules; and such other activities as may be required for reliable and efficient system operation.[355]

The electricity distribution license allows the licensee to erect, control and sustain an electricity distribution system, ensuring the adequate supply of electricity to customers, regulation of meter reading and billing and other additional services.[356] The trading license, on the other hand, gives the licensee the power to purchase and sell electricity in accordance with stipulated terms and conditions.[357]

The *EPSRA* also developed a tripartite approach to resolving the electricity problems in Nigeria. It encompasses the extension of the main grid, the advancement of remote and mini-grid systems in Nigeria, and the generation of electricity from renewable energy sources. This vital approach is to be implemented through the *Rural Electrification*

[352] *Ibid*, s 64.

[353] *Ibid*, ss 64 (3) a and b.

[354] *Ibid*, s 8.

[355] *Ibid*, s 66(1)

[356] *Ibid*, s 67.

[357] *Ibid*, s 68.

Strategy and Plan, under the supervision of the Rural Electrification Agency and the NERC.[358]

The possibility or otherwise of generation, connection, transmission and the off-take potential of small-scale renewable electricity generation in Nigeria will be discussed next.[359]

3.3.1 Generation

As a result of the reform of the Nigerian Power Sector through the *EPSRA*, a new Nigerian Electricity Supply Industry was created, with 23 grid-connected generation plants[360] of a total installed capacity of 12,522 MW and an available capacity of roughly 6,056 MW.[361] The majority of the electricity generation –representing about 81% of the total installed capacity (10,142 MW) with an available capacity of 5,026.48 MW– is derived from thermal energy.[362] Hydropower derives mainly from three plants, providing 1,938.4 MW of total installed capacity with an available capacity of 1,060 MW.[363] Under the electricity generation sub-sector of the Nigerian electricity industry, there are three major components that include: the six (6) Generation Companies (GenCos); the Independent Power Producers (IPPs) (that require licenses to function and are controlled and supervised by the private sector — they currently have three generating facilities); and the National Independent Power Projects (NIPPs), that are administered by the government and that currently have ten generation facilities.

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[358] *Ibid*, s 88(9).

[359] *Ibid*, s 64.

[360] Emodi Nnaemeka Vincent & Samson D Yusuf, "Integrating Renewable Energy and Smart Grid Technology into the Nigeria Electricity Grid System" (2014) 5 Smart Grid and Renewable Energy 220, online: <http://www.scirp.org/journal/sgre>.

[361] "IAEA Country Nuclear Power Profiles", online: <https://www.pub.iaea.org>.

[362] *Ibid.*

[363] *Ibid.*

Hence, pursuant to sections 32, 62 and 64 of the *EPSRA*, there are various categories of generation licenses, including the on-grid electricity generation license, the embedded generation license, and the off-grid electricity generation license.[364]

3.3.1.1 On-Grid Electricity Generation License

This form of license permits the licensee to enter into a long-standing power purchase contract with the Nigerian Bulk Electricity Trading Plc, which enables the holder to generate electricity and connect it into the national grid. The holder is also allowed to collaborate with the Transmission Company of Nigeria (TCN) through a connection agreement in order to connect, evacuate and wheel the power over the national grid.[365]

3.3.1.2 Embedded Generation Licence

Unlike the on-grid electricity generation license, this form of license does not require any connection agreement with TCN or the Nigerian Bulk Electricity Trading Plc (NBET).[366] The licensee is allowed to generate electricity and directly evacuate and connect same through the existing distribution facilities or independent distribution licensee. To achieve this, the holder is expected to enter into the relevant power purchase contract with an electricity distribution licensee (Disco).[367]

3.3.1.3 Off-Grid Electricity Generation License

This form of electricity generation licence allows its holder to generate electricity and offer it for sale to a single buyer. Thus, under this form of license, a licensee after the generation of electricity can only sell to the off-taker through the instrumentality of a power purchase agreement (PPA).[368]

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[364] "Generation of electricity", online:<http://www.nerc.org>.

[365] *Ibid.*

[366] *Ibid.*

[367] *Ibid.*

[368] *Ibid.*

3.3.2 Grid Connection

Presently, Nigeria has developed strategies and incentives both in the *NREEEP*[369] and in the *Regulations on Feed-In Tariff for Renewable Energy Sourced Electricity in Nigeria*,[370] to ensure that on-grid priority access is given to renewable energy sources of electricity. Paragraph 2.8 of the *NREEEP*[371]states that there is a guaranteed market for renewable energy and undertakes to ensure maximum return. It further states that as it relates to grid connection, "the net energy available for sale and connected to the grid, shall be determined after taking into account auxiliary loads, transformation efficiency, plant availability and other similar considerations and may be approved by the regulator (NERC)."

The Nigeria grid system is made up mostly of centralized generation stations. It generally has a one-way electricity flow and a lot of electricity is lost in the course of transmission and distribution of electricity. Customers have fewer choices because the generation facilities are mainly powered by thermal and hydropower sources. No mini-grid operator has so far managed to enter into a Power Purchase Agreement (PPA) with the national grid. This is because the only functional mini grids in Nigeria are isolated mini grids. Nigeria currently has about 14 such isolated renewable energy mini grids. The key player in the industry is the Green Village Electricity Projects (GVE).[372]

3.3.2.1 Existing Audited Commercial Mini grids in Nigeria

The chart below shows the existing commercial mini grids in Nigeria presently, their capacity, location and source of energy from which it is derived.

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[369] *NREEEP*, *supra* note 146.

[370] *Regulations on Feed in Tariff for Renewable Energy Sourced Electricity in Nigeria.*

[371] *NREEEP supra* note 146, para 2.8.

[372] GVE is a renewable energy company in Nigeria that was founded in 2012. It collaborates globally with partners to launch initiatives on powering Nigeria through the Off-Grid electricity solutions: "GVE Projects Ltd Energy Access Social Enterprise in Nigeria and West Africa", online:<https://vc4a.com/ventures>.

Energy developer	Community/Local Government Area and State	Capacity (KW)	Current Capacity Usage by Percentage	Energy Source Type
GVE Projects Ltd	Bisanti, Katcha, Niger State	100	20	Solar PV
GVE Projects Ltd	Egbeke, Etche, Rivers State	40	100	Solar PV
GVE Projects Ltd	Angwan Rina, Shendam, Plateau State	26	3	Solar PV
GVE Projects Ltd	Demshin, Shendam Plateau State.			Solar PV
Nayo Tropical Technology Ltd	Tungan Jika, Magama, Niger State	80	80	Solar PV
Havenhill Synergy Limited	Kigbe, Kwali FCT (Abuja)	16	2 (this project is not operating fully at the moment)	
Rubitec Solar Ltd	Gbamu Gbamu, Ijebu East, Ogun State	100	9	Solar PV Hybrid
ACOB Lighting Technology Ltd	Dokan Karji, Kauru, Kaduna State	34	70	Solar PV
ACOB Lighting Technology Ltd	Oghriagbene Delta State	16	-	Solar PV
ACOB Lighting Technology	Ihuama Rivers State	16	-	Solar PV

Anergy Solar Ltd	Obayantor, Ikpoba-Okha, Edo State	85	47	Solar PV
Anergy Solar Ltd	Osun, Idi-Ata/Onibami	24	-	Solar PV
GoSolar	Kurdula, Gudu Sokoto State	50	5	Solar PV Hybrid
CREDC	Unom Island, Biase, Cross River	20	40	

Source: Information on Private Mini-grids in Nigeria- Report by the World Bank Group[373]

Prior to 2016, there was no legal policy in place to specifically regulate off-grid electrification. However, with the enactment of the NERC *Mini Grid Regulations* in 2016, a legal structure was put in place. The *Regulations*[374] provide a platform for the electrification of sites in Nigeria that are off the grid, and develop measures to ensure that areas that are underserved will have access to reliable alternative sources of electricity. The *Regulations* encourage contributions by the private sector, members of the public, Non-Governmental Organizations (NGOs) and other participants. They extend the licensing provision of the EPSRA by requiring that registration is obligatory for isolated mini grids of up to 100 kW,[375] while a permit is necessary for "isolated mini grids larger than 100 kW of distributed power and up to 1 MW of generation capacity".[376]

3.3.3 Transmission

Under the transmission sub-sector of the Nigerian electricity supply industry, there is only one predominant company, namely the Transmission Company of Nigeria. This sub-sector

[373] "Mini Grids in Nigeria: A Case Study of a Promising Market- Energy Sector Management Assistance Program" (2017) *World Bank*, online:<https://www.openknowledge.worldbank.org/handle/10986/29016>; The Off-grid opportunity in Nigeria-ESMAP <https://www.esmap.org>.

[374] *NERC Mini Grid Regulation* of *2016.*

[375] *Ibid*, s 8.

[376] *Ibid*, ss 7 and 8.

consists of three branches, which are Transmission Service Provider (TSP), the System Operations (SO) and the Market Operations (MO)

3.3.3.1 Transmission Service Provider (TSP)

The TSP is in charge of the inter-connected transmission system of substations and power lines. Its major responsibility is to ensure that the transmission grid is expanded to cater for the areas that are off-grid and to ensure that the physical structure of the system is properly maintained.[377]

3.3.3.2 The System Operations (SO)[378]

This branch is responsible to ensure that the transmission system is operated in a safe and reliable manner, this department must also ensure that the grid system is well secured and ensure maximum safety.[379] It has seven sub-departments headed by the Executive Director, namely operations/control, transitional electricity market, system planning, Supervisory Control and Data Acquisition (SCADA), technical services, communications, and system performance.[380]

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[377] "Transmission", online:<https://www.nercng.org>.

[378] The mission of this department is "exercising grid control to maintain an efficient, coordinated and economic supply of electricity in accordance with the grid code and operational procedures." *Supra* note 377.

The vision of the department is "to operate the grid system efficiently to ensure open access, safe, reliable and economic electricity supply." *Supra* note 377.

The Operational hierarchy is as follows:

"National Control Centre (NCC) Osogbo; There (3) Regional Control Centres (RCCs) at Shiroro, Ikeja West and Benin. With proposed control centres at Kano, Alaoji and Gombe; eight (8) Regional Operations Coordinating Unites (ROCs at Benin, Enugu, Port-Harcourt, Bauchi, Kaduna, Shiroro, Osogbo and Lagos-Several Area Control Centres Covering 330kV and 132kV substations which fall under the supervision of the ROCs." *Supra* note 377.

[379] Nigerian Electricity System Operator <https://www.nsong.org>.

[380] *Ibid.*

3.3.3.3 The Market Operations (MO)

This branch bears the following responsibilities: administering and ensuring the enforcement of market rules and the grid code, ensuring efficiency in the market, market settlement system administration, payment and commercial arrangement administration, supervision of market participants and ensuring periodic reporting on how market rules are being implemented.

The current transmission system in Nigeria comprises 5523.8 km of 330 kV, 6801.49 km of 132 kV, 32 No 330/132 kV substations with total installed transformation capacity of 7,688 MVA, 105 No 132/33/11 kV substations with a total installed transformation capacity of 9130 MVA. The average available capacity is 330/132 kV on 7,364 MVA and 8,448 MVA on 132/33 kV.[381]

.3.4 Off-take potential

Chapter II of the *Regulations*[382] provides for the purchase obligations of the Off-taker. The chapter reveals that priority must be given to renewable energy sourced projects when decisions are made on electricity purchases.[383] But this must be subject to the specified capacity limits indicated in the *Regulations*.[384] The Off-taker is not mandated to purchase electricity that exceeds the limit specified in the *Regulations*; such arrangements are made through Power Purchase Agreements (PPAs).[385] The chapter also determines how costs for the project will be distributed. The developer is to bear the cost for project establishment, improvement of the transmissions and distribution lines, the electric transformer station and other ancillary expenses connected with the equipment.[386] The trivial connection costs

[381] Patrick O. Tolulope and O Sunny, "Smart Grid Technology and Its Possible Applications to the Nigeria 330 kV Power System", (2013) 4 Smart Grid and Renewable Energy at 391 cited in Vincent & Yusuf, *supra* note 360 at 223.

[382] *Ibid.*

[383] *Supra* note 85, chapter II ss 5 (a) and (b).

[384] *Ibid*, ss 5 (b) and (c).

[385] *Ibid*, s 5 (e).

[386] *Ibid*, s 5 (g).

that arise in the course of transmitting power to the grid are to be borne by the Renewable Energy Power Generators.[387] The interconnection cost may be funded by the Off-taker where the Commission considers that it is reasonable to do so, and this can be achieved through a written contract and is subject to recovery from the vendor through the Feed in Tariff (FIT) arrangements.[388] Other deep connection and supporting expenses could be borne by the Transmission System Provider or the Licensed Distributors, as applicable.[389]

3.5 Legal Strategies for Small-Scale Renewable Energy Sources in Nigeria

The *NREEEP* is the primary policy that develops an integrated guideline for the advancement of electricity sourced from small-scale renewable energy in Nigeria. The *NREEEP* states that part of Nigeria's vision for 2020 is to have 40,000 MW of installed electricity.[390] It also provides legal strategies for each of the renewable energy sources, as follows —

3.5.1 Legal Strategies for Hydro Power

These include regulating the use of water in the international rivers through multilateral contracts to curb excesses; boosting local involvement in the establishment of hydropower stations; ensuring the inclusion of small scale hydropower plants in the developmental plans of the rural electricity board; making a feasibility study of hydropower potentials in Nigeria and ensuring that these opportunities are properly highlighted and put on the internet to attract interested investors; and fostering development research on sustainable technologies for the advancement of hydropower in Nigeria and ensuring the safety of hydropower facilities.[391]

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[387] *Ibid*, s 5(h).

[388] *Ibid*, s 5 (i).

[389] *Ibid*, s 5 (j).

[390] *NREEE , supra* note 284 para 1.9.

[391] *Ibid*, para 2.1.

3.5.2 Legal Strategies for Solar Energy

The strategies include: boosting developmental research in the solar energy technologies; promoting the development of programs and incentives to boost the production of solar energy systems by indigenous entrepreneurs; development and implementation of a "web-based solar prospecting tool"[392] that boosts local level solar power conversion; training of qualified manpower; boosting the development of solar energy facilities in the off-grid areas through support like "micro credit facilities";[393] developing the pricing system and Feed in Tariffs to foster solar power projects and the public sensitization of the benefits of solar energy sourced electricity for homes.[394]

3.5.3 Legal Strategies for Wind Power

Here, the policy posits that small-scale wind generating, and storage devices shall continue to be developed. The strategies set to achieve this include: promoting developmental research to ensure the use of wind energy; developing experienced manpower to boost indigenous production of wind power structures; intensifying wind data, maps and web-based studies; providing inducement to indigenous wind developers and consumers especially off-grid; and developing guidelines to ensure that strategies are conducive for the public.[395]

3.5.4 Legal Strategies for Biomass

These comprise organizing educational programs and outreaches to provide sensitization on innovative biomass electricity technologies; fostering developmental research in biomass fuels and technology; providing motivation to indigenous entrepreneurs to boost the production of biomass technology; training and development of experienced manpower for the purpose of maintaining biomass energy systems constructions to be made;

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[392] *Ibid* para 2.3.

[393] *Ibid.*

[394] *Ibid,* .

[395] *Ibid,* para 2.4.

investigating and planting specific trees that are prone to regeneration; and the development of better technologies to boost the use of renewable energy sources.[396]

3.5.5 Legal Strategies for Geothermal, Wave and Tidal Energy

The policy states that such renewable energy sources are not currently in use in Nigeria. Therefore, there are no strategies in place to direct how these should be harnessed. However, developmental studies, programs, guidelines and data acquisition for future purposes are encouraged.[397]

3.6 Summary and Conclusions

This chapter has considered the various renewable energy sources such as solar energy, wind power, hydro power, biomass, geothermal, wave and tidal energy; it has analyzed the advantages and disadvantages of each of these options and made suggestions as to the three (solar, wind, and hydro) that are more viable than others, given the abundance of those specific options in Nigeria. This chapter has also answered the question of the viability of generation, grid connection, transmission and off-take potential of small-scale renewable electricity. Drawing inference from the critical review of the four primary pieces of legislation and policies that govern small-scale renewable electricity in Nigeria, namely the *EPSRA*, the *NREEEP*, the *NERC Regulation on Feed in Tariff for Renewable Sourced Electricity* and the *NERC Mini Grid Regulations*, dealt with above, the following conclusions can be reached:

First, Nigeria has huge potential for small-scale renewable electricity generation as identified by the surveys carried out by the Rural Electrification Agency in collaboration with the World Bank Group, but there are inhibiting factors that have hindered a significant growth of small-scale renewable electricity projects. The first problematic factor is the structure of the Nigerian grid. The Nigerian grid recently collapsed for the fourth time in

[396] *Ibid*, para 2.2.

[397] *Ibid*, para 2.5.

2019.[398] This collapse goes to show that although the laws and policies indicate the Nigerian market as a potential one for investors, the national grid is not ready for the development that is to be initiated by the development of other alternative renewable energy sources.

The second problematic factor is the legal structure that is in place for small-scale renewable electricity. *EPSRA* provides for a limited amount of electricity (1 MW) to be generated without the need for a license. Although there is need for regulation in the Nigerian electricity system, this bench mark has attracted serious criticism from scholars, who argue that it should be increased to promote rural electrification with minimal interference. Also, the framework set for the Renewable Energy Feed in Tariffs (REFIT) which excludes off-grid projects as contained in chapter II paragraph 6b[399] is not encouraging. Although paragraph 6(c) gives the NERC and the Rural Electrification Agency the power to develop the technical and operational modalities for off-grid projects, no procedure has been laid down for purposes of determining this tariff.

The third problematic factor is the emphasis that the laws and policies give to on-grid renewable energy sourced electricity. The laws recognize that off-grid is part of the solution but do not develop robust strategies to boost this effectively. In the writer's opinion, off-grid small-scale renewable electricity generation is no longer optional — it has become a necessity. Since the inception of electricity generation in Nigeria, all that the legal and institutional strategies in place have sought to achieve is to expand the grid and through that to increase access to electricity in the country. These efforts have not been entirely fruitful, hence the urgent need to resort to off-grid small-scale renewable electricity generation as an effective and viable solution.

Finally, the last problematic factor is the failure of the laws to provide a robust strategy for the maintenance of these renewable energy systems and for their disposal after their life cycle is up. Nigeria still has its foot at the door with renewable energy. According to

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[398] Timileyin Omilana "Nigeria: National Power Grid Collapses Again", online:<https://www.allafrica.com>.

[399] Chapter 2 para 6b of the *Regulations on Feed in Tariff for Renewable Energy Sourced Electricity in Nigeria.*

research, beside hydropower plants, no other source of renewable energy is presently contributing to the national grid. Therefore, the legal framework must be developed carefully to incorporate ways to deal with how these energy systems will be maintained and dealt with at the end of their life cycle.

Chapter 4

4 Comparative Analysis of the Ontarian, South Australian, and Nigerian Electricity Models

4.1 Introduction

Certain jurisdictions of the world are considered reference points and world leaders in the energy transition subject. Prominent amongst these jurisdictions are Canada and Australia; the focus of this chapter will be to examine the relevant laws, policies and action plans of the chosen regions in order to make structural legal and institutional recommendations for Nigeria. This chapter will focus squarely on the instrumental laws for safe energy transition in these jurisdictions, putting into consideration the present needs of Nigeria, because it would be an enormous task and beyond the scope of this thesis to attempt an analysis of all the energy laws, policies and action plans in the two jurisdictions chosen. Also, because of the limited space available, only the province of Ontario in Canada and the state of South Australia in Australia will be considered.

Consequently, this chapter is divided into two sections. The first section examines the Canadian electricity market with specific focus on the province of Ontario. This is achieved by giving a brief structural analysis of the Canadian electricity market, analyzing the history of Ontario's electricity with specific reference to legal and institutional progression through the various laws, policies and action plans that aided energy transition in its power sector, and the current Ontario electricity supply mix. A comparison is then drawn with Nigeria where pertinent.

The second section examines the jurisdiction of Australia with specific focus on South Australia, by critically analyzing the history of its electricity industry, the transition to renewable energy and the various laws, policies and action plans developed to foster the transition in order to draw appropriate recommendations for the Nigerian power sector, before equally making pertinent comparisons with the Nigerian sector.

4.2 The Jurisdiction of Ontario (Canada)

Generally speaking, the system of government in operation in Canada is the federal parliamentary system of government, which consists of two levels of government, including the federal and provincial levels of government.[400] Each of these levels of government has powers to make laws on various aspect of the Canadian economy. In the *Constitution Act*, section 92A, and the "1982 resources amendment" the provinces in Canada have powers to make laws for the management and capturing of income from both conventional and renewable resources and the generation of electricity.[401] Thus, the electricity market of Canada, unlike some other regions of the world, does not operate on a national level;[402] every province in Canada operates on its own and develops its electricity structure which is largely owned and largely administered by the provincial government or its agencies.[403] However, Alberta, Nova Scotia and the Prince Edward Island are exempted from the above mentioned arrangement that is they are not publicly owned. The electricity

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[400] *Constitution Act* 1867; see also, Peter W Hogg, *Constitutional Law of Canada* (Thomson Reuters Canada Limited 2016 Student Edition) Chapter 5 (5-2).

[401] Paul Muldoon et al, *An Introduction to Environmental law and Policy in Canada* (Toronto: Emond Montgomery Publications, 2015, 2nd ed) at 39.

[402] Ian Blue, "Off the Grid, Jurisdiction and the Canadian Electricity Sector" (2009) 32 Dalhousie LJ 339 at 340–341; This implies that there is no national electricity grid in Canada, into which all sources of electricity feed, in order to disseminate electricity to its consumers country wide.

[403] The provincial owned institutions in charge of the regulation of the three major activities in the power sector comprise the following:

Ontario — Ontario Power Generation, which is publicly owned, and Hydro One Networks. Other electricity generators in the industry include: Bruce Power Inc; Algonquin Power; Epcor Power; Enwave Energy Corporation; TransCanada Energy; and several municipal distributions with their own generation and other small projects like wind farms and cogeneration projects.

British Columbia—The British Columbia Hydro, which is publicly owned; British Columbia Power Exchange; British Columbia Transmission Corporation; and other distinct corporations.

Quebec—The Hydro-Quebec, which is publicly owned and divided into Hydro-Quebec Production, Hydro-Quebec Trans Energie and Hydro-Quebec Distribution, which are distinct entities.

Manitoba— Manitoba Hydro, which is controlled publicly.

Saskatchewan — Publicly-owned Saskatchewan Power.

New Brunswick — The New Brunswick Power Group, consisting of holding company, generation company, nuclear company, transmission company and distribution company, all of which are distinct entities.

Newfoundland and Labrador — power in this province is regulated by the Nalcor-owned Newfoundland and Labrador Hydro, which is a provincially owned energy company.

utilities in operation in Alberta include the ATCO Electric Ltd, EPCOR Energy and TransAlta utilities. In Nova Scotia, the primary provider of electricity in the province is Nova Scotia Power, owned by Emera Inc, also in charge of transmission. In Prince Edward Island, the Fortis Inc-owned Maritime Electric Limited is in charge of providing electricity and dealing with the transmission of same.

The structural background of the power sector in Canada can best be described as one that is evolving.[404] There has been a drift in some provinces from a monopolistic structure characterized by provincially owned corporations serving as the only decision making body in the electricity sector to the separation of the activities of the power sector which includes generation, transmission and distribution of electricity.[405] In Canada, the three main activities in the power sector are primarily a provincial responsibility.[406] These responsibilities are usually carried out through provincially set up utilities and regulatory institutions.[407] The interests of the power sector are largely represented through various associations set up for that purpose. An example of such association is the Canadian Electricity Association.[408] The federal government through the National Energy Board (NEB) and Atomic Energy of Canada Limited oversees the exportation of electricity, the proper functioning of international and interprovincial power lines and the implementation of the country's obligations under international agreements to effectively use nuclear energy peacefully.[409]

Generally, the generation of electricity in Canada is from diverse sources encapsulating both renewable and conventional sources. In the entirety of Canada, the major source is

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[404] David W Drinkwater, "New Electricity: Generation, Pricing, Wheeling and regulation" 28 Can-USLJ 267-300 at 290-297.

[405] "Electricity infrastructure – about electricity", online: <https://www.nrcan.gc.ca/energy/electricity/electricity-infrastructure/about-electricity/7359>.

[406] *Constitution Act, supra* note 400.

[407] Paul Muldoon et al., *supra* note 401.

[408] The Canadian Electricity Association (CEA) is a national association founded in 1891 that works in collaboration with utilities that operate in the electricity sector, to ensure that the sources of Canada's electricity are very clean. It also operates on three levels (regional, national and international), to ensure that the interests of its members are met: online, <https://electricity.ca/about-cea/>.

[409] *Ibid.*

hydro which contributes 59.3 percent of the power supply, the second most essential contributor is fossil fuels (coal, natural gas and petroleum) which contributes about 19.3 percent of the electricity supply mix; this contributor is essential in the Alberta and Saskatchewan jurisdictions.[410] Ontario has since the year 2014 shut down all of its coal-fired generating plants.[411] The third major contributor to the electricity mix of Canada is nuclear power, which represents about 16 percent of its electricity with a much greater percentage in Ontario.[412] The final contributor to the electricity supply mix of Canada comprises non-hydro renewable sources, which currently contribute 5.2 percent of Canada's electricity supply. They include wind, biomass[413] and solar.[414]

Source	Percentage
Hydro	59.3%
Fossil Fuels (Coal, Natural gas and petroleum)	19.3%
Nuclear Power	16%
Non-hydro renewable sources (wind, biomass and solar)	5.2%

A thorough look at the "future of Canada's electricity system" tagged "Vision 2050"[415] as reported by the Canadian Electricity Association reveals that the major factors that affect electricity on the demand side are: population, technologies and the gross domestic product, while the variables that affect electricity on the supply side are laws and policy constraints, social behaviors of consumers in the market, the generation, transmission and distribution strategies, and the pricing structure.[416] Generally speaking, the electricity mix

[410] *Ibid.*

[411] "The End of Coal ", online: <https://www.ontario.ca>page>end-coal>.

[412] Electricity Infrastructure- about electricity- s*upra* note 405.

[413] B.A Edirin, A.O Nosa, *supra* note 329at 149, .

[414] "Electricity infrastructure- about electricity" s*upra* note 405405, .

[415] "Vision 2050: the Future of Canada's Electricity System", online:<https:www.vision2050.ca>.

[416] *Ibid.*

for Canada is relatively clean, because 63 percent of Canada's electricity is generated from hydroelectric power; and only about 15% of its energy mix is derived from conventional energy sources such a coal and natural gas.[417] The report shows that the composition of the electricity system would be largely dependent on the advancement of technology in the energy sector as it concerns storage.

The National Energy Board report[418] shows that there will probably be strategic changes in Canada's electricity supply mix. Examples of such changes include: the insignificant reduction of the percentage of water-based renewable energy sources such as hydro, wave and tidal;[419] the insignificant reduction of the contribution of nuclear power to the electricity supply mix;[420] the growth in the contribution of natural gas to the mix and the decline of coal;[421] and the increase in the contribution of other renewable energy sources such as biomass, solar, geothermal and wind.[422] The report identifies three major contributors to the electricity mix, namely nuclear, fossil fuels and renewables, and an effective understanding of these will largely demonstrate how the Canadian electricity supply industry has progressed.

The commitment of Ontario in ensuring the promotion of only environmentally friendly sources of energy in its electricity sector and climate change mitigation and adaptation strategies are taken cognizance of in the approval of projects in the province, is buttressed by the recently released guidance by the Canadian Securities Administrators which reinforces and expands the ideas in the previous one (CSA Staff Notice 51-333 *Environmental Reporting Guidance*), mandating the disclosure of material climate change

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[417] *Ibid*.

[418] The National Energy Board (NEB), *Canada's Energy Future: Energy Supply and Demand Projections to 2035*. An Energy Market Assessment November 2013, online: <https:www.neb-one.gc.ca>.

[419] *Ibid*- the projected decrease is about 3 percent.

[420] *Canada's Energy Future*, *supra* note 418: the projected decrease is about three (3) percent.

[421] *Ibid*: the growth of natural gas is projected to about six (6) percent while the decline of coal is about 6 percent.

[422] *Ibid*: the projected increase is from 3 percent to 12 percent.

related risks.[423] The guidance emphasizes the need for investments in businesses to take cognizance of environmental sustainability and antecedent climate change risks.[424] To achieve this, the guidance provides specific responsibilities for the board and management which stipulates what the material information to be disclosed must contain;[425] the application of the guidance also extends beyond carbon intensive industries.[426]

Also, it is also important to state at this point that there are structural changes in the energy sector which would transition the National Energy Board into the Canadian Energy Regulator. Bill C-69 did not come into effect on the 21st of June 2019 after it received royal assent.[427] However, the *Federal Impact Assessment Act* ("IAA") and the *Canadian Energy Regulator Act* (CERA) will become enforceable on August 28th, 2019 thereby repealing the *Canadian Environmental Assessment Act* 2012 and the *National Energy Board Act*. Therefore, the implications are that the Canadian Environmental Assessment Agency will transition to the Impact Assessment Agency and the National Energy Board will transition to the Canadian Energy Regulator coincidentally with the submission of this thesis.

4.2.1 History of the Ontario Electricity Market

According to Daniel Rosenbloom and James Meadowcroft[428], the history of Ontario can be categorized into three regimes, namely: "the Dawn of Power (prior to 1906), the Endless Expansion (1922-1997) and the Hybrid (2004 onward)".

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[423] Canada: The CSA Issues New Guidance in Disclosing Material Climate Change- Related Risks, online: <http://www.mondaq.com/article.asp?articleid=837046>.

[424] *Ibid.*

[425] *Ibid.*

[426] *Ibid.*

[427] Canada: Impact Assessment Act and Canadian Energy Regulator Act Coming into Force, August 28, 2019, <http://www.mondaq.com/article.asp?articleid=837412&email<access=on>.

[428] Daniel Rosenbloom & James Meadowcroft "The Journey towards decarbonization: Exploring socio-technical transitions in the electricity sector in the province of Ontario (1885-2013) and potential low-carbon pathways" (2014) 65 Energy Policy 670-679 at 671.

4.2.1.1 The Dawn of Power (Prior to 1906)

Before 1885, the electricity market in Ontario was not regulated; however, after several disputes in the province's power sector, provincial jurisdiction over its electricity market system was affirmed by the British. Since then, various projects and strategies have been established to improve Ontario's electricity sector. [429] Before 1906, the electricity structure in Ontario was made up of coal fired and hydro electric generators and distributors that were privately owned. In 1902, there was an extreme shortage of coal for electricity generation in Ontario because the Pennsylvania coal workers had gone on strike. This necessitated the development of more hydroelectric stations as a substitution strategy while arrangements were put in place to develop viable options for the establishment of a publicly owned electricity system.[430]

In 1906, Ontario Hydro was established by the government of Ontario for the purpose of building and managing a transmission grid for the province in order to distribute power from the hydro-electric generators to the municipally managed distribution structures.[431] The establishment of a publicly owned electricity structure was considered a better option than the operation of the single privately owned utility that unsuccessfully emerged in 1908. The 'Dawn of Power Regime' officially ended in 1922 with the acquisition of the then largest privately-owned electric power company by Ontario Hydro. [432]

4.2.1.2 Endless Expansion (1922-1997)

The key players that shaped the reforms under this regime were Ontario Hydro, municipal electricity distribution companies, affected government agencies, electric appliance

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[429] Ron Daniels & Michael Trebilcock, "The Future of Ontario Hydro: A Review of Structural and Regulatory Options" in Ron Daniels ed., Ontario Hydro at the Millennium: Has Monopoly's Moment Passed? (Montreal, McGill-Queens Press, 1996) cited in Michael J Trebilcock and Ron Daniels, "Electricity Restructuring: The Ontario Experience" (2000) 33:2 Can Community LJ 161.

[430] Daniel Rosenbloom and James Meadowcroft *supra* note 428 at 672.

[431] Mckay, P Electric Empire: The Inside Story of Ontario Hydro. Between the Lines Toronto (1983) cited in Rosenbloom & Meadowcroft, *supra* note 428at 671.

[432] *Ibid* at 673.

manufacturers and energy consumers.[433] From 1922-1949, plans for the establishment of grid infrastructure and large hydro electric units were facilitated and financial incentives to boost grid expansion were developed on the premise that electricity is at the crux of economic advancement in Ontario.[434]

In the 1950s electricity in Ontario was produced through coal-fired power stations and hydro electricity.[435] The Ontario Energy Board was also established as an impartial body saddled with the responsibility of monitoring the activities of electricity distribution companies and ensuring that consumers are provided with electricity at approved rates.[436] By 1960, there was rise in the demand for electricity and this led to the substitution of plans in favour of coal fired and nuclear electricity projects over hydroelectric plants.[437] In 1970, all the Ontario power systems were integrated to provide power in the jurisdiction; the remote communities were exempted from this arrangement.[438] Electricity generation was expanded and the ministry of energy was established with the sole objective of managing the province's electricity system; the Ontario Hydro OEB was rebranded as Ontario Hydro, with the primary aim of providing energy for the use of Ontarian's and not profit making.[439] The Bruce Nuclear Generating Station and the Darlington Nuclear Generating Station were established between 1977 and 1989, The cost of building these facilities was substantial and this led to the consequential increase in the rates of electricity; subsequently, a 25-year demand-supply planning exercise was launched and in 1993 the prices of electricity were frozen.[440] A committee known as the Macdonald committee was established to draw relevant conclusions and provide solutions on how the Ontario's electricity industry could

[433] Rosenbloom & Meadowcroft, *supra* note 428 at 673.

[434] *Ibid.*

[435]"History of Ontario Hydro", online: <https://www.ontario-hydro.com>ontario-hydro>.

[436]*Ibid.*

[437] Rosenbloom & Meadowcroft, *supra* note 428 at 673.

[438] "History of Ontario Hydro", *supra* note 435435.

[439]"Electricity 101: How Electricity Works, A History of Electricity in Ontario", online: <https://www.hydroembrun.ca>.

[440] *Ibid.*

be restructured and this led to the establishment of the *Energy Competition Act* of 1998.[441] In 2000, the Ontario hydro services company was rebranded as a corporate body known as Hydro One, with five subsidiaries: "Hydro One Networks Inc, Hydro One Remote Communities Inc, Hydro One Markets Inc, Hydro One Telecom Inc and Ontario Hydro Energy Inc."[442]

At this stage, it was asserted that the Crown-Owned energy assets had not been properly managed by previous governments, hence the debt incurred by the sector.[443] Hydroelectric sites became insufficient and the company had to switch Ontario's electricity supply mix to reliance on coal, but due to the dependence on foreign supplies whose prices were not certain and other environmental concerns such as air pollution and climate change, the nuclear power industry became the most viable option for the Ontario electricity industry.[444]

In May 2002, Ontario's electricity industry embraced restructuring and competition, thereby paving the way for private companies to participate in the market and give consumers the prerogative to make the choice on which independent retailer in the industry subscribes to their views and meets their needs or if they still wanted to continue with their electricity distributor.[445] The deregulation process was suspended after a while because of the serious rise in the electricity rates.

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[441] The *Energy Competition Act* was established in 1998 to open up the wholesale and retail electricity markets and restructure the Ontario Hydro and this led to the creation of five (5) separate companies which includes the Ontario Power generation; Ontario Hydro Services Company, the Independent Market Operator, The Electrical Safety Authority and the Ontario Electricity Financial Corporation; *Electricity Act*, 1998, SO 1998, c 15, Schedule A.

[442] "Electricity 101", *supra* note 439.

[443] Michael J Trebilcock and Ron Daniels *supra* note 429 at 162-167.

[444] *Ibid.*

[445] Richard Plerce, Michael Trebilcock and Evan Thomas, "Regional Electricity Market Integration" (2007) 8:2 Competition and Regulation in Network Industries 215-258 at 245-251; see also David W Drinkwater, *supra* note 404 at 271-272 .

4.2.1.3 The Hybrid (2004 Onward)

In 2004, the *Electricity Restructuring Act*[446] was enacted with the aim of resuscitating the province's electricity sector, fostering energy conservation and ensuring the stability of prices in the electricity market.[447] The Ontario Power Authority (OPA) an independent non-profit making organization, was further established to help the government achieve its set targets relating to energy conservation, exploration of renewable energy sources and "provincial electricity capacity planning".[448] It also received the responsibility of facilitating and devising strategies to eliminate coal from the province's energy supply mix.[449] In 2005, the Independent Marketing Operator (IMO) repurposed in the form of a non-profit making organization known as the Independent Electricity System Operator (IESO), who is supervised by the Ontario Energy Board; at the same time, the regulated price plan was introduced with the aim of monitoring the rates paid by the homeowners and businesses whose preferred electricity supplier was their local utility.[450]

In 2006, the government of Ontario established the provincial charge known as the Global Adjustment Charge aimed at covering the difference between the cost of electricity in the market and the amount derived from private electricity generation based on fixed contracts.[451] In the same year, the Ontario electricity industry developed the Renewable Energy Standard Offer Program that established a 20-year Feed-in tariff for hydro, solar (PV), wind and biomass projects.[452] This initiative served as a pricing model for small-scale renewable electricity generation projects and provided financial incentives for

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[446] *Electricity Restructuring Act*, 2004, SO 2004, c 23.

[447] *Ibid.*

[448] Richard Plerce, Michael Trebilcock and Evan Thomas supra note 445 at 250.

[449] *Ibid*.

[450] "Why Ontario Energy Market is Regulated", online: <https://www.energyrates.ca/ontario/ontario-energy-market-regulated/>.

[451] Anindya Sen, "Peak Power Problems: How Ontario's Industrial Electricity Pricing System Hurts Consumers" (2017) 30 The Electricity Journal 62-67 at 64-65; see also: Yuheng Helen Jiang et al, "Ananlyzing the impact of the 5CP Ontario Peak Reduction Program on Large Consumers" (2016) 93 Energy Policy 96-100 at 96-97.

[452] Warren E. Mabee, Justine Mannion and Tom Carpenter, "Comparing the Feed-in Tariff Incentives for Renewable Electricity in Ontario and Germany" (2012) 40 Energy Policy 480-489 at 482-483.

renewable energy production by communities.[453] (This was later expanded in the *Green Energy Act* of 2009[454] to properly define the procedure for connection and applicable rates). By 2007, the province launched the Climate Change Action Plan, which included strategies for tackling greenhouse gas emissions by setting reduction targets.[455]

In 2009, a major milestone was reached in Ontario's energy sector with the enactment of the *Green Energy Act.*[456] Its purpose was to develop strategies that would attract investment in the province, enhance the creation of renewable energy jobs and provide sustainable power from renewable energy sources from Ontario. The Renewable Energy Feed-in Tariff (REFIT) program was also developed as part of this legislation.[457] A five-year Ontario Clean Energy Benefit was launched in 2010 with the aim of providing a 10% discount to consumers for the total cost of their bill, as an initiative for improving the electricity infrastructure and embracing renewable energy sources.[458]

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[453] Gorrie P Renewable Ontario (2009) 35:1 Alternatives 22-25 cited Warren E Mabee, Justine Mannion and Tom Carpenter *supra* note 452 at 482.

[454] *Green Energy Act*, 2009, S.O. 2009, c. 12.

[455] By 2014, the statistics showed that the greenhouse gas emissions had significantly reduced by 5.9%.

[456] *Green Energy Act*, *supra* note 454; The Preamble to the Act states that "the Government of Ontario is committed to fostering the growth of renewable energy projects, which use cleaner sources of energy, and to removing barriers to and promoting opportunities for renewable energy projects and to promoting a green economy. The Government of Ontario is committed to ensuring that the Government of Ontario and the broader public sector, including government-funded institutions, conserve energy and use energy efficiently in conducting their affairs The Government of Ontario is committed to promoting and expanding energy conservation by all Ontarians and to encourage all Ontarians to use energy efficiently". This Act was repealed on the 1st of January 2019.

[457] The Feed-in Tariff (FIT) Program was established to foster the utilization of renewable energy sources such as water power, Solar Photovoltaic (PV), renewable biomass and biogas for the generation of electricity in Ontario. The program offered a comprehensive pricing system through long term agreements. <https://www.ieso.ca/sector-participants/feed-in-tariff-program/overview>.; see also: Chad Walker and Jamie Baxter, "It's Easy to Throw Rocks at a Corporation": Wind Energy Development and Distributive Justice in Canada" (2016) 19:6 Journal of Environmental Policy and Planning 754-768 at 756.

[458] Daniel Rosenbloom, Harris Berton and James Meadowcroft, "Framing the sun: A Discursive Approach to Understanding Multi-dimensional Interactions within Socio-Technical Transitions through the case of Solar Electricity in Ontario, Canada" (2016) 45 Research Policy 1275-1290 at 1278-1287; Marisa Beck, Nicholas Rivers and Randall Wigle, "How do Learning Externalities Influence the Evaluation of Ontario's Renewables Support Policies" (2018) 117 Energy Policy 86-99 at 87.

Ontario also launched a Feed-in-Tariff program with specific set rules for the different small household, farm, and other business electricity generation regulation.[459] The aim of the FIT program is

> …to encourage and promote greater use of renewable energy sources, including on-shore wind, solar photovoltaic (PV), bio-energy (biomass, biogas and landfill gas and hydroelectricity for electricity generating projects in Ontario. Through this program, Ontario procures renewable energy from generation facilities that have a rated electricity generating capacity generally up to and including 500 kilowatts (KW).[460]

Section 6.4(d) of the *FIT Rules*[461] posits that one of the essential requirements that a wind and solar PV FIT generator must satisfy is the domestic content requirement; otherwise, such FIT generators would have failed to fulfill their respective obligations under the contract.[462] There are also pre-requisite provisions that guarantee the use of goods and services of Ontarian origin listed directly under the domestic content grid.[463]

Furthermore, in 2011, a supply mix directive was released for Ontario taking into cognizance what the Ontario system can accommodate. The Ontario Power Authority planned for around 10,700 MW of renewable energy capacity excluding hydro-electricity by 2018.[464] An adjustment was made to this target at the end of 2013, and a new *Ontario Long-Term Energy Plan* was released. It projected that 10,700 MW of wind, solar and bio-energy would by 2021 be online.[465] A further forecast was made that by 2025, the Ontario's

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[459] Canada, *Certain Measures Affecting the Renewable Energy Generation Sector* (2012) WT/DS412/R at Para 7.66 [*Canada Renewable Energy Panel Report*] cited in Dr. Lijuan Xing, "A Denouement with Suspense: The Epilogue of Canada-Renewable Energy" (2014) 14 Asper Rev Int'l Bus. & Trade Law, 1 at 1, n 1.

[460] *Ibid.*

[461] S 6.4(d) of the *FIT Rules*.

[462] *Ibid.*

[463] *Canada Renewable Energy Panel Report, supra* note 459, Annex A-1, Integrated Executive Summary of Japan, WI/DS412/R/Add at para 34(Canada-Renewable Energy), Para 1.

[464] Ministry of Energy, Government of Ontario, *Supply Mix Directive* (2011) at 3 , *Ontario Power Authority*, online: <http://www.powerauthorityon.ca/sites/default/files/IPSP%/20directive%02011027.pdf>; Xing *supra* note 459 at 11, n 72.

[465] Ministry of Energy Government of Ontario, *Ontario's Long-Term Energy Plan by the Numbers*, online: <http://news.ontario.ca/mei/en/2013/12/ontarios-long-term-energy-plan-by-the-numbers.html>; Xing *supra* note 459 at 11, n 73.

energy mix would be as follows: 42 percent derived from nuclear, 46 percent renewable and 12 percent natural gas and none of Ontario's electricity will be from coal.[466] Consequently, within the timeline set by Ontario for the purpose of eliminating coal-fired electricity, the *Green Energy and Green Economy Act* was enacted, dedicated solely to energy conservation and the addition of renewable and clean energy resources into the electricity system.[467]

In 2011, the government released an update of its energy supply mix directive, which devised strategies to meet energy conservation targets, the refurbishment of existing nuclear plants, plans to eliminate coal from its energy supply mix, and to increase the proportion of energy derived from renewable energy sources.[468] These again led to spikes in electricity rates for consumers.[469]

The *Industrial Electricity Incentive Program* and the *Ontario Long-Term Energy Plan* were developed in 2012 and 2013 respectively to ensure environmental protection and enhance energy conservation.[470] In 2015, the Ontario Power Authority merged with the Independent Electricity System Operator (IESO) to establish a new institution with both objectives under the IESO name. Electricity rates were furthermore increased by the Ontario Energy Board based on the costs of nuclear and hydro-electric power plants, incidental costs for renewable energy generation systems and the recovery of costs by Ontario Power Generation.

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[466] Ministry of Energy Government of Ontario, *Ontario's Supply Mix*, online: <http://new.ontario.ca/mei/en/2013/12/ontarios-Supply-mix.html>; Xing *supra* note 459 at 11, n 74.

[467] *Green Energy and Green Economy Act*, 2009, SO 2009, c12.

[468] *Supra* note 428 at 676-677; see also, Daniel Rosenbloom Brendan Haley and James Meadowcroft, "Critical Choices and the Politics of Decarbonization Pathways: Exploring Branching Points surrounding low-carbon Transitions in Canadian Electricity Systems" (2018) 37 Energy Research and Social Science 22-36 at 22-24.

[469] *Ibid*.

[470] Daniel Rosenbloom, "A Clash of Socio-Technical Systems: Exploring Actor Interactions around Electrification and Electricity Trade in Unfolding Low-Carbon pathways for Ontario" (2019) 49 Energy Research and Social Science 219-232 at 222; see also, Konstantinos Karanasios and Paul Parker, "Tracking the transition to Renewable Electricity in Remote Indigenous Communities in Canada" (2018) 118 Energy Policy 169-181 at 174.

At present, the installed capacity on the transmission grid of Ontario is approximately 37,000 MW and Ontario's electricity mix is as follows: nuclear energy contributes 13,009 or 35 percent; gas/oil 10,277MW or 28 percent; hydro 8,482 MW or 23 percent; wind 4,486 MW or 12 percent; biofuel 295 MW or 1 percent; and solar 380 MW or 1 percent.[471]

4.2.1.1 Specific Action Plans by Ontario to get rid of Coal (Fossil Fuel) from its supply mix

The first step was an advisory analysis of total annual implication cost[472] of operating coal-fired plants, which amounted to 4.4 billion dollars.[473] Coal was the single largest contributor to emissions in Ontario. The three key players in the coal removal exercise were the Ministry of Energy, Ontario Power Generation, and the Independent Electricity System Operator (IESO).[474]

Ontario set a systematic timeline within which coal (fossil fuel) was to be removed from a electricity supply mix.[475] The commitment of the province to phase out coal was declared in 2001, when the province stated that it would close down the Lakeview Generating Station by 2001.[476] In 2003, Ontario undertook to phase out coal from its electricity supply mix by 2007.[477] In 2005, the Lakeview Generating Station was finally closed. However, because of the fact that the initial timeline set was not in tandem with the realities of the sector, an adjustment was made to extend the time to 2009 for purposes of ensuring the reliability of the electricity market system. Subsequently, the Ministry of Energy directed the Ontario Power Authority to estimate a more pragmatic timeline within which coal

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[471] "Reality Outlook" (updated on 31 March 2019), online: <https://www.ieso.ca/en/Learn/Ontario-Supply-Mix/Ontario-Energy-Capacity>.

[472] The implication cost includes the health, environmental, financial and other incidental cost of operations.

[473] Jason E. E. Dampier et al, "Assessment of Potential Local and Regional Induced Economic Impact of an Energy Policy Change in Rural Northwestern Ontario" (2016) 6:14 Energy, Sustainability and Society 1-11.

[474] *Ibid.*

[475] *Ibid.*

[476] *Ibid.*

[477] Daniel Rosenbloom, "Framing Low-Carbon Pathways: A Discursive Analysis of Contending Storylines Surrounding the Phase-Out of Coal-Fired Power in Ontario" (2018) 27 Environmental Innovation and Societal Transitions at 129-145 at 129.

would be removed from the province's electricity supply mix.[478] This led to the enactment of the *Cessation of Coal Use Regulation* (2007).[479] This regulation posited that the estimated date for ending the use of coal in Ontario for the generation of electricity would be December 31, 2014.

In 2009, as previously stated, the *Green Energy Act* was enacted, followed by the *Ending Coal for Cleaner Air Act* in 2015. The latter posited that coal could not be used for future electricity generation in Ontario.

All the coal fired plants were not closed simultaneously. After the closure of the Lakeview Generating Station in 2005, the Atikokan Generation Station was closed in 2012, followed by the Nanticoke Generating Station in 2013, and the closure of the Thunder Bay Generation Station in 2014.[480] Ontario is the first North American government to get rid of coal as a major contributor to its electricity mix, making it a good example for a cleaner and greener electricity system.[481] While coal still contributed 25% of Ontario's electricity mix in 2003, the province had completely succeeded in eliminating it by 2014.[482] This signified a major reduction in the emission of greenhouse gases in the province.[483]

4.2.1.2 Comparative Analysis of the Canada (Ontario) and Nigeria Electricity Models

As a result of the fact that the *Green Energy Act* has been repealed, another jurisdiction must be considered because recommendations from Ontario can only be made subject to the proviso that the Green Energy Act has been repealed. Still, certain comparative

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[478] *Ibid* at 129-145.

[479] O Reg 496/07: *Cessation of Coal Use- Atikokan, Lambton, Nanticoke and Thunder Bay Generation Stations* under *Environmental Protection Act* RSO 1990 c E 19.

[480] Mark Winfield and Scott Weiler, "Institutional Diversity, Policy Niches and Smart Grids: A Review of the Evolution of Smart Grid Policy and Practice in Ontario, Canada" (2018) 82 Renewable and Sustainable Energy Review, 1931-1938 at 1933.

[481] *Ibid.*

[482] "LTEP (Long Term Energy Plan) Module 5", online: <http://www.ontarioenergyreport.ca/data-catalogue.php#LTEP.MODULES>.

[483] *Ibid.*

distinctions and lessons can be drawn from the existing legislative and institutional structure of the Ontario electricity industry.

First, a comparative analysis of the history and action plans adopted by the electricity sector of Ontario reveals that with the exception of international and interprovincial power matters,[484] electricity is dealt with provincially — which emphasizes the smaller units perspective. In Nigeria, to the contrary, electricity is a national affair in practice, evidenced by national electricity decisions implemented through the national electricity bodies. The only aspect of the power sector that the States are allowed to legislate upon or exercise jurisdiction over is when such areas are not expressly covered by the national grid in place. This legislative strategy accounts for the majority of the inadequacies and inefficiencies in the Nigerian power sector.[485]

Secondly, the first step taken by the Ontario government in order to get rid of coal was to set a timeline within which coal would no longer be a constituent of its electricity supply mix. Although subsequent adjustments were made to the timeline, they were considered to be realistic and this facilitated the accomplishment of the plan. Nigeria, on the other hand, has set timelines in its laws and policies within which it expects a certain percentage of its electricity supply mix to be derived from renewable energy. For instance, one of the primary purposes of the *NREEEP* is to "set national targets for achievements in electricity from renewable energy and energy efficiency capacity addition by 2020 and beyond". Following this objective, the policy set the target for Nigeria to be 40,000 MW with an implication of 4.3 GW of renewable generation every year, with effect from year 2015 onwards.[486] It also projects that its long term goal is for renewable energy to constitute

[484] See *National Energy Board Act*, RSC 1985, c N-7, s 26 (1); see also the case of *Caloil Inc v Canada (Attorney General)* [1970] S.CJ No 91, where the court emphasis the limit to which the federal government can interfere with the development of laws in the energy sector, using its heads of power; see, Dwight Newman, *Natural Resource Jurisdiction in Canada* (LexisNexis: Canada, 2013) at 112.

[485] See paragraph 13 and 14 Part II Second Schedule *Constitution of the Federal Republic of Nigeria* 1999 as amended.

[486] *NREEEP supra* note 146, Para 1.9.

20% of its electricity supply mix.[487] Yet the *NERC Regulations on Feed in Tariff for Renewable Energy Sourced Electricity in Nigeria* in section 8(a) and (f) states that:

> the maximum total installed renewable energy project capacity based on the draft National Energy Master Plan (NEMP) which envisaged that by the end of the 2020, 10% of the national energy supply shall be from renewable…a total of 2,000MW of RE power shall be admissible into the grid (1000MW by the end of 2018 and 2,000 MW by the end of 2020) while the total grid capacity is anticipated to be within 10,000MW to 20,000 MW by 2020.[488]

Thus, unlike the Ontarian approach, Nigeria is not set to get rid of fossil fuel entirely; the policy and the REFIT program furthermore lack harmony and make renewable energy an option and not an inevitability. These inconsistencies in the laws make it difficult to understand what the common target is for the injection of renewable energy into the power sector.

Thirdly, a critical review of the *Cessation of Coal Use Regulation in Ontario*[489] reveals that the owners and operators of the affected generation stations were given a specific date by which they were to ensure that coal was no longer used for electricity generation purposes in those stations. This constituted a major enforcement strategy used to get rid of fossil fuel. Nigeria, to the contrary, has no law, plan or policy that intends to remove fossil fuel from the electricity supply mix by prohibiting its use for electricity generation purposes.

4.3 The Jurisdiction of South Australia

The Australian State of South Australia is the second jurisdiction to be analyzed in this research for the purposes of making relevant recommendations for energy transition

[487] *NREEEP supra* note 146, Para 6.

[488] Section 8(a) and (f), *supra* note 266.

[489] *Supra* note 479.

success purposes in Nigeria.[490] South Australia is one of six States in Australia, the other five being New South Wales, Queensland, South Australia, Tasmania, Victoria and Western Australia.[491]

Generally speaking, Australia operates a federal structure of government which divides the powers between the Commonwealth and the six States. Under the established federal system, the former six colonies became the existing six States outlined above and every State reserved the right to have its own Constitution. However, the operation of the State Constitutions must remain subject to the provisions of the *Australian Constitution*.[492]

Australia has a strong background of renewable energy transition,[493] which could be exemplary to Nigeria. According to the International Energy Agency review of 2018, Australia had the highest share of fossil fuels in its electricity generation mix out of its 30 member states in 2015, signified by 86 percent.[494] However, with the recent trends and the new technologies being developed with the aim of boosting renewable electricity generation and storage, the Australian electricity market is also experiencing a shift and the old energy business models are giving way for the adoption of more innovative and rapid technologies that seek to provide answers to the novel legal questions that arise because of the quest to

[490] South Australia is one of the states in Australia and it has its state's capital as Adelaide, other cities include Mount Barker, Mount Gambier, Murray Bridge, Port Adelaide, Port Augusta, Port Augusta, Port Pirie, Port Lincoln, Victor Harbor and Whyalla.

[491] "State Government", online: <https://www.australia.gov.au>.

[492] Ss 106 and 107 of the *Australian Constitution*; worthy of note is the fact that the *Australian Constitution* does not directly confer the power to legislate for the environment, energy or climate change issues on the federal government. However, by virtue of section 51 of the *Australian Constitution* and the case of *Commonwealth v Tasmania ('Tasmania Dam Case')* which gives the federal government power to legislate on corporations, the Federal government legislates on the electricity sector indirectly. See also the case of *Victoria v Commonwealth* (1975) 134 CLR338 (AAP Case'); Jacqueline Peel and Lee Godden Australian Environmental Management: A "Dams" Story (2005) 28 University of New South Wales Law Journal 668 as cited in Kallies Anne, "A Barrier for Australia's Climate Commitments: Law, the Electricity Market and Transitioning the Stationary Electricity Sector" (2016) 39:4 University of New South Wales Law Journal, 1547 at 1576.

[493] Kallies Anne, "The Impact of Electricity Market Design on Access to the Grid and Transmission Planning for Renewable Energy in Australia: Can Overseas Examples Provide Guidance" (2011) 1:47, 2 RELP, 1 at 14.

[494] International Energy Agency, *Energy Policies of IEA Countries: Australia: 2018 Review*, (IEA, Paris, 2018) 95, cited in James Prest & Grace Soutter,"The Future of Australia's Federal Renewable Energy Law" (2018) 92 ALJ 799 at 800, n 11.

adopt ways of reducing emissions and provide positive solutions to tackle the problems of climate change.[495]

4.3.1 Australian Federal Government Perspectives: Legal and Institutional Initiatives

As previously highlighted, electricity in Australia has both federal and state influence. Originally, the issue of electrification in Australia began through small-scale electricity facilities in various cities. Subsequently, following the agglomeration of these facilities, state owned monopolies emerged. These facilities became vertically integrated local grids and operated as centralized methods. However, as a result of expansion and rising interconnection between the states, there was need for federal cooperative market integration through the National Electricity Market.[496] This was administered through the *National Electricity (South Australia) Act 1996*.[497] Thus, the generation and retail subsector of the market were competitive while the transmission and distribution subsectors were still managed as monopolies.[498] Also, the institutional structure of the electricity market was reorganized to foster national market competition. The changes brought about by the reorganization were agreed upon by the Council of Australian Governments[499] and they include:

a. The division of the generation, transmission, distribution and system operations activities of the industry.

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[495] Donald Zillman, Le Godden, LeRoy Paddock & Martha Roggenkamp (eds), *Innovation in Energy law and Technology: Dynamic Solutions for Energy Transitions* (OUP, 2018) 434, cited in Prest & Soutter, *supra* note 494 at 800, n 13.

[496] Hugh Outhred, "The Evolving Australian National Electricity Market: An Assessment" in Graeme Hodge, Valarie Sands, David Hayward & David Scott, eds, *Power Progress: An Audit of Australia's Electricity Reform Experiment* (2004); Australian Energy Market Operator, "An Introduction to Australia's National Electricity Market" (2010), online: <https://www.abc.net.au>.

[497] *National Electricity (South Australia) Act* 1996.

[498] Farhad Billimoria & Rahmatallah Poudineh "Electricity Sector Transition in the National Electricity Market of Australia: Managing Reliability and Security in an Energy-Only Market" (2018) EL 31 The Oxford Institute for Energy Studies, 1 at 7.

[499] Hugh Outhred, "A Review of Electricity Industry Restructuring in Australia" (1998) 44:1 Electric Power Systems Research, 15 at 15.

b. The establishment of mechanisms to ensure customers' prerogative to choose their electricity supplier.
c. The facilitation of interconnected transmission and distribution networks through fair market practices.
d. The establishment of equal opportunity market rules to ensure the impartial admissibility of new electricity generators and retailers in the industry.
e. The elimination of all regulatory bottlenecks that impede interstate electricity trade.[500]

The resultant effect of the above changes was the emergence of a wholesale electricity pool market.[501] The operation of the market was by obtaining the preferred sales price of the electricity generators and balancing same through a dispatch process[502] based on the consumer's demands.[503] This implies that the consumers' preferences determine the drive of the market.[504] (A prominent example of consumer behaviour influences is the closure of the last coal-fired power station because of preference for wind energy generated electricity).[505]

It is therefore pertinent at this point to analyze the federal government initiatives for the promotion of renewable energy sourced electricity in Australia. The preliminary step was the recognition that the primary way to minimize greenhouse gas emissions effectively is through the expansion of electricity generated from renewable energy sources.[506] This led

[500] *Ibid.*

[501] AC Worthington & H Higgs, "The Relationship between Energy Spot and Futures Prices: Evidence from Australian Electricity Market" (2004) 3:4 ICFAI Journal of Applied Economics 65.

[502] A dispatch process is the procedure through which a power generation or distribution company sells electricity to end users based on their demand.

[503] *Ibid.*

[504] *Ibid.*

[505] "The Final Closure of South Australia's Coal Fired Station", online:<https://www.reneweconomy.com.au>; see also, Ben Elliston, Iain MacGill & Mark Diesendorf, "Comparing Least Cost Scenarios for 100% Renewable Electricity with Low Emission Fossil Fuel Scenarios in the Australian National Electricity Market" (2014) 66 196 at 196.

[506] Vanessa Ritzinger, "Designing an Emissions Trading Scheme to Encourage the Reduction of Greenhouse Gas Emissions: A Comparison of Australian and European Experiences" (2013) 9:1 Macquarie Journal of International and Comparative Environmental Law 44 at 65.

to the establishment of the 'Mandatory Renewable Energy Target'.[507] The purpose of the target was to facilitate the injection of renewable energy into the Australian electricity mix through renewable energy certificates.[508] The three laws enacted to regulate the exercise were the *Renewable Energy (Electricity) Act 2000,*[509] the *Renewable Energy (Electricity) (Charge) Act 2000*[510] and the *Renewable Energy (Electricity) Regulations 2001* (as amended).[511]

Through the above mentioned legislation, a national scheme was established for the electricity retailers and wholesalers, mandating them to obtain and surrender a specific number of renewable energy certificates that indicate the amount of electricity generated from renewable energy sources.[512] Where a particular entity falls short of the required amount, they would be mandated to pay a "renewable energy shortfall change".[513] The scheme also allowed for these certificates to be traded where they had been registered by the industry regulator.[514]

Further, the law established critical mechanisms for the independent review of the performance of the MRET as mandated under section 162 of the *Renewable Energy (Electricity) Act 2000.*[515] This created some form of checks and balances in the sector. The most prominent contribution by the review panel was that a minimum of 15 years was needed to effectively invest in energy/electricity projects and expect return. Therefore, it was necessary to increase the targets and extend the target dates to ensure that projects commenced would be completed and yield adequate returns for the investors, in order to

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[507] Anthony Kent & David Mercer, "Australia's Mandatory Renewable Energy Target (MRET): An Assessment" (2006) 34:9 Energy Policy 1046 at 1046.

[508] *Ibid.*

[509] *Renewable Energy (Electricity) Act 2000.*

[510] *Renewable Energy (Electricity) (Charge) Act 2000.*

[511] *Renewable Energy (Electricity) Regulations 2001* (as amended); see also Michael MacGinley, "The New Renewable Energy Legislation" (2001) 20 Australian Mining and Petroleum Law Journal 87.

[512] Anthony Kent & David Mercer, *supra* note 507.

[513] *Ibid.*

[514] *Renewable Energy (Electricity) Act 2000*, ss 26-28.

[515] *Renewable Energy (Electricity) Act 2000.*

portray Australia as an economically viable economy with well managed investment frameworks set to attract potential investors.[516]

Another form of initiative is 'financial incentives': various financial strategies were introduced by the federal government to enhance the utilization of the renewable energy technologies. Two paramount financial programs introduced were:

1. The Photovoltaic Rebate Program (PVRP)
2. The Renewable Remote Power Generation Program (RRPGP).

The Photovoltaic Rebate Program was controlled on account of the Commonwealth by the federal government through the states as a form of cash rebates to households and communities in the federation who set up "approved, grid connected or stand-alone photovoltaic systems".[517] The Renewable Remote Power Generation Program was established with the aim of giving support to both new and old off-grid energy installations aimed at converting diesel-oriented technologies to renewable energy technologies.[518]

Subsequently, the government also introduced an indirect Carbon Pricing Mechanism with the sole aim of putting a price on energy with associated greenhouse gas emissions in order to reduce dependence on it and increase investment in cleaner energy options.[519] This initiative was repealed and replaced by the '*Direct Action Policy*' which was a mitigation strategy with the aim of reducing emissions . The shortfall of these policies was that they made no allusion to renewable energy promotion as a key plan for emission reduction. However, they had the ability to serve as a source of income channelled as an incentive for

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[516] McLennan Magasanik Associates Pty Ltd, *impacts of a 20, 000 GWh Target for the MRET Scheme Final Report to the MRET Review Panel* (September 2003), online:<https://www.mretreview.gov.au/report/pubs/mret-mma.pdf> cited in Alaxandra S Wawryk & Adrian J Bradbook, "Australian Initiatives Promoting Renewable Energy Resources in Electricity Generation" (2005) 23:2 Journal of Energy and Natural Resources Law, 188 at 196 n 50.

[517] Australian Greenhouse Office, *Renewable Remote Power Generation Program*, online: <www.greenhouse.gov.au/renewable/rrpgp/index.html>; Energy South Australia, *Regional and Remote Areas RRPG*, online:<https://www.sustainable.energy.sa.gov.au/dhtml/ss/section.php?>cited in Wawryk & Bradbook, *supra* note 516 at 200 n 65.

[518] *Ibid.*

[519] *Clean Energy Act* 2011, as repealed by the *Clean Energy Legislation (Carbon Tax Repeal) Act* 2014 sch 1 pt 1 item 1.

renewable energy generators. Another government competitive grant scheme known as the Renewable Energy Demonstration Program (REDP) was also introduced to boost renewable energy projects and mini grid projects.[520]

4.3.2 South Australian State Government Perspectives: Historical Analysis

Electricity in South Australia began privately in 1885 when a hydro electric plant was used to power a dining room.[521] In 1898, the first public electric utility, known as the Nile Street power station, was established, and used to power street lighting in the cities of south Australia.[522] A new power station known as the Grenfell Street power station was built in 1901, and it became the sole supplier of electricity to the cities and suburbs, following the closure of the Nile Street power station in 1907.[523] In 1909, Adelaide experienced its first extreme blackout and in response to this, the State transitioned its electricity control mechanisms from Adelaide to London, with the establishment of a power station known as Osborne 'A' to generate more electricity and supplement Grenfell Street power station, the sole electricity supplier.[524] Subsequently, in 1946, the government of South Australia took over the privately owned electricity assets because the privately owned monopoly sought to increase the tariff and also refused to employ the state-owned coal source (Leigh Creek Coal).[525] The government instituted the Electricity Trust of South Australia (ETSA) in the same year.[526] At this stage, South Australia's power sector was still largely dependent on the importation of black coal from the east.

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[520] K Hogg and R.O'Regan, "Renewable Energy Support Mechanisms: An Overview" (PricewaterhouseCoopers LLP, Globe Law and Business),cited in Sunday Olayinka Oyedepo et al, "Towards a Sustainable Electricity Supply in Nigeria: The Role of Decentralized Renewable Energy System" (2018) 2:4 European Journal of Sustainable Development Research 1 at 25 n 39.

[521] This dining room was owned by Mr Hullet of Port Augusta.

[522] "South Australian Electricity Report", *Australian Energy Market Operator*, online:<https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/integrated-system-plan> 1 at 27-34.

[523] "Our Heritage", *Electranet*, online: <https://www.electranet.com.au>.

[524] *Ibid.*

[525] "Timeline of Milestones (and Mishaps) in South Australia's Electricity Story", online:<https://www.mobile.abc.net.au>.

[526] *Electricity Trust of South Australia (Torrens Island Power Station) Act 1962*.

However, the Electricity Trust of South Australia began investigation into more innovative generation methods, especially through nuclear power and wind turbines to independently generate electricity and promote energy self-sufficiency for South Australia. The state chose Port Augusta as the center of this development. It established three electricity plants powered by coal. Over time, these plants were thoroughly upgraded, and they had strong links to the electricity grid. In 1971, South Australia experienced price hikes that were estimated to constitute a 72 percent rise in the cost of household electricity bills.[527] This led South Australia to make very controversial moves in its electricity sector by unbundling power sector activities into the three major areas of generation, retail and transmission, and leasing them to the private sector through long term agreements under the pertinent legislation.

In 2001, Australia set a federal renewable energy target through the Mandatory Renewable Energy Target (MRET) highlighted earlier, with the aim of attaining 20 percent of renewable sourced electricity content in its electricity supply mix. The landmark advancement on the target took place with the launching of the first wind farm in 2003. Following the same pattern, in 2007, South Australia set a renewable energy target through the *Climate Change and Green House Reduction Act*[528]which posited that by 2014, the state should have 20 percent of its energy from renewable energy sources. This was exceeded and the target was increased. Due to the movement towards renewable energy, the detrimental environmental impacts of coal fired stations and the fact that coal was no longer economically viable, the coal fired generators at Port Augusta were shut down.[529]

In 2016, because of a severe storm, the state experienced a great power blackout which led to deliberations between the fossil fuel and renewable energy sectors.[530] A power plan was developed aimed at building and maintaining a 360 million dollar gas-fired plant and a 100 MW battery. In 2017, Tesla, Neon and the state government entered into a contract to

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[527] Kathryn Davidson, "Is Electricity Affordable in South Australia?" (2005) 40:3 Australian Journal of Social Issues 441-455 at 441-443.

[528] *South Australia Climate Change and Green House Reduction Act* 2007.

[529] *Supra* note 525.

[530] "South Australia's Blackouts: Not as simple as it looks", *Australian Energy Council*, online:<https://www.energycouncil.com.au>.

establish the world's largest lithium ion battery in South Australia. Furthermore, the government also established temporary hybrid turbines with the aim of having a temporary back-up power generator for the purpose of providing electricity in case of shortage of power.

The new plan established measures to tackle the failures of the national electricity regulation framework. The first proposition was that the 100 MW capacity battery would be financed by the renewable technology fund with the aim of updating South Australia's energy grid and transforming it to renewable energy storage technologies.[531] At the time the electricity grid of South Australia was fraught with volatility and the plan proposed that where the batteries were properly configured and installed, it would ensure that there would be a great injection of energy into the grid over a short time.[532] The second proposition was a rule change by the Australian Energy Market Commission that would enable the large battery installations to compete with the electricity generators, although the generators were opposed to this proposal. The next component of the plan was a proposed legislation that would in the case of an emergency enable the state government to overrule the National Electricity Market's dispatch process to prevent blackouts in the future. This would imply that although the electricity sector has been deregulated, the federal government would still possess some form of control which would be applicable to prevent negative occurrences in the sector.[533] The plan also states that all new electricity generators with a capacity of more than 5MW are required to show how they would contribute positively to the State's energy security to ensure a reliable power supply.[534]

Finally, the plan provides for the introduction of an energy security target that mandates retailers to compulsorily purchase a minimum percentage of electricity from the local generators, before considering buying electricity from the Victorian coal-fired stations to boost the revenue of local producers and lower emissions in the sector. Therefore, the plan

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[531] "Battery Storage and Renewable Technology Fund New Generation More Competition", online:<https://www.energymining.sa.gov.au>.

[532] *Ibid.*

[533] *Supra* note 496.

[534] *Ibid.*

has a tripartite focus which includes: "suppressing retail price rises by introducing more competition into the wholesale market; enhancing the physical security of electricity supply and encouraging renewable generation; and reducing greenhouse gas emissions." Thus, in South Australia less reliance is placed on fossil-fuels based energy because of the speedy expansion of grid-connected and distributed renewable generation.[535]

4.3.3 Electricity Legislative Framework

In Australia, the lead energy law maker is South Australia and the key laws and policies include:[536] The *National Electricity Law*[537] which is a schedule to the *National Electricity (South Australia) Act* 1996.[538] Other subordinate laws include the *National Electricity Rules*[539] and *National Electricity (South Australia) Regulations*.[540] It is the primary legislation that governs the electricity sector in South Australia. It provides modalities for the operation of the national electricity market and other ancillary matters. The *National Energy Retail Law*[541] which is a schedule to the *National Energy Retail Law (South Australia) Act* 2011.[542] Other subordinate legislation include the *National Energy Retail Rules*[543] and the *National Energy Retail Regulations*.[544] This law is primarily responsible for the retail activities of the electricity industry. The preamble of the law states that it is "an Act to establish a national energy customer framework for the regulation of the retail supply of electricity…"

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[535] Bruce Mountain & Jamie Carstairs, "Batteries, Interconnectors and Institutions: The Case of South Australia" (2018), online: <https:www.10.5547/2160-5890.7.1.bmaou>.

[536] Australian Energy Regulator, "Energy Industry Regulation", online: <https://www.aer.gov.au/industry>.

[537] *National Electricity Law*.

[538] *National Electricity (South Australia) Act* 1996.

[539] *National Electricity Rules.*

[540] *National Electricity (South Australia) Regulations.*

[541] *National Energy Retail Law*.

[542] *National Energy Retail Law (South Australia)* Act 2011.

[543] *National Energy Retail Rules*. These rules were made pursuant to the National Energy Retail Law by the AEMC, it provides a set of rules that govern the sale and supply in the electricity sector, from the retailers and distributors to the end consumers. <https://aemc.gov.au>regulation>.

[544] *National Energy Retail Regulations.*

The *Competition and Consumer Act* of 2010[545] which is a law that provides for legal rules for the ideal terms of an electricity contract, the interrelationship between consumers and manufacturers and pricing. It also establishes the Australian Energy Regulator. Its main aim is to foster competition and prevent unfair practices in the electricity market in order to protect consumers. *The Australian Energy Market Commission Act* of 2004[546] which is a law that establishes the Australian Energy Market Commission and provides for the constitution, purpose and function of the Commission.

4.3.4 Electricity Institutional Framework

The Institutional framework include: The Australian Energy Market Commission which According to sections 5 and 6 of the Australian Energy Market Commission *Establishment Act* of 2004, the AEMC is a body corporate with the functions of developing market rules, providing advice to the Ministerial Council on Energy when needed, and performing other ancillary functions through the instrumentality of its powers under the National Energy Laws or Jurisdictional Energy laws. The Australian Energy Regulator: the AER collaborates with other energy bodies and state energy regulators to devise regulatory plans to ensure that consumers are well represented and served in the energy sector by overseeing the activities of the market participants and the fairness of market competition. It is in charge of administering the wholesale electricity market and has the following functions amongst others: enforcing the energy market laws on behalf of the Australian National Electricity Market;[547] establishing revenue caps for the regulation of the income of transmission and distribution network service providers; and establishing the regulatory guidelines within which the electricity business operations thrive.

Also the Council of Australian Governments (COAG) is an intergovernmental assembly in Australia. It was founded in 1992 and reaches agreement on national energy matters. Agreements reached are binding and foster reforms for advanced energy solutions in

[545] The *Competition and Consumer Act* 2010, No 51, 1974.

[546] *The Australian Energy Market Commission Act* 2004.

[547] <https://www.aer.gov.au>.

Australia.[548] While the Energy Consumers Australia is an organization established by the Council of Australian Governments with the aim of fostering the interests of consumers relating to the quality, reliability and safety of energy services in Australia. This organization runs independently, and it serves as a direct means of collaborating with other regulators to adopt best practices that would improve the results for consumers.[549]

The primary renewable energy sources of electricity in South Australia are wind and solar, mainly through wind farms and solar photovoltaic systems.[550] The wind farms are paired with large batteries to ensure power stability and back-up in cases of emergency.[551] By estimation, over 200,000 South Australian homes have installed the solar photovoltaic (PV) systems on the roof top of their houses to provide power independently for each household.[552] Also, mechanisms have been put in place to ensure that any excess electricity generated is directed into the main grid.[553] To boost the development and utilization of renewable energy in the sector the Australian government has funding in place to enhance investment in renewable sourced electricity.[554]

After electricity has been generated, the need to deliver electricity to end users arises and this is achieved through the transmission network operated by ElectraNet after a series of voltage reduction at various levels.[555] The power retailers purchase electricity through the National Electricity Market and sell it to consumers.[556] The consumers retain the prerogative of choosing who their energy retailer would be and the contract type they prefer

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[548] Council of Australian Governments, online: <https://www.coag.gov.au>.

[549] Energy Consumers Australia, online: <https://www.energy.gov.au>.

[550] Adam Lucas, "Conflected Conflict in the Wake of the South Australian Blackout: Diversionary Strategies and Policy failure in Australia's Energy Sector" (2017)29 Energy Research and Social Science 149-159 at 154-155.

[551] *Ibid.*

[552] <https://onestepoffthegrid.com.au>.

[553] *Ibid.*

[554] Sally A Weller, "Globalisation, Marketization and the Transformation of Australia's Electricity Sector" (2018) 49;3 Australian Geographer 439-453 at 444-445.

[555] *Ibid*; see also, Ben Heard et al, "Beyond Wind: Furthering Development of Clean Energy in South Australia" (2015) 139:1 Transactions of the Royal Society of South Australia 57-82 at 61.

[556] Andrew Blakers, Bin Lu and Matthew Stocks, "100% Renewable Electricity in Australia" (2017) 133 Energy 471-482 at 475.

after critical comparison of energy market offers.[557] The price consumers pay for their electricity comprises of four major components, namely whole sale costs,[558] network costs,[559] retail costs[560] and green costs.[561] End consumers have the choice of purchasing electricity from either the local retailer whose prices are directly influenced by the electricity industry regulator or through a competitive retail contract without any price control by the central electricity regulator. Often, consumers choose the latter option, because they get to prioritize and make decisions that best suit their energy preferences.

The Australian electricity industry is managed by the States, although as stated earlier, there is a National Electricity Market (NEM), which ensures that there is connectivity and trade between the various States with the exception of Western Australia. Every state is expected to develop its own energy policy. Generally, the most predominant source of energy in Australia is coal, especially in the most populated states of New South Wales and Victoria. However, the recent transition from high carbon concentrated energy to low carbon concentrated energy in South Australia, which has attracted political, social and economic analysis, and that sets the province as a successful example of a renewable energy transition and electricity capacity building, is worth an examination.

The competitive outcome of the restructuring of the Australian electricity industry that began in the mid-1990's when the four major activities in the industry (generation, transmission, distribution and electricity retailing) were unbundled from their monopolistic structure,[562] led to the generation subsector having a lot of businesses involved in it; the transmission subsector was left as a state monopoly, while the distribution and retail

[557] In South Australia, the process is made easy through the energy made easy price comparison tool, see: Martin Gill, "Simplifying Tariff Comparisons" online: https://www.accc.gov.au.

[558] This refers to the costs contained in the agreement between the electricity generator and the retailer which entails the expenses incurred by the retailer when buying electricity from the National Electricity Market.

[559] This refers to cost associated with the transmission and distribution of electricity, it also extends to the costs associated with the maintenance of the electricity structure like the wires and electricity poles.

[560] This largely differs from one retailer to another; it encompasses electricity connection, billing and account management expenses.

[561] This refers to expenses that relate to energy efficiency renewable energy feed in arrangements and targets set by the government.

[562] <https://www.efa.com.au>.

subsectors were either run by the government monopolistic structure or stand-alone businesses. More so, South Australia is the State that pioneered the idea of privatizing the electricity industry.[563] The components of the plan that fostered renewable energy integration in South Australia include:

Enhancing the resilience of the grid: Following the blackout incident that occurred in September 2016, investigations carried out by the Australian electricity market operators revealed that two major factors caused the occurrence, namely the extreme weather conditions (two tornadoes) and the faulty protection settings that affected the balance of supply and demand leading to grid frequency collapse. Therefore, to ensure there would be no future electricity crisis, structural amends were made.[564]

Boosting the level of renewable sourced electricity performance: The prominent measures that South Australia implemented to boost the level of renewable sourced electricity in South Australia involved ensuring that facilities such as the turbines for the production of wind power had 1) accurate control settings, 2) active power control for the modulation of output, and 3) good batteries for back-up storage.

Boosting electricity capacity and interconnection: Another tremendous step taken by South Australia is the partnership it formed through its interconnection with the national market to the State of Victoria for power supply purposes despite the emphasis that the policy placed on home-grown sources. This interconnection creates a strong back-up for the State.[565] Also, with the recent discovery that the State of Victoria may not have so much energy to spare because of the recent closure of the coal fired power station, South Australia has already begun negotiations and investigation on how best to create similar interconnections with Eastern Australia to integrate more renewable sourced electricity in the region and to boost the security of its electricity system.[566]

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[563] David Olsson & Stephen Jacques Mallesons, "South Australian Electricity Privatization Sparks Interest in Capital Markets." (2001) 20:1 International Financial Law Review, 37.

[564] *Ibid.*

[565] Heard, *supra* note 555.

[566] *Ibid.*

4.3.5 South Australia's Battery Initiatives as a Prominent Measure to Ensure Electricity Availability

South Australia recently launched the world's largest battery, known as the Tesla big battery, which has helped in stabilizing its grid connection, preventing power outages and reducing systems cost. A recent report analyzing its performance since its installation in December 2017 has shown that the battery has saved the Australian government about 40 million dollars.[567] Also, 48.9 percent of the energy in the jurisdiction is derived from renewable energy, and there are projections in accordance with the Australian Energy Market Operator's system plan that by 2020 the renewable energy component in electricity will account for 73 percent of the jurisdiction's energy and that by 2025, it will constitute 100 percent thereof.[568] The launch of the "largest expansion of home battery storage in the world" is the hallmark of energy transition in South Australia.[569]

4.3.5.1 The Virtual Power Plant

The government has reemphasized its unwavering support for the launch of "Tesla's virtual power plant of solar and power wall home batteries".[570] The capacity of the power plant is 250 MW and its aim is to reduce the price of electricity, enhance the stability of the grid, ensure grid protection during power outages, and support the transition to renewable sourced energy. The plan spans three phases with the aim of powering around 50,000 houses. The power plant provides energy primarily for the house through a solar

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[567] "South Australia's Tesla Big Battery Saves $40 Million in Grid", online: <https://www.pv-magazine.com>south-australia>.

[568] "Tesla Big Battery Defies Skeptics, Sends Industry Bananas Over Performance"-<https://reneweconomy.com.au>south-australia>.

[569] <https://virtualpowerplant.sa.gov.au>.

[570] *Ibid*. The Virtual Power Plant is a household electricity system that includes solar panels and power wall batteries and other important apparatus that would enhance grid connection. It functions by deriving the solar energy and storing it into the battery for both present and futuristic purposes. Where a household requires more electricity than is derived from the solar energy, it would automatically draw from the grid. The final electricity bill includes both electricity used from the grid and the solar panels; however, those under the VPP scheme would be charged a lower rate which largely depends on the amount of electricity used by the household and the electricity retail contracts signed by the parties. The VPP initiative has benefits such as lower costs, reliability, and ability to share excess electricity, ability to feed into the grid, and boosting electricity supply and security.

PV and battery system and any excess is fed into the grid to boost energy supply to the rest of the state when needed.

The three main actors involved in the creation of the virtual power plant are Tesla, whose primary responsibility is to develop the plant, manage and maintain its installation, and to ensure back-up through battery storage; the energy locals[571] whose duties include regulating the supply of electricity, retail services, billing and contracts between the parties and the South Australian government whose duty is to provide funding through loans and grants through the instrumentality of the Renewable Technology Fund.

4.3.5.2 Home State Battery Scheme

The home state battery scheme[572] is a strategic plan to lower the electricity rates for all South Australians who purchase the home battery system. The state government provides subsidies to help pay for installing the systems. This project is also supported by funding from the Clean Energy Finance Corporation which also helps household pay for the remaining part of the subsidized electricity system installation.[573] The components of the home state battery includes a battery, an inverter and rooftop solar panels. The consumers also have the option of requesting a backup power system to prevent power failures and uninterrupted power supply even during extreme cases of black out.[574]

4.3.5.3 Small-scale grid connection in South Australia

The legal and institutional mechanism in place for small scale grid connection is that a renewable energy generation proponent must seek approval from the electricity distribution company to gain access and connect to the grid. The application for approval to connect is filed by the applicant's solar retailer and the distribution company on his behalf through the completion of a small embedded generator request form. An approval number is issued

[571] This is an Australian electricity startup company whose aim is to provide energy through cleaner sources at cheaper and fairer rates.

[572] "South Australia's Home Battery Scheme", online:<https://www.homestatebatteryscheme.sa.gov.au>.

[573] *Ibid.*

[574] *Ibid.*

within a specific number of days depending on the capacity of the intended project; then installation commences. The second stage involves contract negotiation and signing between the electricity generator and the electricity retailer, other necessary conclusions on the terms of the feed-in tariff are also made at this stage. After an agreement has been reached with the retailer, the necessary arrangements are made to install the meter through the required application. The duration of installation is largely dependent on the location.

Once approval has been obtained, the applicant's electricity system is reconfigured to grant him access and connection to the grid in accordance with the applicable terms. The installer is also expected to complete an electrical certificate of compliance and to make copies of it available to the power company and the electricity consumers. Finally, the distribution company notifies the retailer of the connection and the necessary changes are reflected in the following electricity bill.[575]

4.3.4 Comparative Analysis between the Australian Model and the Nigerian Model

In the energy (electricity) industry, there are four common models of transition, namely the vertically integrated monopoly, the unbundled monopoly, the unbundled model with limited competition and the unbundled model with full competition.[576] Prior to the mid-1990's when Australia's electricity system was restructured, the first model was in operation. However, it currently operates on the fourth model. In Nigeria, the electricity system of operation was in accordance with the first model prior to 2005. The current structure is the third model, which unbundled the vertical monopolistic structure (NEPA) and encourages limited competition.

Thus, in the light of the aforementioned, the first distinction to be drawn between the Australian electricity sector and the Nigerian electricity sector is based on the degree to which competition is allowed in its power sector. A successful electricity sector thrives on

[575] <https://www.solaraccreditation.com.au>.

[576] Leigh Tesfatsion "Electric Power Markets in Transition: Agent-based modeling tools for transactive energy support" online: <https://doi.org/10.1016/bs.hescom>.

two major indices: “freedom of expertise and the freedom of choice of the consumers”.[577] From the structural analysis of the Australian electricity sector undertaken above, it is evident that the power sector is not only unbundled but also encourages full completion in its activities signified by the existence of its competitive electricity market pool earlier discussed and administered through the *Competition and Consumer Act of 2010*. On the other hand, Nigeria does not operate a fully deregulated system despite its unbundled nature.[578] Its electricity sector is governed by structural licensing guidelines that provide for the requirements to be fulfilled before an entity can be engaged in any of the core activities in the industry. The guidelines set are also to be administered through the national electricity body known as the NERC.

The second distinction between the two electricity systems also relates to the structure of the sector and is similar to the previously highlighted distinction between the Nigerian and Ontarian models of electricity. The Australian electricity sector applies segmentation in adopting legal and structural reforms in its power sector. Although there is a National Electricity Market, each State is individually responsible for adopting laws and policies that would effectively enhance its electricity industry. In Nigeria the electricity market is centrally administered.

Another significant difference between the two systems is the fiscal incentive (subsidy) introduced by the government of South Australia in order to foster the generation of electricity through renewable energy sources. As highlighted above, the government of Australia both at the federal and state levels had financial initiatives in place in the form of specific and general rebate programs. The specific rebate programs were for households that would install the photovoltaic systems while the general rebate programs were targeted as incentives to households that would convert their individual electricity facility from

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[577] J Schultz & O Sharpe, “The Role of Regulation in Australia’s Future Energy Mix” (Environment and Climate Change law Library: Adelaide, Australia, 2014) , cited in Norbert Edomah, Chris Foulds & Laed Jones “The Role of Policy Makers and Institutions in the Energy Sector: The Case of Energy Infrastructure Governance in Nigeria” (2016) 8:829 Global Sustainability Institute 1 at 15 n 45. <https://www.mdpi.com/journal/sustainability>.

[578] J Iseolorunkanmi, “Issues and Challenges in the Privatized Power Sector in Nigeria” (2014) 6: 1 Journal of Sustainable Development Studies 161, cited in Kalu Ukoha & E K Agbaeze, “Deregulation of the Nigerian Power Sector on Performance: A Review” (2018) 148: 3 European Journal of Scientific Research 377 at 385 n 9.

fossil fuel-based sources to renewable energy sourced electricity. These programs catered for both grid-connected and stand-alone systems. Other initiatives adopted in the South Australian model include the Mandatory Renewable Energy Target (MRET);[579] the introduction of tradable renewable energy certificates and a shortfall charge fee as mechanisms for enforcing the MRET;[580] and the tax strategy implemented through the carbon pricing mechanism replaced by the direct action policy.[581] A critical review of these incentives and the financial incentives in the Nigerian electricity industry like the feed in tariff mechanism reveals that Nigeria does not have a robust and convincing financial strategy to safely transition into a renewable energy based electricity sector, given that the incentives only cater for grid connected electricity and that there is currently no grid connected renewable energy sourced electricity save for the already existing hydro electric plants.

Furthermore, the South Australian government devised strategies for remedying the investment insecurity occasioned by the intermittent nature of the wind and solar renewable energy sources by establishing several battery investment schemes such as the Tesla Battery,[582] the Virtual Power Plant,[583] and the Home State Batteries,[584] as highlighted earlier. On the contrary, Nigeria's *NREEEP* which is the primary policy for renewable energy transition and efficiency, merely exposes the potentials of the renewable energy sector and makes no reference to how investment insecurities triggered by the intermittent nature of some of the renewable energy sources it proposes would be tackled.

Another major distinction to be drawn between the two models is the licensing structure established. The laws in South Australia give investors ample time to invest and get a return

[579] Paul Simshauser, "Garbage Can Theory and Australia's National Electricity Market: Decarbonisation in a Hostile Policy Environment" (2018) 120 Energy Policy 679-713 at 699.

[580] *Ibid*, *supra* note 507.

[581] K Hogg and R.O'Regan *supra* note 520.

[582] *Supra* note 568.

[583] *Supra* note 569.

[584] *Supra* note 572.

on their investment. A major criticism of the current legal regime for the Nigerian electricity industry is the limited period for which licenses are issued.[585]

4.4 Summary and Conclusions

This chapter has analyzed the legal and institutional structure of the electricity industry of Ontario and South Australia through a historical and contextual perspective. A comparative analysis was also made between the two systems and Nigeria to carefully identify gaps in Nigeria's present electricity legal framework structure. The study of both systems reveals that the major trends in the electricity sector that foster energy transition include 'decentralization', 'proper deregulation', and a 'low carbon footprint'. Therefore, until the structural and legislative imbalances have been resolved, there will be little or no progress because drawing inference from the two models analyzed, market reform/ restructure is inevitable, beginning from the constitutional division of powers, to the conflicts in the laws accompanied by other antecedent failures occasioned by the limited competition currently in operation in the Nigerian power sector.

[585] This has been dealt with in previous chapters.

Chapter 5

5 Conclusions and Recommendations

5.1 Introduction

Javier Betancourt of the USAID- funded Renewable Energy and Energy Efficiency Project (REEEP), a project launched in 2013 to electrify Nigeria through mini-grids and emphasis on renewable energy sources, posited that-

> …there are many communities …most actually …where extending the grid is a net present value-losing proposition. You will never get enough money out of these communities to justify doing this. You can't electrify everybody using the grid or large-scale generation. The best solution are mini-grids this is the future. But there needs to be a template in Nigeria for how this is going to evolve.[586]

Thus, a safe transition to low-carbon energy in Nigeria's power industry must encapsulate small-scale renewable electricity generation, such as roof top solar technologies and other small wind and hydro power facilities, because these indirectly have a positive impact on the electricity market by lowering the demand on grid-connected electricity. Consequently, the world is advancing its electricity models to incorporate viable off-grid options as opposed to having absolute reliance on grid connected electricity and Nigeria must reform its laws and institutions accordingly.

In the light of the foregoing, the following recommendations are proposed by the writer as viable solutions to the Nigeria electricity sector problems:

[586] "In Nigeria, a Template for Solar-Powered Mini-Grids Emerges", online:<https://www.greentechmedia.com>.

5.2 Recommendations

5.2.1 Proposed Structural Adjustments

The proposed structural adjustments will be dealt with under three subheadings namely:

i. Decentralization of the Nigerian electricity system
ii. Harmonization of the electricity laws and institutions
iii. Deregulation of the Nigerian electricity system

5.2.1.1 Decentralization of the Nigerian electricity system

The electricity business is very technical because it cuts across various sectors of the economy, such as the legal, finance, tax, public, private, engineering and economic sectors. In fact, since it is directly linked to the mainstay of Nigerian economy, (the petroleum sector), it is considered to be a very sensitive sector because once there is a decline in the performance of the industry, it negatively affects the output of the nation.[587] Therefore, the methods of operation or governance in the industry should be very specific to the country involved — in this instance, Nigeria.

"To decentralize is to deprive of centralization; to cause to withdraw from the center or place of concentration; to divide and distribute (what has been united or concentrated), as authority or the administration of public affairs."[588] Decentralization is often considered as the most prominent solution to most socio-economic challenges, like that of the electricity sector in Nigeria.[589] In Nigeria, unlike other parts of the world, electricity supply decisions

[587] See Sadikat M Ibrahim et al, "The Impediment to Nigeria Understanding Oil Production Volumes, Losses and Potential Solutions" (2017) 36 International Journal of African and Asian Studies 36 at 36; Yinka Omorogbe, "The Legal Framework for the Production of Petroleum in Nigeria" (2015) 5 Energy and Natural Resources L 273 at 273; Eghosa Osa Ekhator, "Public Regulation of the Oil and Gas Industry in Nigeria: An Evaluation" (2016) 21:1 Annual Survey of International and Comparative Law, 43 at 89.

[588] Definition of decentralization adopted from the *Webster's New International Dictionary* (2nd ed, unabridged).

[589] M Nyendu, "Democratic Decentralization in Ghana: The Need for a Policy Review", (2012) 47:2 Journal of Asian and African Studies 221, cited in Toyin Cotties Adetiba & Aminur Rahim, "Decentralized Governance in Nigeria: A Means to an End" (2012) 2:8 Research on Humanities and Social Sciences.

are reached at the center by the federal government. It would be paramount at this stage for emphasis to reiterate the provisions of *Paragraph 13 and 14 Part II Second Schedule Constitution of the Federal Republic of Nigeria* 1999, as amended, in order to identify what proposed changes are to be made to the Nigerian laws. These provisions are as follows:

"The National Assembly may make laws for the Federation or any part thereof with respect to-

(a) Electricity and the establishment of electric power stations;
(b) The generation and transmission of electricity in or to any part of the Federation and from one state to another state
(c) The regulation of the right of any person or authority to dam up or otherwise interfere with the flow of water from sources in any part of the federation;
(d) The participation of the federation in any arrangement with another country for the generation, transmission and distribution of electricity for any area partly within and partly outside the Federation;
(e) The regulation of the right of any person or authority to use, work, operate any plant apparatus, equipment or work designed for supply or use of electrical energy."[590]

"A House of Assembly may make laws for the state with respect to-

(a) Electricity and the establishment in that State of electric power stations;
(b) The generation, transmission and distribution of electricity to areas not covered by a national grid system within that state; and
(c) The establishment within that state of any authority for the promotion and management of electric power stations established by the state."[591]

From the foregoing, both the federal and state governments have the power to make laws and regulate electricity supply as shown in the concurrent list. However, most actions, policies and programs in the industry are still mainly determined at the federal level. Decisions in the power sector are reached centrally for the 36 states and the capital, through

[590] Paragraph 13, part II Second Schedule of the *Constitution of the Federal Republic of Nigeria* 1999 as amended.

[591] *Ibid*, para 14.

the instrumentality of the *EPSRA*[592] and the laws only permit the state government to make laws for areas in their state not covered by the national grid.[593]

This, to the writer, is the beginning of the structural problems in the industry. Therefore this thesis recommends that the laws be amended to reflect electricity as a matter exclusively under the legislative jurisdiction of the states as is the model in both the Canadian and Australian systems compared in chapter four, which are countries that share similar fossil fuel background with Nigeria and have a similar legal structure in operation.[594] The proposed amendment will not be difficult because, unlike the *Canadian Constitution* that is largely unwritten, Nigeria operates a written Constitution and its amendment procedure is provided for in section 9[595] which gives the National Assembly the power to alter any of the provisions of the constitution, provided such alteration is backed by the votes of "not less than two-thirds majority of all the members of that house and approved by resolution of the Houses of Assembly of not less than two-thirds of all states".[596] The amendment procedure is subject to section 58(1) of the *Nigerian Constitution* which states that the presidential assent is needed and where he withholds his assent, each house would pass the bill by a two-thirds majority and the bill shall become law without the assent of the president. The *Nigerian Constitution*, has been amended four times since the first release of its *Alteration Act* in 2010.[597]

This recommendation is as a result of the fact that the dual approach made by the laws for resolving the issue has not yielded much result since its inception. Putting electricity under the exclusive jurisdiction of the state would amount to a grassroots approach for resolving the problems in the electricity sector. The proposed system would be structured to ensure

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[592] *EPSRA.*

[593] *Supra* note 590.

[594] Both systems operate the federal system of government see: S3 of the *Commonwealth of Australia Constitution Act* and s 91 and 92 of the *Constitution Act*, 1867.

[595] S9 *Constitution of the Federal Republic of Nigeria 1999 as amended.*

[596] S9(2) *Constitution of the Federal Republic of Nigeria, 1999 as amended.*

[597] See: *Constitution of the Federal Republic of Nigeria* (First Alteration) Act, 2010; *Constitution of the Federal Republic of Nigeria* (Second Alteration) Act, 2010; *Constitution of the Federal Republic of Nigeria* (Third Alteration) Act 2010; *Constitution of the Federal Republic of Nigeria* (Fourth Alteration) Act, 2017.

that each state is left to devise strategies, plans and beneficial programs that would positively develop its power sector and the federal level would be left to deal with international and state interconnection concerns.[598] Interconnection of lines to create dependency between one state and another is also encouraged to enhance availability in the case of blackouts. Thus, Paragraph 13(b) and (d) should be retained as federal jurisdictional matters while Paragraph 13 (a) (c) and (e) should be made exclusive state matters. Also, drawing inference from the South Australian strategy adopted in 2016 during its black out, this thesis proposes that Paragraph 14 (b) should be expunged from the constitution and replaced with viable off-grid solutions supervised by the local governments; where rural areas within the state are located far away from the grid and its interconnected systems they should be allowed to create an electricity hub for the purposes of generating their own electricity, with the ability to connect to and feed into the grid in the event of excessive generation.

5.2.1.2 Harmonization of Laws and Institutions

There is an urgent need to streamline the provisions of the laws that govern the electricity sector in Nigeria. The first step would be to resolve the conflict between the *Nigerian Constitution* and the *EPSRA.* The *EPSRA* introduced the NERC in section 31,[599] which automatically usurped the state governments of their functions in the power sector. These instances include: giving the NERC the power to make regulations for "captive power generation"[600]- which includes off-grid electricity matters and the development of the Rural Electrification Agency, both being initiatives run federally through the instrumentality of the *EPSRA.* These ought to be controlled by the state governments.

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[598] See, e.g., s 92(10)(a) *Constitution Act* of 1867; and the case of *Hewson v Ontario Power Co of Niagara Falls*, [1905] SCJ No 59, 36 SCR 596 (SCC), which buttress the fact that the federal government of Canada has jurisdiction over interprovincial electrical operations.

[599] *EPSRA*, s 31.

[600] See *EPSRA*, s 62(2)(a) *EPSRA* s 100 defines 'captive generation' as "generation of electricity for the purposes of consumption by the generator and which is consumed by the generator itself and not sold to a third party.''

Also, as part of the structural adjustment, there is a need to harmonize all the laws that are responsible for the power sector in Nigeria with a view to properly state the roles of each institution created in the sector without conflict. For example, the corporate sector of Nigeria has harmonized laws tagged the *Companies and Allied Matters Act*[601] which effectively deals with all subsectors in the corporate sector, and it has one major commission that primarily deals with the issues that arise out of corporate affairs in Nigeria. This makes it easier to acquaint oneself with the procedural requirements for business in the sector. However, in the Nigerian electricity sector, there is a plethora of laws and policies that set different targets and strategies for the same purpose of increasing access to electricity in Nigeria; this is the main reason for the lack of clarity in the power sector. For example, as highlighted in Chapter 4, the *NREEEP* sets the national target at 40,000 MW of installed capacity by 2020. On the other hand, the *NERC Regulations on Feed in Tariff for Renewable Energy Sourced Electricity in Nigeria* sets the same target at 10,000 to 20,000 MW by 2020. Also, the institutional roles of the NERC conflict with the provisions of the Constitution.

5.2.1.3 Deregulation of the Nigerian electricity system

The third proposed solution to ensure proper structural adjustment in the Nigerian electricity system is to encourage careful deregulation of the system. As highlighted in Chapter 2, the electricity model in operation in Nigeria is an unbundled system with limited competition, characterized by regulatory and institutional bottlenecks. Part of the transferable lessons from the analysis of the South Australian system is deregulation, especially in the generation of electricity. The structure of the South Australian model attracts investors to the electricity sector and gives consumers the prerogative to choose which of the generators would be their provider and also what form of retail contract they would prefer signing. However, the writer is of the opinion that if a fully competitive market were to be operated in Nigeria, care should be taken to ensure that the forces that

[601] *Companies and Allied Matters Act* Cap C20 Laws of the Federation of Nigeria.

increase the prices are in check.[602] This could be achieved by introducing a separated body to oversee the activities and processes carried out by the primary electricity body in each state.

5.2.2 Recommendations Relating to Rural Electrification Efforts

5.2.2.1 Inadequate Provisions for Small-scale Renewable Electricity in Nigeria

Unlike the South Australian model that streamlines the steps to be taken in order for consumers to produce their own electricity, and feed extra production into the grid, there is no clear strategy for such initiative in Nigeria. Although the licensing structure implies that the possibility exists for individuals to be involved in any of the three main activities of the electricity sector and their subsectors,[603] the steps are not clear and the writer is of the opinion that this is a major reason why, 14 years after the electricity licensing structure has been put in place, there has still not been any successful small-scale renewable electricity grid connection. Therefore, the writer recommends that a review of sections 7–10 of the *NERC Regulations for Mini-Grids* should be mandated and the application form for the Mini Grid permit and development should be amended to expunge the option of developing diesel-based mini-grids[604]

Another militating factor is the inadequacy of Renewable Energy feed in tariff strategies in the *Regulations* that exclude off-grid electricity sources. The *Nigerian Electricity Regulatory Commission, Regulations on Feed in Tariff for Renewable Energy Sourced Electricity in Nigeria* in *Paragraph 6b* states that—

> Off-grid projects shall not be included in the REFIT arrangement. NERC shall work in close consultation and collaboration with the Rural Electrification Agency to develop the technical and operational modalities for off-grid projects.

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[602] Some of the forces that increase the prices in a deregulated market includes: corruption, the lack of political will, inefficiency of the national market regulations and inadequate supervision which gives rise to the emergence of a monopolistic structure in the deregulated market.

[603] *EPSRA,* s 62.

[604] *NERC Regulations for Mini-Grids* 2016; ss 7-10; See also annex 3, particularly at 5.0.

Therefore, it is strongly suggested that the *REFIT* program as enunciated in *paragraph 6b* be expanded to include the legal modalities for boosting *REFIT* for off-grid project purposes. Also, the capacity of off-grid electricity generation that is possible without the need for a license should be increased for Nigerians[605] in order to reduce their reliance on the main grid and boost energy independence.

5.2.2.2 Grid Resilience/Restructuring

One of the measures stated in the *EPSRA* for improving access to electricity is the expansion of the grid. However, it is not logical to advocate for expansion of the grid without adequate schemes in place to boost the resilience of the grid. Thus, in addition to mandating the Minister to submit reports to the President on the progress and achievement of the Rural Electrification Strategy and Plan, including grid expansions, section 88(9) of the *EPSRA* should be amended to include a requirement that the Minister should report to the government on the plans being made for the adoption of smart grid technologies[606] and the restructuring of the grid system to operate as a parent to six interconnected grid systems representing the six geopolitical zones of Nigeria.[607] This would also boost grid renewable electrification in Nigeria. (See in this regard **Annex A: Nigeria's New Proposed 'Decentralized, Deregulated and Low Carbon Footprint' Electricity Industry**).

5.2.3 Proposals to Improve the Renewable Energy Mix

5.2.3.1 Primary Sources of Renewable Energy Recommended

The review in chapter two of the various sources of renewable energy available in Nigeria reveals that solar, wind and hydro are the most prominent sources of renewable energy. Therefore, it is highly recommended that the strategies posited in the *NREEEP* be

[605] See *EPSRA*, s 62(2).

[606] See Amuta Elizabeth et al, "Smart Grid Technology Potentials in Nigeria, an Overview" (2018) 13:2 International Journal of Applied Engineering Research, 1191 at 1194.

[607] The World Bank, "National Bureau of Statistics, Nigeria" <https://www.documents.worldbank.org>. The six geopolitical zones in Nigeria include: the south-south, south east, south west, north west, north east, north central.

implemented immediately insofar as these three sources are concerned. Although the *NREEEP* recognizes the availability of other renewable energy sources, the writer recommends that it would be better to focus on these three sources prior to expanding to the remainder. Also, the Nigerian laws omit to cater for the problems associated with renewable energy at the end of the life cycle of the solar panels and wind turbines used for exploitation purposes. Therefore, this thesis also recommends that the *NREEEP* be amended to include strategies on how to deal with these facilities after their use. Also drawing inference from the advantages and disadvantages of onshore and offshore wind power, as well as the geographical availability of the various renewable sources, this thesis recommends that the wind programme targets in the *NREEEP* be amended to include: offshore forms of wind power and hydro power as the prominent electricity source in the Southern part of Nigeria, and solar power as the prominent source in the Northern part of Nigeria.

As was done in the South Australian model, the writer recommends that in incorporating and enforcing measures for the promotion renewable energy sourced electricity it is also pertinent for the electricity laws and institutions to address supply insecurity issues arising from the intermittent availability of wind and solar power, through the establishment of battery schemes to be facilitated through financial incentives as highlighted further down in this chapter.

5.2.3.2 Incentives for Transitioning to Renewable Energy

It is crucial that an inclusive system be developed that makes electricity affordable to all Nigerians. As highlighted in Chapter 3, the projects being carried out by the Renewable Energy Agency focus on persons who can actually pay for the electricity bills, neglecting the fact that many Nigerians live in abject poverty. One of the strategies adopted in South Australia was the introduction of various financial programs fostered by the state government to help pay for home battery installations that cost around a 100 million dollars. Likewise, it is suggested that practical ways to achieve the recommendation in this subsection would include introducing subsidies for renewable energy sourced electricity and financial incentives for households who adopt small scale electricity generation or who

convert their current fossil fuel-based electricity platforms to renewable energy-based platforms. External funding opportunities could also be sought from the World Bank and Non-Governmental Organizations who are committed to improving the electricity sector.[608]

5.2.3.3Prohibition of Fossil Fuels

The careful review of the energy sector strategies in Nigeria has shown that the laws and policies in question aim not so much to phase out conventional sources of electricity, but rather to make renewable energy sources of electricity a mere percentage of the electricity supply mix of Nigeria.[609] Therefore, in the writer's opinion, a notable way to strictly transition the Nigerian energy sector would be by placing a prohibition on the use of fossil fuels in Nigeria for the purposes of electricity generation. This proposed approach is a transferable lesson from the Ontarian electricity model as previously highlighted in chapter 4. The first step taken by the Ontario legislative system was to prohibit the use of coal for the generation of electricity after a specific period of time as posited in the *Cessation of Coal use Regulation*.[610] Therefore, it is suggested that the parts of the laws and policies that state that renewable energy sources be given a priority be retained. However, a new regulation should be enacted with the aim of prohibiting the use of fossil fuels for electricity generation purposes by a certain date to be determined by the federal government through the NERC.

5.2.4 Suggestions re the Practical Implementation of Renewable Energy Technologies

5.2.4.1Collaboration/Partnership with a Successful Region

The writer also recommends that partnerships be established with jurisdictions of the world that have successfully transitioned from being a fossil fuel-based economy to a renewable

[608] Kayode Oladipo et al, "Power Sector Reform in Nigeria: Challenges and Solutions" (2018) IOP Conference Series Materials Science and Engineering.

[609] For example, the NERC regulation on feed in tariff states 2000 MW, which is 10% by 2020.

[610] O Reg. 496/07: *Cessation of Coal Use- supr*a note 479.

energy-based one. Although research shows that partnerships have in the past been formed with provincially owned companies like Manitoba Hydro[611] and international institutions like the World Bank group,[612] it is advisable that efforts should be greatly intensified in this regard to enhance results.

5.2.4.2Introduction of Mandatory Tradable Renewable Energy Certificates

Another transferable mechanism adopted by the Australian government is the introduction of the Mandatory Tradable Renewable Energy Certificates. It is not enough for the laws to prohibit the use of fossil fuels by a certain date through the instrumentality of a regulation and to set capacity targets: it is extremely important to additionally adopt implementation strategies, and one of the primary strategies in this regard is to mandate the admitted electricity retailers and wholesalers to tender certificates indicating the amount of electricity purchased derived from renewable energy sources in accordance with the standard targets set. Punitive measures should also be set to deal with non-compliance in the industry.

5.2.4.3International Interventions

The negative environmental effects of the pollution caused by fossil fuel-based energy is trans-boundary in nature.[613] Although countries have their independence and reserved rights to decide what aspects of international agreements to enforce based on unique signatory and domestication measures, there is still need for the establishment of appropriate international strategies to foster energy transition. In the writer's opinion, secondary attempts such as the establishment of the *Sustainable Energy for All (SE4ALL)* initiative, the *United Nations Framework Convention on Climate Change* and the initiative introduced by the International Renewable Energy Agency have not been very persuasive

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[611] Oke, *supra* note 24 at 38 n 7.

[612] "Mini Grids in Nigeria: A Case Study of a Promising Market- Energy Sector Management Assistance Program" (2017) *World Bank*, online:<https://www.openknowledge.worldbank.org/handle/10986/29016>; The off-grid opportunity in Nigeria-ESMAP <https://www.esmap.org>.

[613] Notable trans-boundary cases are the *Trail Smelter Case (United States of America v Canada)* (1938/1941) 3 RIAA 1905 and *Gabcikovo-Nagymaros Project (Hungary v Slovakia) (Judgment) 1997]* ICJ Rep 7, 41.

to the member states, with the result that the world is not even close to de-carbonizing its energy generation in the near future. If these international organizations could –in the same way it fights against the detrimental effects of fossil fuels on the environment– develop intensive international commitments through hard international laws to reduce reliance on fossil fuels globally by setting binding global targets on member states, it would go a long way to change the negative attitudes of states with large dependence on fossil fuel like Nigeria. Furthermore, an express inclusion of renewable energy expansion as a major strategy for climate change mitigation and adaptation under the *UNFCCC* could represent as a major step forwards.[614]

5.3 Summary

This thesis has dealt with problems in the Nigerian electricity sector, especially relating to inhibiting factors militating against the promotion of small-scale renewable electricity generation. Chapter one provided a general overview of the Nigerian economy with specific focus on its natural resource potential, its population density, electricity derivative sources and the percentage of the Nigerian population without access to electricity. It also highlighted the national and international obligations of the country relating to issues of energy security, energy conservation and environmental standards. Despite the numerous obligations enshrined in the laws, policies and international treaties already adopted and ratified as required under section 12 of the *Nigerian Constitution*,[615] access to electricity has still not improved in Nigeria, because a significant number of persons do not have access to electricity, while the remaining percentage of persons have access to a very limited amount of electricity.

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[614] Bruce Stuart, "International Law and Renewable Energy: Facilitating Sustainable Energy for All" Melbourne Journal of International Law (2013) 14:1 18 at 38-39.It is pertinent to state that the *UNFCCC* does not make express reference to renewable energy save for art 4(1) (c) which posits that member states have the duty "to promote and cooperate in the development , application and diffusion of technologies that 'control, prevent or reduce' emissions in sectors including the energy sector. Also, the *Kyoto Protocol to the UNFCCC* 2303 UNTS 148 which posits the emission reduction targets for the state parties does so in art 2(1) (a) which contains non-binding strategies for state parties to research, develop and foster the use of renewable energy. Theses informed the writer's suggestion above for more stringent hard international regulations.

[615] *Constitution of the Federal Republic of Nigeria* 1999 as amended.

In Chapter two, the possibility of small-scale renewable electricity generation, transmission, distribution and off -take potential were discussed in detail with reference to the limitations set by the *EPSRA* on licensing as enforced by the Rural Electrification Agency and the NERC.[616] Other electricity structural issues such as grid connection, mini-grids and the legal strategies for renewable energy were also outlined. A historical analysis of the evolution of the Nigerian Electricity Supply Industry was posited under three subheadings namely: the colonial regime, the monopolistic regime of NEPA and the liberalization regime. It was further asserted that the landmark contribution of the present liberalization regime is the enactment of the *EPSRA* which brought about reforms such as new licensing structure,[617] electricity tariff structure[618] and the establishment of the NERC.[619] The key functional institutional bodies were further highlighted and examined and the gap in the existing framework was summarized to be the absence of an efficient legal framework that embodies not just the obvious renewable energy potentials of Nigeria, but also provides legal mechanisms for investment and implementation strategies.

Chapter three highlighted Nigeria's renewable electricity source potentials in various forms of energy such as solar, wind, hydro, biomass, geothermal, wave and tidal energy. In analyzing these potentials, the advantages and disadvantages of each of these forms of energy were itemized and the prospective host communities in Nigeria were also enumerated.

Based on successful energy transition strategies adopted by comparable jurisdictions, Chapter four examined two models namely the Ontarian model and the South Australian model. Through a historical analysis, the legislative and institutional frameworks of these models were evaluated. A comparative analysis was also made between these models and the Nigerian model, identifying pertinent differences and gaps for recommendation purposes.

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[616] *EPSRA*, s 62.

[617] *Ibid.*

[618] *Ibid*, s 76.

[619] *Ibid*, ss 31 – 61.

Finally, Chapter five concludes that expanding the national electricity grid is a very expensive option and although this has for long been the goal of the country, all efforts to expand have proved fruitless, especially because of the rising population of the nation. At the moment there are about 200 million people in Nigeria and statistical projection data indicates that this figure will double by the year 2050.[620] Therefore, the strategies previously applied to solving the electricity problem in Nigeria have to be revised in accordance with the current situation.

[620] "Nigeria", online:<https://www.data.worldbank.org>.

ANNEX A

Nigeria's New Proposed 'Decentralized, Deregulated and Low Carbon Footprint' Electricity Industry

THE NIGERIAN ELECTRICITY INDUSTRY

THE FEDERAL GOVERNMENT	**THE STATE GOVERNMENT**	**THE LOCAL GOVERNMENT**
The Federal Government would deal primarily with three matters concerning electricity: i. Domestication and enforcement of international affairs ii. Regulation of interconnection between the various states iii. Develop the timely regulation to eliminate the use of fossil fuel by a definite deadline	Each State Government reserves the right to: i. Make laws, guidelines and policies for the development of electricity in their state. ii. Choose which source of renewable energy would be relied upon based on availability and convenience	Each Local Government within the state would maintain a supervisory role to ensure that remote areas not connected to one of the six proposed grids can conveniently develop mini-grids to provide energy for their household and feed excess energy into the grid

The South-South Geopolitical Zone Interconnected Grid System (Rivers, Akwa ibom, cross river, delta and Edo states)
The South-East Geopolitical Zone Interconnected Grid system (Enugu, Anambra, Imo, Abia, Ebornyi states)
The South West Geopolitical Zone Interconnected Grid System ((Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo states)
The North West Geopolitical Zone Interconnected Grid System (Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara)
The North East Geopolitical Zone Interconnected Grid Sytem (Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe states)
The North central Geopolitical Zone Interconnected Grid System (Abuja, Kwara, Benue, Kogi, Nassarawa, Niger and Plateau states)

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EDUCATION AND QUALIFICATION

University of Western Ontario, London, Ontario

- Master of Laws with focus on Environmental, Energy and Natural Resources Law (in view)

Nigerian Law School, Abuja Nigeria November 2017-August 2018

- Bar Certificate

Afe Babalola University Ado-Ekiti, Nigeria September 2012-October 2017

- Bachelor of Laws (LL.B)

Class of Degree First *Class Honors (Summa cum laude)*

LEGAL EXPERIENCE

Volunteer- **Community Legal Services- Western Law Clinic- University of Western Ontario** (February 2019-till date)

Legal Intern, **Redwood and Oak (Legal Practitioners)**, Port-Harcourt, Nigeria (May 2018-July 2018)

- Participated in client interview sessions
- Attended court sessions and prepared summaries for review by regulatory counsel
- Assisted in the preparation of legal memorandum and summary papers on contemporary energy issues.
- Performed other administrative duties as required by the regulatory counsel
- Assisted in the drafting of legal documents such as affidavits, statement of claims, statement of defense and briefs

Research Assistant, **Institute for Oil, Gas Energy, Environment and Sustainable Development**, **Afe Babalola University** (October 2015 – June 2017)

- Conducted legal and policy research on sustainable development themes such as bio-diversity, climate change mitigation and adaptation, stratospheric depletion of the ozone layer and the legal framework in existence to tackle the underlying problem, mitigation of legal and other attendant risks in relation to investment in the international oil and gas/energy sector and the green economy paradigm as a necessity and not an option in Nigeria.

Legal Intern, **Anthony Bola Adesemoye and Co Chambers**, **Port-Harcourt, Nigeria** (July-August 2015 and July –August 2016)

- Assisted in undertaking legal research on a wide range of corporate, civil and international environmental conservation matters.
- Reported research findings via summary papers and supported documentation during meetings.
- Prepared legal memorandum and legal opinion on various subject matters

Legal Intern, **Chika Idoko and Associates, Legal Practitioners; La Freedom Chambers Port-Harcourt, Nigeria** (July 2017)

- Assisted in undertaking legal research on contemporary issues relating to corporate, civil, environmental, and international energy law matters
- Gathered case law and relevant evidence for court cases
- Summarized transcripts of oral testimonies of parties

MEMBERSHIP OF PROFESSIONAL BODIES

- Member, Nigerian Bar Association
- Member, International Law Association (Nigerian Branch)
- Member, Nigerian Society of International Law
- Associate member of the Nigerian Institute of Chartered Arbitrators

AWARDS

- Most Outstanding Student of the Year, Law Students Society Award, Afe Babalola University, Ado Ekiti 2016/2017 session
- Raymond Zard (ZARTECH) award for the best graduating law student (2017)
- P.C. Adeghije prize for the best graduating law student (2017)

VOLUNTEER ACTIVITIES

Student support worker, Legal Clinic, Afe Babalola University, Ado-Ekiti (2015-2017)
Student Member, Academic Committee of the College of Law, Afe Babalola University, Ado Ekiti, (2016/2017)
Editorial Assistant, Journal of Sustainable Development Law and Policy, Afe Babalola University, Nigeria

PEER REVIEWED PUBLICATIONS

Njokuji Ogechi Judith, "Effective Waste Management as a Key to Sustainability in Nigeria: Challenges and Prospects" Law Students Society Journal (ALSSJ), Afe Babalola University, Ado Ekiti, Nigeria, 2017

Njokuji Ogechi Judith, "Emissions Control as an Effective Tool for Combating Air Pollution in Nigerian Vehicular Emissions" (LL.B Thesis, 2017)

INTERESTS/HOBBIES

Reading and writing, researching, court trial participation, settlement conferences (negotiation, mediation and arbitration), travelling and singing.

LANGUAGES SPOKEN: English and Intermediate French