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Emerging Trends in Resource-Rich Sub-Saharan Africa and a Spotlight on the Nigerian Transitional Energy Market

Tade Oyewunmi* and Ivie Ehanmo†

The sub-Saharan Africa region is rich in energy resources such as oil and gas, solar and biomass, including mineral resources that are essential for the technologies that are needed in securing reliable and sustainably low-carbon energy systems globally. As urbanization and economic growth policies gain traction across the region, it will be essential to develop the local institutions, framework(s) and market structures that will ensure these resources can be accessed and utilized efficiently. Notably, several countries in the region have been on a path towards institutional reform to promote economic growth, industrialization, and energy access and reliability. Thus, considering the significant amount of investments required and the need to foster healthy collaborations between private and public sector stakeholders, the policymakers in various contexts often need to work towards creating a rules-based, investment friendly environment, equitably allocating scarce resources, transparent revenue management framework(s), and economic diversification. This Article begins by highlighting the emerging trends and outlook for energy sector transformation and reforms in selected countries across the region. Since Nigeria has traditionally been the leading energy producer in the region with the biggest economy and peculiar experiences in energy reforms and regulation, this Article will focus on and explore the recent legal and

* © 2021 Tade Oyewunmi, Assistant Professor of Law and Senior Energy Research Fellow at Institute for Energy and the Environment (IEE), Vermont Law School, South Royalton,VT, USA.

† © 2021 Ivie Ehanmo, Partner, George Etomi & Partners, Legal and Regulatory Expert, Energy Market and Regulatory Consultants (EMRC- a member of the MRC Group); Advisor, USAID Power Africa Transaction Reform Program [PATRP]- Nigeria Power Sector Reform Program (NPSP).

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regulatory developments in Nigeria's transitional energy market as a signpost to plausible challenges, solutions, and opportunities.

I. INTRODUCTION

Before COVID-19 struck, several of the major economies in sub-Saharan Africa (SSA) seemed to be grappling with the demands of managing rapid urbanization and economic development, reducing poverty, raising standards of living, and ensuring economic diversification to mitigate the impact of the boom and bust price cycles of exported resources (especially oil) in the international markets.[1] A key factor in the medium- to long-term realization of various economic and development aspirations will be the degree of access to affordable and reliable modern energy services. On a general note, energy enables growth in both developing and developed economy contexts. Historically, the roll-out of long-distance energy networks, operated by vertically integrated utilities as a means of delivering affordable and reliable energy services to an increasing number of people as well as large-scale demand points such as steel and manufacturing industries, is one of the main factors that has supported industrialization and modern standards of living over the past century.

In several jurisdictions, the traditional energy supply systems gradually gave way to wholesale markets in which open access to energy networks was encouraged. Further, emerging technological trends have enhanced the role of an increasing array of distributed energy resources and renewable energy systems as part of the drive towards decarbonization and sustainability. Some African countries are also adopting such paradigms and approaches to energy, even though there are still considerable institutional developments and investments required to achieve the desired objectives of secure, reliable, and affordable energy access for all.[2] From the late 1990s and 2000s until present times,

1. GUY BLAISE NKAMLEU ET AL., AFRICAN ECONOMIC OUTLOOK 2020: DEVELOPING AFRICA'S WORKFORCE FOR THE FUTURE 1-35 (2020), https://www.afdb.org/en/documents/african-economic-outlook-2020 [https://perma.cc/W66P-VKC8] (for instance, Nigeria was implementing an Economic Recovery and Growth Plan (2017–20), South Africa, Ghana, Kenya and Senegal all had some form of ongoing economic and/or energy sector reforms); *see generally* ANTHONY SIMPASA ET AL., WEST AFRICA ECONOMIC OUTLOOK 2020: COPING WITH THE COVID-19 PANDEMIC (2020), https://www.afdb.org/en/documents/west-africa-economic-outlook-2020-coping-covid-19-pandemic [https://perma.cc/4ADX5A2H]; *see generally* FERDINAND BAKOUP ET AL., REGIONAL ECONOMIC OUTLOOK 2019: WEST AFRICA (Augustin Fosu & Peter Montiel eds., 2019), https://www.afdb.org/en/documents/document/regional-economic-outlook-2019-west-africa-108624 [https://perma.cc/4RQZ-2VJD]. Nine countries reportedly saw growth of at least 5.0 percent in 2017 and 2018, and five have been growing at that rate since 2014–16. Prior to the outbreak of the COVID-19 pandemic, West Africa region was poised to expand by 4.0 percent in 2020. *Id*.

2. *See generally* BAKOUP, *supra* note 1.

countries such as Nigeria, South Africa, and Kenya facilitated the participation of privately-owned Independent Power Producers (IPPs) to operate alongside state-owned utilities. Other countries are similarly designing and implementing reforms to their traditional utility model for electricity supply by creating institutions such as "independent system operators to carry out responsibilities for least-cost generation planning, power procurement, system operation, and power dispatch, and transmission and distribution planning."[3]

The legal and regulatory institutions have a pivotal role to play in the drive towards achieving universal energy access and a more sustainable path towards rapid economic development and growth.[4] It is important to have a clear and efficient framework, comprising independent institution(s) for economic regulation, which creates an equitable, rules-based playing field for electricity providers, consumers, and private operators, and cost-reflective tariffs for utilities, while still ensuring the obligation to serve and provide reliable and affordable energy.[5] There is a growing inclination for decentralized systems based on available energy sources such as natural gas and distributed renewables. These systems could serve as a means of reaching the areas underserved by the traditional grid-based networks. Hence, such a legal and institutional framework would, among other things, provide a firm basis for (i) supporting community-based financing; (ii) construction and operation of micro-grids and independent distribution networks; (iii) third-party generators and operators seeking market access; (iv) clarifying facility siting requirements; (v) guaranteeing the parameters for ensuring affordability

3. *See generally* GABRIELLE DYSON ET AL., REVISITING REFORMS IN THE POWER SECTOR IN AFRICA, (2019), https://www.afdb.org/en/documents/revisiting-reforms-power-sector-africa [https://perma.cc/U4VU-T4XE] [hereinafter REVISITING REFORMS]; Anton Eberhard et al., *Kenya's Lessons from Two Decades of Experience with Independent Power Producers*, 52 UTIL. POL'Y J. 37, 37 (2018) (discussing IPPs within the Kenyan electricity sector); Hugh Corder & Terhemen Andzenge, *Regulation as a Catalyst for the Electrification of Africa*, *in* ENDING AFRICA'S ENERGY DEFICIT AND THE LAW: ACHIEVING SUSTAINABLE ENERGY FOR ALL IN AFRICA 71, 77-78 (Yinka Omorogbe & Ada Okoye Ordor eds., 2018). The countries with more extensive records of sectoral reforms pertaining to regulatory frameworks, allowing private sector participation, encouraging competition in generation and retail, and restructuring the traditional state-owned utility include Kenya, Nigeria, Ghana, South Africa, and Uganda. They appear to be making more progress in terms of their legal and regulatory approaches to developing viable energy systems and markets. *Id*.

4. Corder & Andzenge, *supra* note 3, at 79; Tade Oyewunmi, *Principles and Rationales for Competitive and Secure Gas Markets*, *in* REGULATING GAS SUPPLY TO POWER MARKETS: TRANSNATIONAL APPROACHES TO COMPETITIVENESS AND SECURITY OF SUPPLY 53, 66 (2018) [hereinafter *Regulating Gas Supply to Power*].

5. Corder & Andzenge, *supra* note 3, at 80.

and reliability; (vi) establishing energy efficiency standards; (vii) establishing energy conservation and demand response measures; (viii) the creation and management of cross-border interconnectors; and (ix) ensuring that civil society has the opportunity to participate in the energy decision-making process.[6]

This Article aims to briefly highlight the emerging trends and outlook for energy sector transformation and the reforms in selected countries across the sub-Saharan Africa sub-region in Part II. It then focuses on the recent legal and regulatory developments in Nigeria's transitional energy market as a signpost to plausible challenges, solutions, and opportunities that others may face in Part III. Undeniably, all countries, especially in Africa, have their own peculiar social, political, and economic attributes; however, there are some common elements in an energy market transitions and development context which most of the countries face. Such common elements include:

- abundant local primary energy resources such as oil, gas, hydro, and solar but insufficient local market structures and delivery networks;[7]
- reliance on traditional sources in the rural areas, while urban areas tend to rely on inadequate grid-based energy or standalone systems and back-up generators fueled by oil and diesel;
- under-investment in transmission and distribution networks, although from the 2000s there has been growing attention to energy policy reforms, private sector participation, and liberalization;[8] and
- the affordability and network constraints for grid-based supply.

Nigeria typically takes the lead in several issues, including the size of domestic oil and gas resources, the economy, and the population, as well

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6. Yinka Omorogbe, *Universal Access to Modern Energy Services: The Centrality of the Law*, *in* ENDING AFRICA'S ENERGY DEFICIT AND THE LAW: ACHIEVING SUSTAINABLE ENERGY FOR ALL IN AFRICA 5, 21 (Yinka Omorogbe & Ada Okoye Ordor eds., 2018).

7. Tade Oyewunmi, *International Petroleum Transactions and the Development of Gas-to-Power Markets in West Africa*, 17 OIL, GAS & ENERGY L.J. 1, 18 (2019) (discussing how no gas is being supplied to public power plants under the PRG framework) [hereinafter *International Petroleum Transactions*]; Rahmat Poudineh & Tade Oyewunmi, *Natural Gas in Nigeria and Tanzania: Can it Turn on Lights?*, 115 OXFORD ENERGY F. 1, 18 (2018) (discussing rural populations utilization of wood, charcoal, manure, and crop residues for household energy use).

8. Sam Amadi, *Improving Electricity Access through Policy Reform: A Theoretical Statement on Legal Reform in Nigeria's Power Sector*, *in* ENDING AFRICA'S ENERGY DEFICIT AND THE LAW: ACHIEVING SUSTAINABLE ENERGY FOR ALL IN AFRICA 375 (Yinka Omorogbe & Ada Okoye Ordor eds., 2018).

as in the process of market liberalization and reform efforts.[9] Notwithstanding this, the emphasis on emerging trends in Nigeria discussed in Part III shows, among other things, that sectoral reforms or announcing a scheme of energy-related master plans are not "ends" in themselves, but a "means" to one or more ends, which includes ensuring reliable and affordable energy supply to support growing social and economic development.[10] A major determinant to realizing the ends is often the extent to which the local market structures, capacities, and institutions are supported by law and good quality regulation.[11] This Article goes on to examine the regulatory framework governing the Nigerian Electricity Supply Industry (NESI) with particular emphasis on the evolution of the on-grid and off-grid electricity systems and the increasing role of renewable energy in a developing economy that is equally rich in hydrocarbons and thus relies considerably on natural gas for electricity generation. It discusses the challenges with on-grid electricity supply and the increasing role of off-grid power supply in ensuring reliable access to electricity supply.

II. ENERGY OUTLOOK IN SELECTED SSA CONTEXTS

The International Energy Agency (IEA) recently noted that "Africa needs a significant scale-up in electricity-sector investment in generation and grids."[12] About $120 billion USD per year would be required between 2019 and 2040 to achieve reliable electricity supply for all.[13] To realize such objectives and capital influx, it is necessary to ensure appropriate legal and institutional structures exist which will support the development of viable markets and efficient utilities. Such institutions will need to deal with issues regarding commercial risks and technical losses, and to facilitate public participation and protection of property rights, as well as reasonable returns on invested capital. The countries with a sound local financial sector, coupled-with structural and economic growth indicators

9. *Nigeria*, GAS EXP. COUNTRIES F. (2019), https://www.gecf.org/countries/nigeria [https://perma.cc/K8CD-CSSJ]; Prinesha Naidoo, *Nigeria Tops South Africa as the Continent's Biggest Economy*, BLOOMBERG (Mar. 4, 2020, 2:26 AM), https://www.bloomberg.com/news/articles/2020-03-03/nigeria-now-tops-south-africa-as-the-continent-s-biggest-economy [https://perma.cc/75QL-3TGY]; *Regulating Gas Supply to Power*, *supra* note 4, at 67.

10. Amadi, *supra* note 8, at 344.

11. *Regulating Gas Supply to Power*, *supra* note 4, at 67.

12. *See generally* INT'L ENERGY AGENCY, AFRICA ENERGY OUTLOOK 2019 (2019), https://www.iea.org/reports/africa-energy-outlook-2019 [https://perma.cc/MN4E-GR99].

13. *Id.*

may have an edge in securing local and international investments.[14] While energy demand is projected to grow at 3.5% per annum (p.a.) over the next couple of decades, the availability of resources domestically, or access to affordable supplies via imports for those with limited domestic options, would be essential.[15] Within the past decade, about 30% of global oil and gas discoveries have been in sub-Saharan Africa.[16] The continent has about 488 trillion cubic feet (Tcf) of proven gas reserves, and gas production is projected to increase by 110%.[17] In addition, there have been a series of major discoveries in recent years in East Africa (Mozambique and Tanzania), Egypt, West Africa (Senegal and Mauritania), and South Africa, which collectively accounted for "over 40% of global gas discoveries between 2011 and 2018."[18] To realize the full potential inherent in availability of domestic gas resources in the region, the relevant production and supply projects will need to be bankable,[19] thus requiring applicable legal, regulatory, and contractual frameworks that are designed to enhance timely investment decisions and effectively mitigate post- and pre-completion risks.[20] There is now a significant paradigm shift from developing projects (e.g., started in the 1990s to 2000s) mainly as a means of creating alternative sources of export and foreign exchange earnings, towards domestic supply and utilization for electricity, commercial, and industrial uses. Developing a viable value chain for domestic gas utilization options such as cooking gas, liquefied petroleum gas (LPG),

14. *Id.*

15. *Id.*; Yinka Omorogbe & Tade Oyewunmi, *Oil and Gas Law and Policy in West Africa*, 2017 OIL, GAS & ENERGY L.J. 1, 1 (2017).

16. AFRICA ENERGY OUTLOOK, *supra* note 12.

17. *Energy Outlook 2019: Insights from the Evolving Transition Scenario–Africa*, BP, (last visited Dec. 15, 2020), https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2019-region-insight-africa.pdf [https://perma.cc/XW8Y-TXHQ]; BP PLC, STATISTICAL REVIEW OF WORLD ENERGY 2018, 26 (2018); *see generally* BOSTON CONSULTING GRP. ET AL., 2018 GLOBAL GAS REPORT (2018).

18. AFRICA ENERGY OUTLOOK, *supra* note 12.

19. *See generally International Petroleum Transactions*, *supra* note 7 ("'Bankable' gas or energy supply project or proposals can be regarded as those with sufficient collateral, future cashflow, and high probability of success, that is acceptable to institutional lenders or stakeholders for financing and investment decisions. In other words, considering the overall structure of the project vis-à-vis risks and returns, relevant lenders, sponsors or financiers are willing to support it. Any risks to the stability of cashflows and reasonable returns, whether due to changes in law, taxation or regulation; or supply and service interruption due to political interference or terrorist action or sabotage of infrastructure, will be crucial").

20. Tade Oyewunmi, *The Evolving International Gas Market and Energy Security in Nigeria*, *in* 237 ENERGY IN AFRICAN DEVELOPING ECONOMIES: POLICY, MANAGEMENT AND SUSTAINABILITY 117-45 (Sola Adesola & Feargal Brennan eds., 2019).

and gas-to-power systems provide considerable options in reducing the reliance on traditional sources such as biomass, charcoal, and heavy oil, which are widely known to be unsustainable and create health and safety risks. In the sub-region, bioenergy is the largest source of energy, accounting for two-thirds of final energy consumption.[21] Interests around an integrated approach towards the deployment of off-grid and mini-grid applications powered by renewables such as solar is also gaining traction and will expectantly play a major role in enabling universal energy access.[22]

With regard to electricity, the demand is currently reported to be about 700 terawatt-hours (TWh) (with North African economies and South Africa accounting for over 70% of the total).[23] This demand is expected to rise to over 1,600 TWh or reaching about 2,300 TWh by 2040 to support growth in residential, commercial, and industrial applications.[24] Despite the abundant solar resources available in most locations, Africa is reported to have only about 1% of the global installed capacity. Solar systems utilization is expected to grow as more policy initiatives and steps towards off-grid solutions are implemented. Regarding wind energy, countries with advantageous wind locations and resources are expected to allocate more resources towards more wind energy, especially Ethiopia, Kenya, Senegal, and South Africa, while Kenya is making significant efforts towards geothermal development.[25]

A. South Africa

Oil and coal have traditionally played a key role in South Africa's economic growth and energy supply mix.[26] As a result of the carbon-

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21. AFRICA ENERGY OUTLOOK, *supra* note 12 ("Around 850 million people in Sub-Saharan Africa rely on the traditional use of biomass, cooking with inefficient stoves, while another 60 million rely on kerosene or coal to meet their daily energy needs. Cooking with polluting fuels and stoves has major health and environmental consequences and was linked to almost 500 000 premature deaths in 2018. Less than 200 million people in sub-Saharan Africa currently have access to cleaner options such as LPG, natural gas, electricity or improved biomass stoves").

22. SUSTAINABLE ENERGY FOR ALL, INTEGRATED ELECTRIFICATION PATHWAYS FOR UNIVERSAL ACCESS TO ELECTRICITY: A PRIMER 14 (2019).

23. AFRICA ENERGY OUTLOOK, *supra* note 12.

24. *Id.*

25. *Id.*

26. U.S. ENERGY INFO. ADMIN., SOUTH AFRICA, (Oct. 26, 2017) https://www.eia.gov/international/analysis/country/ZAF [https://perma.cc/T9KH-9586] [hereinafter EIA ON SOUTH AFRICA] ("South Africa's economy is heavily dependent on coal, as it accounts for about 70% of the country's total primary energy consumption; while the electricity sector accounts for more than half of the coal consumed, followed by Sasol's petrochemical industries, metallurgical industries, and domestic heating and cooking.")

intensity and sustainability issues arising from such reliance on coal and oil, it has become increasingly important to facilitate the transition towards cleaner and less hazardous energy systems which are accessible, affordable, and guarantee similar levels of energy and economic security.[27] The country has a well-developed electricity network and a very high rate of electrification and access compared to others in the SSA region.[28] It also supplies electricity to other countries in the Southern African Development Community (SADC) sub-region.[29] Arguably, the most efficient or cost-effective way to connect those without access in the South African context is to extend the grid to about 81% of the population, while the remaining can be affordably served by mini-grids and stand-alone systems.[30] Due to the need for retiring and reducing reliance on an aging fleet of carbon-intensive coal, the government launched policy and regulatory initiatives to enhance the utilization of gas-to-power and renewable energy systems, including concentrating solar power (CSP).[31] According to the White Paper on Renewable Energy of 2003, the government sought to promote various renewable energy sources and laid down a ten-year target in this regard.[32] Additionally, the "national Integrated Resource Plan (IRP 2010) which was promulgated in May 2011 set a more ambitious target of 17,800 MW of renewable energy to be

27. *Africa Energy Outlook*, *supra* note 12; Phebe Asantewaa Owusu & Samuel Asumadu-Sarkodie, *A Review of Renewable Energy Sources, Sustainability Issues and Climate Change Mitigation*, 3 CIV. & ENV'T ENG'G 1, 9 (2016); RABIA FERROUKHI ET AL., RENEWABLE ENERGY BENEFITS: MEASURING THE ECONOMICS 3, (2016).

28. INT'L ENERGY AGENCY, SOUTH AFRICA ENERGY OUTLOOK 2020 15 (2020), https://iea.blob.core.windows.net/assets/1d996108-18cc-41d7-9da3-55496cec6310/AEO2019_SOUTH AFRICA.pdf [https://perma.cc/RR62-BUZK].

29. EIA ON SOUTH AFRICA, *supra* note 26; *see generally* Victoria R. Naluleand & Smith I. Azubike, *Energy Transitions and Decarbonisation in Southern African Countries*, *in* DECARBONISATION AND THE ENERGY INDUSTRY LAW, POLICY AND REGULATION IN LOW-CARBON ENERGY MARKETS (Tade Oyewunmi et al. eds., 2020).

30. *See* Charlie Zajicek, *How Solar Mini-grids Can Bring Cheap, Green Electricity to Rural Africa*, OVERSEAS DEV. INST. (Jan. 2019), https://www.odi.org/blogs/10730-how-solar-mini-grids-can-bring-cheap-green-electricity-rural-africa [https://perma.cc/LF6B-WVHG].

31. INT'L ENERGY AGENCY, *supra* note 28 (about 35 GW (of 42 GW currently operating) of coal-fired power capacity is expected to be decommissioned, while at least 20 GW of the additional 29 GW of electricity needed by 2030 is expected to be supplied by natural gas for reliability and affordability and renewables).

32. DEPT. OF MINERALS AND ENERGY REPUBLIC OF SOUTH AFR., WHITE PAPER ON RENEWABLE ENERGY xi, (2003), https://www.compete-bioafrica.net/policy/White%20paper%20on%20renewable%20energy.pdf [https://perma.cc/HG43-4DQZ].

achieved by 2030 in respect of the electricity generation mix."[33] The agenda involved a competitive tender program, "the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), to stimulate private investment in utility-scale renewable energy (e.g., solar and wind) generation." [34] While the REIPPPP framework aimed at enabling private sector participation as well as foreign investments, there was a significant commitment to local content and ownership requirements.[35] Such provisions are designed to ensure local involvement, procurement by local developers, job creation, and capacity building. The REIPPPP has enabled significant independent power project (IPP) investments, while Eskom (the state-owned vertically integrated utility that has played a central role in the generation, transmission and distribution of electricity in South Africa for decades) maintained its role as South Africa's main energy utility.[36]

South Africa has "limited natural gas proved reserves and potentially large shale gas resources."[37] The prospects of available local gas reserves offshore as well as the existing pipeline networks connecting gas production sites in neighboring Mozambique have created a reasonable dash towards gas as a means of ensuring energy reliability and replacing carbon-intensive coal and energizing several economic and industrial applications.[38] Hence, the gas industry in South Africa "is undergoing

33. *Id.*; *South Africa Power Africa Fact Sheet*, USAID, https://www.usaid.gov/powerafrica/south-africa (last updated Dec. 15, 2020) (noting that in June 2018, "the REIPPPP for utility-scale transactions led to 27 power purchase agreements and plans to add 19,400 MW of new renewable generation by 2030 is stipulated in the updated draft IRP released in August 2018").

34. REVISITING REFORMS, *supra* note 3.

35. *Id.*

36. *Id.*; *see also* ESKOM RSCH. REFERENCE GRP., ALTERNATIVE INFORMATION & DEV. CENTRE, ESKOM TRANSFORMED: ACHIEVING A JUST ENERGY TRANSITION FOR SOUTH AFRICA, (2020) (Eskom also supplies and trades electricity through the South African Power Pool (SAPP). Through Eskom, South Africa imports electricity from the Cahora Bassa dam in Mozambique, while it also exports electricity via Eskom to Botswana, Eswatini, Lesotho, Mozambique, Namibia, Zambia, and Zimbabwe. The Integrated Resource Plan (IRP2019) notes that transmission infrastructure is needed to further unlock regional energy trading and enable development of generation projects).

37. EIA ON SOUTH AFRICA, *supra* note 26.

38. Gas commercializing options such as gas-to-power systems, LPG for cooking, etc. are proven to help in reducing energy-related emissions in countries that hitherto significantly relied on coal (e.g. the United States and the U.K.), while providing the necessary operational flexibility and reliability that may be more costly and disruptive with other intermittent variable alternative energy sources. *See* Tade Oyewunmi, *Natural Gas in a Carbon-Constrained World: Examining the Role of Institutions in Curbing Methane and Other Fugitive Emissions,* 9 LSU J. ENERGY L. & RES. 1, 39 (forthcoming 2021); Heather D. Dziedzic & Tade Oyewunmi, *Decarbonization and the Integration of Renewables in Transitional Energy Markets: Examining the Power to Gas Option*

rapid expansion."[39] The Gas Act no. 48 of 2001 and the Government/Sasol regulatory agreement referred to in Section 36 of the Act, which aims to "promote the orderly development of the piped gas industry, the establishment of a national regulatory framework, and the establishment of a National Gas Regulator as the custodian and enforcer of the national regulatory framework," laid a useful foundation for the market to be developed.[40] Notably, the mandate of the National Energy Regulator of South Africa (NERSA), established under Section 3 of the National Energy Regulator Act, 2004, is primarily the regulation of the electricity, piped-gas, and petroleum pipelines sectors based on the Electricity Regulation Act, 2006 (Act No. 4 of 2006), Gas Act, 2001 (Act No. 48 of 2001) and Petroleum Pipelines Act, 2003 (Act No. 60 of 2003).[41] Other institutions are also involved in the implementation of energy policy in South Africa. For example, the Petroleum Agency of South Africa (PASA) regulates oil and natural gas exploration and production and provides public data on those activities. Eskom, the state-owned electricity company, "generates about 90% of South Africa's electricity and owns and operates the national electricity grid."[42]

B. Senegal

A major part of Senegal's plans to become an emerging economy hinges on its energy sector reform plans and objectives.[43] Some of the main priorities include lowering the cost of generation by reducing dependence on imported 'carbon-intensive' heavy oil, increasing electricity access (especially in the rural areas), and reducing reliance on traditional biomass in some areas to more efficient sources such as LPG, gas-to-power, and solar.[44] The Government aims to achieve universal access through a combination of on- and off-grid solutions, although the

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in the United States, 2.9 OGEL Intel. J. 1, 3 (2019); GAS TECHNOLOGY AND INNOVATION FOR A SUSTAINABLE FUTURE, IGU 40 (2020).

39. *See Natural Gas Overview*, DEP'T OF MIN. RES. & ENERGY OF S. AFR., http://www.energy.gov.za/files/naturalgas_frame.html [https://perma.cc/2B9H-FXPB] (last visited Aug. 28, 2020).

40. Gas Act 48 of 2001 (S. Afr.).

41. National Energy Regulator Act 40 of 2004 (S. Afr.); Electricity Regulation Act 4 of 2006 (S. Afr.); Gas Act 48 of 2001 (S. Afr.); Petroleum Pipelines Act 60 of 2003 (S. Afr.).

42. EIA ON SOUTH AFRICA, *supra* note 26.

43. WORLD BANK GRP., SYSTEMIC COUNTRY DIAGNOSTIC OF SENEGAL 57 (Paolo Zacchia et al. eds., 2018).

44. *Senegal Power Africa Fact Sheet*, USAID, https://www.usaid.gov/powerafrica/senegal [https://perma.cc/54B4-VJPC] (last updated Aug. 14, 2020).

country's rural concessions program faces significant hurdles.[45] The IEA notes that Senegal's economy could grow six-times larger even while limiting growth in energy demand in certain scenarios to three times its current level by utilizing new gas resources and boosting the use of renewables in power.[46] About $33 billion USD in investments would be required through to 2040 in order to effectively realize the various plans for gas utilization, expanding electricity and networks, and developing the off-grid renewable energy solutions.[47] In a developing economy context such as Senegal, utilities may encounter liquidity issues, creditworthiness and network constraints. Thus, to attract such huge amount of investments, it would be essential to proactively develop local market structures and institutional capacities.[48] Additionally, the legal and regulatory framework will be required to play an instrumental role especially in creating a robust and transparent framework for resource revenue management, the design of local content rules and incentives, the development of natural gas commercialization strategies, and a framework for assessing export potentials vis-à-vis domestic market requirements in sectors such as electricity, industry, and commercial settings.

C. Ghana and Kenya

While these two countries are located at different ends of the SSA, with Ghana in the west and Kenya in the east, it is worth highlighting the recent energy development trends and outlook in the context of this discussion.[49] Kenya is noted to have one of the most developed power sectors in the region, comprising a fairly open market and participation by Independent Power Producers (IPPs) since the mid-1990s.[50] Kenya also benefits from an active private sector with a track record of creditworthy off-takers and abundant renewable energy resources, especially geothermal, wind, and solar.[51] Limited and aging transmission and distribution infrastructure, financing, opaque procurement processes, right

45. *Id.*

46. AFRICA ENERGY OUTLOOK, *supra* note 12.

47. *Senegal Energy Outlook 2020*, IEA (Nov. 2019) www.iea.org/articles/senegal-energy-outlook [https://perma.cc/43LS-VS4G].

48. U.N. CONF. ON TRADE & DEV. (UNCTAD), WORLD INVESTMENT REPORT 2018 iv (2018).

49. ANTON EBERHARD ET AL., INDEPENDENT POWER PROJECTS IN SUB-SAHARAN AFRICA: LESSONS FROM FIVE KEY COUNTRIES 7 (World Bank Grp., 2016).

50. *Id.* at 99; *Kenya Power Africa Fact Sheet*, USAID, https://perma.cc/9CXM-2YVB. https://www.usaid.gov/powerafrica/kenya (last updated Apr. 16, 2020).

51. *Kenya Power Africa Fact Sheet*, *supra* note 50; POWER AFRICA, DEVELOPMENT OF KENYA'S POWER SECTOR 2015-2020 4, (2016).

of way disputes, and other challenges affect the country's sector growth.[52] While Ghana "aspires to industrialize, modernize its agriculture, and provide economic opportunities for its growing population, it faces some challenges with its unreliable and costly supply of electric power and liquidity issues for the sectors."[53] Even though Ghana currently has over 4,000 MW of installed generation capacity, "the actual availability rarely exceeds 2,400 MW due to changing hydrological conditions, inadequate fuel supplies, and dilapidated infrastructure."[54] However, the considerable endowment of natural gas and renewable energy portends that Ghana is poised to overcome these constraints.

Like Senegal,[55] Ghana relies significantly on oil importation to meet shortfalls and affordability requirements for energy generation locally.[56] Ghana recently announced "oil and gas licensing rounds, while also developing several upstream- to midstream gas projects from the Sankofa and Gye Nyame fields in the Offshore Cape Three Points (OCTP) area, as well as the Tweneboah-Enyennra-Ntomee (TEN) projects to augment shortfalls in imports and meet growing demand."[57]

The West African Gas Pipeline (WAGP) which was designed to take gas from major producers in Nigeria as fuel for power generation utilities in neighboring Benin, Togo and Ghana, was one of the first major cross-border gas utilization projects in the region.[58] The WAGP is not being maximized despite the bespoke framework of financing and international agreements framework due to the underlying security of supply issues and

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52. *Kenya Power Africa Fact Sheet*, *supra* note 50.

53. *Ghana Power Africa Fact Sheet*, USAID, https://www.usaid.gov/powerafrica/Ghana [https://perma.cc/PXM3-FURR] (last updated Apr. 16, 2020); *International Petroleum Transactions*, *supra* note 7, at 23. In a recent study that sought to examine energy policy models and the tradeoffs between electricity access, cost, and reliability in the Ghanaian context, it was opined that energy transitions should enable energy systems that are equitable and promote social and economic development for all segments of society. All segments of society in this regard include all stakeholders and, in particular, local end-users. The study underscores the importance of stakeholder engagement throughout the planning, policy and implementation process. *See* Erin Baker et al., *Who is Marginalized in Energy Justice? Amplifying Community Leader Perspectives of Energy Transitions in Ghana*, 73 ENERGY RES. & SOC. SCI. 101933 (2021).

54. *Ghana Power Africa Fact Sheet*, *supra* note 53.

55. AHMADOU SAÏD BA, THE ENERGY POLICY OF THE REPUBLIC OF SENEGAL: EVALUATION AND PERSPECTIVES15 (2018).

56. George Marbuah, *Understanding Crude Oil Import Demand Behaviour in Africa: The Ghana Case*, 4 J. AFR. TRADE 75, 75 (2017).

57. *International Petroleum Transactions*, *supra* note 7, at 2.

58. Simon Collier, *The Role of Gas in Powering Africa's Future*, *in* AFRICA CONNECTED 4, 5 (2019).

power sector liquidity issues.[59] Notwithstanding these challenges, there are other commercialization options from traditional large-scale to small-scale Liquefied Natural Gas (LNG) projects, like Floating Storage and Regasification Units (FSRU) and Floating Liquefied Natural Gas (FLNG), which are being considered while sectoral institutional reforms take shape.[60]

In Ghana's attempt at pursuing renewable energy development, the Ghanaian Renewable Energy Act of 2011 provided for a suite of policies, regulations, and programs.[61] In addition to its existing large hydropower capacity, the law required Ghana to reach 20% percent of renewable energy utilized in its generation mix by 2020, while also outlining regulatory tools to reach that goal, including:

- A feed-in-tariff (FiT) for renewable energy technologies, published and updated regularly by the economic regulator, i.e. the Public Utilities Regulatory Commission (PURC).
- A net-metering arrangement, to allow individual utility customers to sell energy generated via domestic solar PV panels to be sold back to the grid.
- A renewable energy Purchase Obligation (REPO), applying to large industries and bulk customers of the electricity utility, which would require them to purchase a certain share of their electricity consumption from RE.[62]

In 2016, the Ghanaian government launched a competitive auction for energy to procure 20 MW of solar PV capacity.[63] Even though the winning bid, from a South African IPP, named a price of just around 0.11 USD/kWh, a change in government "later the same year stalled the project negotiations for over 18 months."[64] This delay exemplifies how the wider political economy and government changes may have undue influence on the effectiveness of energy policy, especially where the government acts as the primary steward via government departments and ministries as opposed to governance by independent or quasi-independent agencies with a clear statutory mandate. Projects and negotiations stalled even though "onshore wind developments had previously received licenses and

59. *International Petroleum Transactions*, *supra* note 7, at 19.

60. BRIAN SONGHURST, Floating LNG Update: Liquefaction and Import Terminals 2 (2019).

61. Renewable Energy Act 832 of 2011 (Ghana); REVISITING REFORMS, *supra* note 3.

62. Renewable Energy Act 832 of 2011 (Ghana); REVISITING REFORMS, *supra* note 3.

63. REVISITING REFORMS, *supra* note 3, at 40; WIKUS KRUGER ET AL., RENEWABLE ENERGY AUCTIONS: A GLOBAL OVERVIEW 18 (2018).

64. REVISITING REFORMS, *supra* note 3.

PPAs with the main national utility, ECG, through direct negotiations."[65] Independent non-governmental operators as well as the state-owned hydropower company also procured utility-scale solar PV under the renewable energy law. Some of these arrangements were designed as a hybrid generating arrangement with the hydro dam as storage capacity.[66]

1. Considerations for Energy Access

In most of the SSA scenarios, the current reality is that the poor or low-income earners, in most cases, cannot afford a price based solely on project economics, i.e., the fully cost-reflective price. Thus, energy access for those in the low-income bracket may not be a commercial venture, so the state often has to play the roles of facilitator and financier.[67] The government may have to fund access programs from its revenues, which may be earned, more often than not, from export projects and domestic revenue sources or by partnering with the private sector. As opined by Omorogbe:

> in practice, financing energy access for the poor, as well as stimulating growth in renewables, comes from three main sources: financing by the energy investor, revenue allocated for the purpose by the state from its budget or grants, or loans from banks or equity markets. Development finance plays a key role, from development banks and organizations such as the African Development Bank, the OPEC Fund for International Development, the European Union, the Power Africa Initiative, and the Global Alliance for Clean Cookstoves. [68]

Law and regulation have an instrumental role in providing a framework for policy implementation by relevant institutions. Thus, policy comprises mainly statements and announcements of intentions to develop market structures and local institutions.[69] A policy that is unaccompanied by legislation and the apparatus to implement the objectives of the same remains as a statement of intent, not bound to be adhered to nor create unenforceable rights and interests.[70]

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65. *Id.*
66. *Id.*
67. Omorogbe, *supra* note 6, at 19.
68. *Id.*
69. *Id* at 21.
70. *Id* at 22.

III. THE NIGERIAN ENERGY MARKET CONTEXT

Nigeria is the most populous country in Africa and currently has the biggest economy on the continent in terms of gross domestic product (GDP).[71] Nigeria is also the largest oil producer in Africa, holding the largest natural gas proved reserves on the continent, and was the world's fifth-largest exporter of liquefied natural gas (LNG) as of 2018.[72] Since the 1960s and 1970s, Nigeria's petroleum industry has been the mainstay of its economy.[73] Revenues from oil and gas exports typically constitute about 75% of government revenue and about 90-95% of total export revenue annually.[74] Notably, there has been sustained economic growth and an annual average real GDP growth of about 7% over the past ten years, primarily due to developments in the non-oil sector.[75] The primary energy resources in Nigeria include crude oil, natural gas, coal, and tar sands. For renewable energy resources in Nigeria, there are hydro, fuelwood, solar, wind, and biomass.[76] According to the Energy Commission of Nigeria (ECN), fuelwood and charcoal account for 60% of the total primary energy consumption (TPEC) as of 2017.[77] The consumption is largely due to inability of low-income consumers in rural areas to afford or secure reliable access to substitutes such as kerosene, cooking gas, and grid-based electricity.[78] The U.S. Energy Information Administration (EIA) estimates the TPEC level in Nigeria as of 2012 to be about 4.5 quadrillion British thermal units (Btu).[79] Traditional biomass and waste (i.e. wood, charcoal, manure, and crop residues) accounted for 80% of the TPEC, while oil is 13% and natural gas and hydro were estimated to account for 6% and 1% respectively. On electricity, Nigeria's generation capacity was 12,664 megawatts (MW) in 2017, of which about 10,522 MW (83%) is powered by from natural gas; 2,110 MW (17%)

71. Naidoo, *supra* note 9.

72. *Nigeria,* U.S. ENERGY INFO. ADMIN., https://www.eia.gov/international/analysis/country/NGA [https://perma.cc/67C6-T2DY] (last updated: June 25, 2020).

73. Tade Oyewunmi, *Nigerian Energy Law and Policy-(Sub-Saharan Africa—Energy Policy Section) in* ENCYCLOPEDIA OF MINERAL AND ENERGY POLICY (Günter Tiess, Tapan Majumderand, & Peter Cameron eds., 2017), https://doi.org/10.1007/978-3-642-40871-7_158-1 [https://perma.cc/5QRV-CAH3] [hereinafter "*Nigerian Energy Law and Policy*"].

74. *Id.* at 1.

75. *Id.* (the services industries such as "telecommunications and financial services contributed about 57% of the growth, while manufacturing and agriculture contributed about 9% and 21% respectively").

76. Famous O. Igbinovia, *An Overview of Renewable Energy Potentials in Nigeria: Prospects, Challenges and the Way Forward*, ENERGETIKA, Nov. 2014.

77. *Nigerian Energy Law and Policy*, *supra* note 73, at 2.

78. *Id.*

79. *Id.*

from hydroelectricity; and 32 MW (1%) from solar, wind, and biomass and waste.[80] Due to issues with fuel supply and other challenges which will be discussed below, the country's net electricity generation was far lower than capacity, which was about 28% of total capacity in 2017.[81]

Given the above facts and figures, the Nigerian energy supply context could be a good example in considering how and to what extent the identified energy transition trends occurring globally plays out in a resource-rich but developing economy. The process for such a transition to less carbon-intensive and efficient energy supply mix should be fair, just, affordable, and pragmatic. In this Part, this Article provides a brief overview of the NESI and the evolution of the institutional framework. Section A discusses the outlook for the nation's energy mix, including specific issues relating to the generation, transmission, and distribution of electricity in Nigeria. Section B examines the challenges and progress made in the NESI by pointing out the roles played by the relevant independent and quasi-independent regulatory institutions. Section C highlights the state of the grid-based energy supply networks in Nigeria while Section D examines the evolving role of off-grid energy systems, particularly renewable. Section E considers the future outlook and recent development aimed at securing energy supply from both the grid-based and off-grid systems to guarantee reliable access to electricity and energy supply.

A. Developing the NESI: An Overview

The first power generating plant in Nigeria dates back to 1898; in 1946, the Nigerian Government established an arm of the Public Works Department to handle electricity supply in Lagos, as well as the Electricity Corporation of Nigeria (ECN). [82] Generation, transmission, and distribution gradually evolved as a public service and were managed by

80. EIA *Nigeria*, *supra* note 72. There are several ongoing plans and projects targeted at exploiting the country's hydropower potentials such as the 3.01 GW Mambilla plant, the 700 MW Zungeru hydropower project, and the 40 MW Kashimbila hydropower project. Existing ones such as the 578 MW Jebba hydropower project and the 548 MW Kainji hydropower project are reportedly being rehabilitated. The current Government support and investor interest in solar power projects have been growing in the past few years in Nigeria, partially as a way to mitigate natural gas supply shortages and to increase access to electricity in remote and rural areas.

81. *Id.*

82. Claudius A. Awosope, *Nigeria Electricity Industry: Issues, Challenges and Solutions*, PUB. LECTURE SERIES Vol. 3, No. 2, Oct. 2014, at 5-6.

the government.[83] In 1962, the Niger Dams Authority (NDA) was established, which had the responsibility of constructing dams and developing the hydropower potentials of the country.[84] In 1972, the ECN and NDA were merged to form the National Electric Power Authority (NEPA) with a monopoly over electricity generation, transmission, and supply.[85] The gradual liberalization of the sector began in the late 1980s, and the first IPP projects started to develop in the 1990s.[86] The National Electric Power Policy of 2001 provided for enabling the process of liberalization, competition, and private-sector participation in the power sector and was consolidated by the enactment of the Electric Power Sector Reform Act (EPSRA) in 2005.[87]

The EPSRA laid the foundation for the privatization and unbundling of NEPA, which was corporatized and unbundled into six generation companies, eleven distribution companies, and a national transmission company.[88] The successor generation and distribution companies were eventually privatized in 2013 based on the provisions of the NEPP and the EPSRA.[89] In line with the provisions of the EPSRA, the Nigerian Electricity Regulatory Commission (NERC) was established as the main independent regulatory authority for the sector.[90] Since then, NERC has issued several regulations, guidelines, and orders to govern the activities of market players within various segments of the electricity market.[91] The

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83. W. S. Ebhota & P. Y. Tabakov, *The Place of Small Hydropower Electrification Scheme in Socioeconomic Stimulation of Nigeria*, 13 INT'L J. LOW-CARBON TECHS., 311, 311–19 (2018).

84. *Id.*

85. Tade Oyewunmi, *International Best Practices and Participation in a Private Sector Driven Electricity Industry in Nigeria: Recent Regulatory Developments*, INT'L ENERGY L. REV. 8, 306-14 (2013) [hereinafter "*International Best Practices*"]; Desmond Oriakhogba, *Legal Regime for the Regulation of the Electricity Market in Nigeria: An Appraisal*, AHMADU BELLO UNIV. J. PUB. & INT'L L. 116-33 (2011).

86. Adekola Oyenuga, *Getting Nigeria's Electricity Sector Liberalization Right–Four Important Issues*, INT'L ASS'N FOR ENERGY ECO., First Quarter 2009, at 23; Ebhota & Tabakov, *supra* note 83.

87. Arif Mohiuddin, *Transaction Timeline Spotlight Nigeria*, 13 HANDSHAKE 20, 21 (2014); Electric Power Sector Reform Act (2005) (Nigeria).

88. Electric Power Sector Reform Act (2005) (Nigeria).

89. *International Best Practices*, *supra* note 85; *see also* Electric Power Sector Reform Act (2005) (Nigeria). The privatization involved a process of divestiture and concession in which 51% equity was taken up by private investors in the distribution companies and thermal generation companies on the one hand and the award of a 20–25-year concession in two hydropower generation companies. The Transmission Company of Nigeria is still owned by the government but managed by a private company under a management contract.

90. *About Us*, NIGERIAN ELEC. REG. COMM'N, https://nerc.gov.ng/index.php/about (last visited Aug. 29, 2020).

91. *Regulating Gas Supply to Power*, *supra* note 4, at 66-84; *Nigerian Energy Law and Policy*, *supra* note 73, at 6.

NERC issues licenses based on Section 32(2)(d) of the EPSRA to entities that wish to engage in the business of electricity: (a) generation, excluding captive generation; (b) transmission; (c) electricity system operation; (d) distribution or; (e) trading.[92] The NERC also issues permits for captive generation, i.e. electricity generated for consumption by the generating entity and not sold to a third party. However, the licensing powers do not include entities that generate 1 MW and below of electricity or a distribution network of 100 kW or below.[93]

The implementation of Nigeria's power sector reforms was planned to take place through three market development stages, comprising (i) the transitional market stage, characterized by competition for the market; (ii) the medium-term market stage, characterized by full wholesale competition for the market and in the market; and (iii) the final market stage, entailing the market being open to full wholesale and retail competition.[94] Following the issuance of NERC Order 136 directing the commencement of the Transitional Electricity Market (TEM Order) in January 2015, it can be argued that the power market reform is on course and well ahead of the inextricably linked and interdependent gas supply industry.[95] During the TEM stage, it is expected, among other things, that market rules issued by NERC will formally go into effect, and the provisions of contracts executed during the privatization process will remain enforceable both de facto and de jure.[96]

NERC plays a pivotal role in the development and evolution of the NESI.[97] The commission is set-up to be an independent body with economic regulation and quasi-judicial powers, including licensing of operations in the various NESI segments, i.e. generation, transmission, and distribution of electricity.[98] It is empowered to establish one or more electricity tariff methodologies. Accordingly, the NERC has adopted the MYTO framework, which represents a hybrid approach to economic regulation and combines incentive-based, cost-reflective, and price-cap

92. *Licensing*, NIGERIAN ELEC. REG. COMM'N, https://nerc.gov.ng/index.php/component/remository/Licensing/orderby,1/?Itemid=591 (last visited Jan. 12, 2021).

93. *Id.*

94. *See generally Regulating Gas Supply to Power*, *supra* note 4.

95. *Id.*

96. *Id.*; TADE OYEWUNMI & AKIN P. IWAYEMI, GAS-TO-POWER MARKET IN NIGERIA: A REGULATORY AND ECONOMIC ASSESSMENT 21 (2016).

97. *About Us*, *supra* note 90.

98. *Licensing*, *supra* note 92.

tariff-setting features.[99] The MYTO framework is designed to ensure operators realize higher returns on investments when they gain more allocative and productive efficiency.[100] Notably, the NERC issued a Regulation on *Feed-In-Tariff for Renewable Energy Sourced Electricity in Nigeria* in 2015 ("FIT Regulations") pursuant to Section 96 of the EPSRA Act.[101] The main objective was to enhance further investments and energy-mix diversification in the power sector.[102] The FIT Regulations apply to qualifying renewable energy sourced electricity with capacity above 1 MW and smaller than 30 MW at a site that is connected to the transmission grid or the distribution networks.[103] This is a grid-related energy supply initiative that could encourage grid-connected generation and distribution companies as well as new operators seeking to develop small scale renewable energy systems. For larger renewable energy systems that are above 30 MW, the NERC requires a broader integrated resource plan before initiating a competitive bid process.[104] As will be discussed later, such integrated resource planning approach is essential in managing reliability and coordination of demand and supply balancing and network operations when such developments create significant changes in the energy source mix and when such new sources are from variable and intermittent ones such as solar.[105]

It is noted that the FIT Regulation and framework for renewables entail a guaranteed price and access to grid, FiTs for up to 5 MW of solar, 10 MW of wind, 10 MW of biomass, and 30 MW of small hydro.[106] The typical Power Purchase Agreement (PPA) are based on plant life cycle of 20 years.[107] The newly privatized electricity distribution companies are expected to procure minimum of 1000 MW (50% of the total projected

99. *Regulating Gas Supply to Power*, *supra* note 4, at 122-23, 168.

100. *Nigerian Energy Law and Policy*, *supra* note 73, at 7.

101. NIGERIAN ELEC. REG. COMM'N, REGULATIONS ON FEED-IN TARIFF FOR RENEWABLE ENERGY SOURCED ELECTRICITY IN NIGERIA (2015).

102. Babalwa Bungane, *NERC Approves Feed-in Tariffs for Renewable Energy Sources*, ESI AFRICA (Nov. 3, 2015), https://www.esi-africa.com/top-stories/nerc-approves-feed-in-tariffs-for-renewable-energy-sources/.

103. *Id.*; *see also Renewable Energy Sourced Electricity*, NIGERIAN ELEC. REG. COMM'N [hereinafter *Renewable Energy Sourced Electricity*], https://nerc.gov.ng/index.php/about (last visited Aug. 29, 2020).

104. *Renewable Energy Sourced Electricity*, *supra* note 103.

105. *Id.*

106. *Regulations on Feed-In Tariff for Renewable Energy Sourced Electricity in Nigeria*, *supra* note 101.

107. Thomas Pastore & Maria Ignatova, *Life-Cycle and Cost-Benefit Analyses of Renewable Energy: The Case of Solar Power Systems*, *in* SUSTAINABLE COMMUNITIES DESIGN HANDBOOK: GREEN ENGINEERING, ARCHITECTURE, AND TECHNOLOGY (2010).

renewable sourced electricity) while the Nigerian Bulk Electricity Trading Company (NBET) is expected to procure minimum of 1000 MW (50% of the total projected renewable sourced electricity).[108] Considering both that generally feed-in tariffs are fixed electricity prices that are paid to renewable energy producers for each unit of energy produced and injected into an electricity grid, and that such energy is at the same time by nature difficult and costly to store when there are no creditworthy buyers or network integrity issues, one could argue that the viability of each project could be compromised by liquidity issues and the integrity of the transmission and distribution networks.[109] Thus, the effectiveness of the various plans, incentives, and regulations are impacted by the legal, institutional, and contractual tools available to address with such market challenges and the ability of the government itself to provide bankable guarantees, which could also be challenging.[110]

Other NERC regulations deal with matters such as mini-grid development, regulatory enforcement, and tariff review processes.[111] Sections 31–61 of the EPSR Act deals with the NERC's establishment and independence issues like appointments of Commissioners and remuneration, the objectives and functions of the NERC, as well as its decisions and orders, funding and accounts.[112] The Act provides that the NERC's seven Commissioners are to be appointed by the President, on the confirmation of the Nigerian Senate, for a fixed term of five years in respect of the Chairman and four years in respect of the Vice-Chairman and other Commissioners.[113] The President may specify the selection criteria for the Commissioners and may remove them for reasons prescribed in the EPSR Act.[114]

The EPSR Act not only empowers the NERC to regulate and make decisions, orders, and the like, but also outlines a scheme for ensuring the NERC remains accountable to the relevant stakeholders in the power

108. *Renewable Energy Sourced Electricity*, *supra* note 103.

109. *See generally Regulating Gas Supply to Power*, *supra* note 4.

110. *Id.* at 171-77.

111. *Id.*; *see also* Jan Glazewski et al., *Promoting Renewable Energy in African Countries: An Outline of Fiscal and Financial Incentives in South Africa and Nigeria*, *in* ENDING AFRICA'S ENERGY DEFICIT AND THE LAW: ACHIEVING SUSTAINABLE ENERGY FOR ALL IN AFRICA 237, 251-56 (Yinka Omorogbe & Ada Ordor eds., 2018).

112. *See generally Regulating Gas Supply to Power*, *supra* note 4; Electric Power Sector Reform Act (2005) (Nigeria).

113. *Regulating Gas Supply to Power*, *supra* note 4; Electric Power Sector Reform Act (2005) (Nigeria).

114. *Regulating Gas Supply to Power*, *supra* note 4.

sector. In ensuring accountability, Section 47 empowers the NERC to hold public hearings on issues and matters within the scope of its regulatory functions, especially on matters of significant public interest.[115] Section 49 also stipulates that the NERC may refer any questions of law arising from any of its orders or decisions to the Federal High Court.[116] Anyone aggrieved by the NERC's regulatory decisions, especially pertaining to licensing, the outcome of the NERC's mediation or arbitration in disputes between licensees, or decisions relating to pricing and tariffs, may apply to the NERC for review of such decision, order, or refusal.[117] For instance, in *Lagos State Government of Nigeria v. Power Holding Company of Nigeria*, the Lagos State Government filed a petition alleging that the Power Holding Company of Nigeria, Ikeja Electricity Distribution Co. Plc, Eko Electricity Distribution Co. Plc, and the Transmission Company of Nigeria (as successors of the unbundled NEPA) breached the contractual obligations to supply electric power to Lagos State and electricity consumers within the State under a Barge Power Purchase Agreement (BPPA) concluded in 2000.[118] In this case, the NERC dismissed an objection to its jurisdiction to hear the petition and held *inter alia* that the alleged breach does not amount to an executive or administrative action by a Federal Government agency which could have meant the Federal High Court had exclusive jurisdiction to hear the dispute as provided under the Constitution.[119] Rather, the breach and dispute are contractual and fall under the regulatory and quasi-judicial oversight of the NERC as provided under the EPSR Act.[120] In rightly assuming jurisdiction to entertain the petition, the NERC also noted that, as with every other inferior administrative or quasi-judicial body in Nigeria created under the Constitution, the NERC is subject to the supervisory jurisdiction of the Federal High Court.[121]

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115. *Id.*; Electric Power Sector Reform Act (2005) (Nigeria).

116. *Regulating Gas Supply to Power*, *supra* note 4; Electric Power Sector Reform Act (2005) (Nigeria).

117. *Regulating Gas Supply to Power*, *supra* note 4; Lagos State Government of Nigeria v. Power Holding Co. of Nigeria [2009] Case No. NERC/03/000004/2008(Nigeria).

118. Lagos State Government of Nigeria v. Power Holding Co. of Nigeria [2009] Case No. NERC/03/000004/2008 (Nigeria). The parties to the initial BPPA were the Lagos State Government, the NEPA, the Federal Government and Enron Nigeria Holding Ltd and Enron Nigeria Barge Ltd (whose interests were later assigned to AES).

119. *See Regulating Gas Supply to Power*, *supra* note 4.

120. *Id.*; Electric Power Sector Reform Act (2005) (Nigeria).

121. Lagos State Government of Nigeria v. Power Holding Co. of Nigeria [2009] Case No. NERC/03/000004/2008 (Nigeria); *Regulating Gas Supply to Power*, *supra* note 4.

B. The NESI's Energy Mix and Supply Systems

Sources of energy can be grouped as renewable or non-renewable. Non-renewable fuel sources for power generation include natural gas, coal, and liquid fuels from crude oil,[122] and some of the renewable fuel sources are solar, wind, biomass, geothermal, wave or tidal, and hydro energy.[123] Electricity generation in Nigeria is dominated by both non-renewable thermal and renewable hydropower.[124] According to the EIA, the total primary energy consumption in Nigeria was about 1.5 quadrillion British thermal units in 2017.[125] Natural gas, petroleum, and other liquids amount to 97% of the country's primary energy consumption.[126] Traditional biomass and waste (typically consisting of wood, charcoal, manure, and crop residues used for power generation), coal, and renewables accounted for only a marginal 3% of consumption in 2017.[127]

Electricity generation for Nigeria's grid is largely thermal-based, which means that most, in the amount of 85%, of the power plants in Nigeria are fueled by gas.[128] Currently, electricity generated from solar, wind, biomass, and geothermal are not fed into the grid but are diverted to serve predominantly rural, underserved, or unserved areas that have limited access to electricity. Although there is an installed generation capacity of about 12,910 MW, the country only generates about 4,000 MW, less than 8,400 MW projection for 2018 in the Multi-Year Tariff Order (MYTO).[129] The current generation level is grossly inadequate to cater to the growing demand, which by the general rule of thumb should be supplied with at least 200,000 MW of electricity, given the current estimated population of 200 million.[130] Several factors have been blamed for the current shortages; the main issues were the inadequacy of gas

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122. *Energy Explained*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/energyexplained/ [https://perma.cc/HU37-RA48] (last visited Aug. 29, 2020).

123. *Id.*

124. *Nigeria*, *supra* note 72.

125. *Id.*

126. *Id.*

127. *Id.*

128. ADVISORY POWER TEAM, OFFICE OF THE VICE PRESIDENT, NIGERIA POWER BASELINE REPORT 13 (2015), https://mypower.ng/wp-content/uploads/2018/01/Baseline-Report.pdf [https://perma.cc/5XG6-P5BX].

129. *Operational Report of 29/07/2019*, NIGERIA ELEC. SYS. OPERATOR https://www.nsong.org/Library.aspx [https://perma.cc/Y8CD-7SJN].

130. *See* TADE OYEWUNMI & IVIE EHANMO, DECARBONISATION AND THE ENERGY INDUSTRY, LAW, POLICY AND REGULATION IN LOW-CARBON ENERGY MARKETS (2020) [hereinafter DECARBONISATION AND THE ENERGY INDUSTRY].

supply to a large fleet of gas-fired power plants, liquidity issues, creditworthiness of the NESI operators, and years of underinvestment in essential networks pre-privatization.[131]

In addition to the 55% of Nigerians that do not have access to grid-based electricity supply, power generation in Nigeria is also inadequate.[132] Other challenges in the sector include aging, poorly maintained distribution and transmission networks that require upgrades and modernization. [133] Consequently, a great deal of load-shedding and blackouts occur, and households and businesses rely to a large extent on private petrol and diesel generators. [134] Although the annual total consumption of electricity has risen rapidly over the last three decades due to the increase in rural-urban migration, a high level of suppressed demand remains.[135] In 2015, power supply in Nigeria averaged 3.1 GW, which is estimated to be only a third of the country's minimum demand.[136] As aptly stated by CPCS Transcom, electricity demand in Nigeria far outstrips supply. [137] Compared to smaller economies such as Algeria with 11,000 MW of capacity, or comparably sized economies such as Egypt with 24,000 MW of generation capacity, the gaps in Nigeria's energy capacity are obvious. [138] In Nigeria, generation of electricity from individual back-up diesel and petrol generators is estimated at 6,000 MW, i.e., approximately twice the capacity of grid-connected generators.[139]

Recent regulatory and policy strides to address the challenges include the immediate past Nigerian federal government setting a target of 20,000 MW of generation capacity by 2020, while the current government is pursuing incremental additions to generation capacity. [140] NERC's

131. Between January and August 2015, Nigeria's power generation firms sent out an average 3,317 MWh/h of electricity daily from 25 grid-connected generators with a total installed capacity of 12,522 MW. These generation plants include the recently privatized Gencos, the National Independent Power Project (NIPP) generators, and independent power producers (IPPs). Currently, gas-fired thermal power plants generate about 85% of the installed capacity, while hydroelectric power plants generate the remaining 15%. *See Natural Gas in Nigeria and Tanzania: Can it Turn on Lights?*, *supra* note 7, at 15; NIGERIA POWER BASELINE REPORT, *supra* note 128, at 13.

132. *Natural Gas in Nigeria and Tanzania: Can it Turn on Lights?*, *supra* note 7, at 15.

133. *Id.*

134. ENERGY COMM'N OF NIGERIA, NATIONAL ENERGY POLICY (DRAFT REVISED EDITION) 54 (2018), https://www.energy.gov.ng/Energy_Policies_Plan/National%20Energy%20Policy.pdf.

135. *Id.*

136. PWC, POWERING NIGERIA FOR THE FUTURE 6 (2016), www.pwc.com/gx/en/growth-markets-centre/assets/pdf/powering-nigeria-future.pdf.

137. DECARBONISATION AND THE ENERGY INDUSTRY, *supra* note 130, at 310.

138. *Id.*

139. *Id.* at 311.

140. *Natural Gas in Nigeria and Tanzania: Can it Turn on Lights?*, *supra* note 7, at 15.

regulations and guidelines for captive power generation, customer eligibility, embedded generation, and independent distribution networks, mini-grid permits, and renewable-energy-sourced electricity help to outline a cognizable framework for much-needed capacity additions, including off-grid systems.[141]

- *The Electricity Value Chain*

The NESI comprises Gas Producers, Generation Companies (GenCos) and Independent Power Producers (IPPs), the Transmission Company of Nigeria (TCN), the Nigerian Bulk Electricity Trader (NBET), Distribution Companies (DisCos), and Customers/End-Users.[142] The value chain is structured to be linked back to back by contracts, which mirror each other to ensure industry liquidity and sustainability.[143] As depicted in Figures 1 and 2 below, the revenue structure is facilitated by a reverse payment system commencing from the distribution companies, who collect 100% of the revenue from tariffs charged to end-users and remit a portion following deductions to the transmission/wholesale and generation segments of the value chain and feedstock producers.

141. *Id.*

142. *Power Generation in Nigeria*, NIGERIAN ELEC. REG. COMM'N, https://nerc.gov.ng/index.php/home/nesi/403-generation (last visited Sept. 27, 2020).

143. *Natural Gas in Nigeria and Tanzania: Can it Turn on Lights?*, *supra* note 7, at 15; Ivie Ehanmo, Presentation delivered to the staff of the legal department of an electricity distribution company and counsel at George Etomi & Partners: Introduction to the Nigerian Electricity Supply Industry (Feb. 24, 2017).

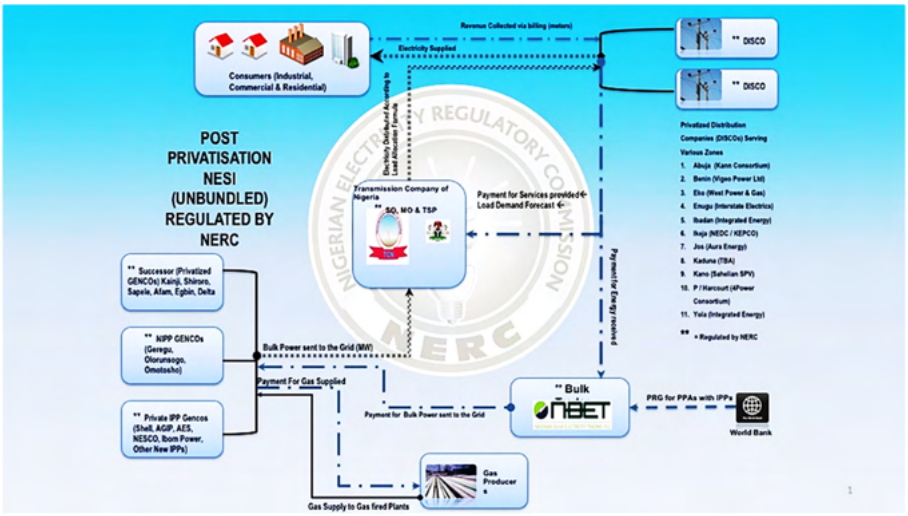

Figure 1: The Electricity Value Chain by the NERC[144]

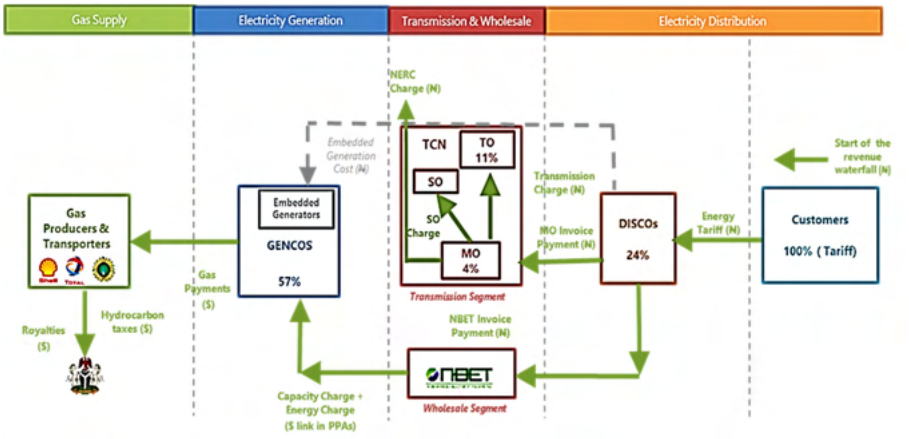

Figure 2: Income and Revenue Allocation Structure[145]

144. *Nigeria Electricity Supply Industry Structure*, NIGERIAN ELEC. REG. COMM'N, https://nerc.gov.ng/index.php/home/nesi (last visited July 29, 2019).

145. *Doing Business in Nigeria: A Guide for Foreign Investors*, GEORGE ETOMI & PARTNERS, Apr. 2018, at 3, https://www.geplaw.com/wpcontent/uploads/2018/04/pdfresizer.com-pdf-resize.pdf [https://perma.cc/B7BH-M6Z8] [hereinafter *Doing Business in Nigeria*].

The gas producers comprise mainly international and local oil and gas companies.[146] Arrangements between gas producers and power generators are typically consolidated by Gas Sales Agreements (GSA) (sometimes referred to as the Gas Supply and Purchase Agreement) to define supply commitments between upstream producers and wholesale gas offtakers in the power market. There are also Gas Transportation Agreements (GTA) to secure transmission pipeline capacity for the delivery of the purchased gas volumes to the gas-fired power plant.[147] The power producing GenCos and IPPs generate electricity and sell to the NBET and/or other eligible customers.[148] Eligible customers are a class of buyers whose monthly electricity consumption is a minimum of 2 MW and meet the eligibility requirements under the Eligible Customer Regulation, 2017.[149] The NERC reports that, as of June 2018, only 5 Power Purchase Agreements (PPAs) were fully active, and only 3 GSAs were fully active, out of which two were self-suppliers, i.e., Shell Petroleum Development Company of Nigeria (SPDC)'s AFAM VI and Okpai IPP, owned by the Nigerian National Petroleum Corporation (NNPC)/Agip Joint Venture.[150]

The TCN is responsible for the transmission of electricity from the GenCos to the DisCos.[151] It is also responsible for managing the grid network and is solely owned by the Federal Government of Nigeria.[152] The TCN is made up of three major departments: System Operator (SO), Market Operator (MO), and Transmission Service Provider (TSP).[153] The SO is primarily responsible for the planning, dispatch, and operation of

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146. *Id.*; *Natural Gas in Nigeria and Tanzania: Can it Turn on Lights?*, *supra* note 7, at 15.

147. Tade Oyewunmi, *Examining the Legal and Regulatory Framework for Domestic Gas Utilization and Power Generation in Nigeria*, 7 J. WORLD ENERGY L. & BUS. 538, 538-57; *Natural Gas in Nigeria and Tanzania: Can it Turn on Lights?*, *supra* note 7, at 15; *Doing Business in Nigeria*, *supra* note 145.

148. DECARBONISATION AND THE ENERGY INDUSTRY, *supra* note 130, at 312.

149. Nigerian Electricity Regulatory Commission, *Eligible Customer Regulations*, NERC-R-111 (2017), available at https://powerlibrary.nigeriaelectricityhub.com/2019/09/23/nerc-eligible-customer-regulation-2017/; DECARBONISATION AND THE ENERGY INDUSTRY, *supra* note 130, at 312.

150. *Natural Gas in Nigeria and Tanzania: Can it Turn on Lights?*, *supra* note 7, at 15.

151. Tade Oyewunmi & Ivie Ehanmo, *Energy Law and Regulation in Nigeria – Prospects for Reliable Electricity Supply*, *in* DECARBONISATION AND THE ENERGY INDUSTRY 307, 312 (Oyewunmi et al. eds. 2020) [hereinafter *Prospects for Reliable Electricity Supply*].

152. *Transmission*, NIGERIAN ELEC. REG. COMM'N, https://nerc.gov.ng/index.php/home/nesi/404-transmission, last visited Aug. 26, 2019; *Natural Gas in Nigeria and Tanzania: Can it Turn on Lights?*, *supra* note 7, at 15.

153. NIGERIA POWER BASELINE REPORT, *supra* note 128, at 19.

the transmission system.[154] The MO is responsible for the operation of the electricity market and commercial arrangements and administering the wholesale electricity market.[155] The TSP is charged with improving the reliability, stability, and efficiency of the network and expanding and maintaining the network.[156]

The NBET is established in line with the provisions of the EPSRA as the licensed trader for the NESI.[157] NBET engages in the "purchase of electrical power and Ancillary Services" (from IPPs, NIPPs, and successor GenCos) and subsequent resale to DisCos and eligible consumers.[158] Furthermore, NBET has the responsibility for providing credit enhancement for operators. This is done primarily by backstopping the payment obligations of the DisCos to the GenCos.[159] NBET signs a Power Purchase Agreement (PPA) with the GenCos and a Vesting Contract with the DisCos.[160] The EPSRA in Section 26(1)(a) envisages that NBET's role will eventually cease when the electric power market becomes competitive enough and the DisCos become financially viable. To be considered viable, the Discos should at least be able to efficiently remit receipts (monies obtained for the end-users) to the NESI.[161]

The DisCos receive electric power allocated to their network (based on an energy allocation percentage per DisCo) for onward supply to the end-users.[162] The DisCos are required to remit receipts to keep the entire value chain of the NESI viable.[163] Despite the capacity and generation shortages from the grid-based supply systems, several off-grid initiatives are being operated under decentralized networks.[164] These initiatives will be highlighted in subsequent sections of the paper.

1. Developing Capacity in Power Generation

The guiding principle for the regulation of the generation segment is to foster competition and ensure the efficient use of the generation

154. *Id.*
155. *Id.*
156. *Id.*
157. Electric Power Sector Reform Act, Section 25(a) (2005) (Nigeria).
158. *Doing Business in Nigeria*, *supra* note 145.
159. *Id.*
160. *Id.*
161. *Id.*
162. *Id.*
163. *Id.*
164. *See* Femi Asu, *Nigerian Firm, USADF Promote Off Grid Energy Projects*, PUNCH Oct. 18, 2018, available at https://punchng.com/nigerian-firm-usadf-promote-off-grid-energy-projects/.

technologies in the system.[165] In Nigeria, the Azura gas-to-power project exemplifies a growing trend in private sector participation in power generation.[166] The total generation capacity of a power system is a crucial determinant of the ratio of access to electricity within the system.[167] Generally, one measures energy access based on 1 MW to 1,000 homes, which implies that 1,000 consumers can be effectively supplied with a 1 MW generation plant.[168] Considering this premise, it is apparent that energy access in Nigeria is still far from its expected goal as the installed, available, and average generation capacity is hovering around 13,000 MW, 7,652.6 MW, and 4,000 MW, respectively.[169] This is insufficient to cater to the ever-increasing population, currently estimated at 200 million, and growing rural-urban migration rates.

The available generation capacity has increased significantly since 2013 when the sector was privatized.[170] The capacity increase is a positive sign, since the bids for the generation companies at the time of privatization were based on the capacity recovery plan of the respective bidders in addition to the standard highest bid value.[171] Thus, the minimum performance target of the generation companies as enshrined in the Performance Agreement, which formed part of the transaction documents at the time of privatization, was based on capacity improvement.[172] Although available generation capacity has increased considerably since 2013 following the privatization and new IPPs coming online, average generation capacity has not witnessed an equal increase, which ought to be the standard, which means that the generation companies are not fully dispatched.[173] According to industry best practices in critically

165. *See generally Regulating Gas Supply to Power*, *supra* note 4.

166. *Financial Solutions Brief, Nigeria Azura-Edo IPP*, WORLD BANK GRP. (Jan. 2018) http://pubdocs.worldbank.org/en/629011518200593880/Briefs-Guarantees-NigeriaAzuraEdo.pdf. The Azura-Edo IPP is a 450 MW open cycle gas turbine power station and the first phase of a 2,000 MW project. The relevant parties reached financial close on 28 December 2015 and construction started on 5 January 2016.

167. *See generally Regulating Gas Supply to Power*, *supra* note 4.

168. Jonathan G. Koomey et. al, *Sorry, Wrong Number: The Use and Misuse of Numerical Facts in Analysis and Media Reporting of Energy Issues*, 27 ANN. REV. ENERGY & ENV'T 119, 120 (2002).

169. *Operational Report of 29/07/2019*, *supra* note 129.

170. *Prospects for Reliable Electricity Supply*, *supra* note 151, at 314.

171. *Id.*

172. *Id.*

173. *Id.*

underserved countries, available generation capacity should be equal to the average generation, but this has not been the case in Nigeria.[174]

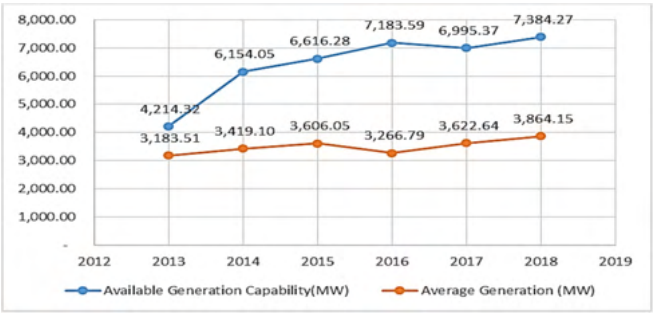

Figure 3. NESI Generation Capacity vs. Actual Generation (2012-2019)[175]

From Figure 3 above, in 2018, out of 7,384.27 MW average daily available generation capability, the GenCos were only allowed to generate an average of 3,864.15 MW, meaning the GenCos lost about 3,520.12 MW daily.[176]

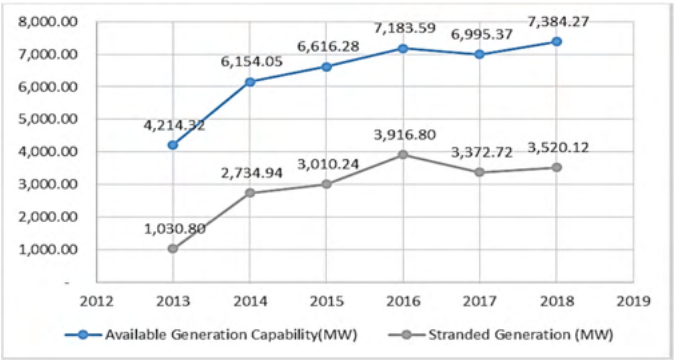

Figure 4. NESI Available Generation vs. Stranded Generation (2012-2019)[177]

Furthermore, as seen in Figure 4 above, there has been an increase in stranded generation, peaking in 2016, where about 54.52% (3,916.80

174. *Id.*
175. *Id.*
176. *Id.*
177. *Id.* at 315.

MW) of GenCos' available generation capacity was stranded daily and not paid for.[178] The increased available generation capacity from GenCos has not necessarily translated to a corresponding increase in power supply to consumers. As a result, local consumers generally believe the entire sector has failed following privatization.[179] A question worth asking here is- what are the plausible factors leading to inefficiencies power generation?

a. Bottlenecks in Power Generation

First, thermal and hydropower plants designed to operate optimally and efficiently at baseload often operate outside baseload. Thus, there is a reduction in efficiency leading to operational implications for gas-fired thermal plants which are on one hand running on contracted gas volumes, while on the other hand incurring massive fixed charges to keep such units available even when there is liquidity (shortfalls in paying for generated electrons) and transmission constraints downstream. Second, frequency deviations out of tolerable zones damage the units as well as increase the maintenance costs close to three times above regular maintenance costs. Consequently, such deviations distort the wholesale price, and the cumulative effect is not recognized by the MYTO. This system imbalance affects power generators significantly by depriving them of the ability to sell the output of their plants, thus inhibiting investments to increase the capacity of power plants or contracting for more gas. Existing generation may not be optimally deployed due to transmission network constraints, translating to increased risks in terms of a machine breakdown, maintenance, and repair costs or take-or-pay obligations and stranded capacity. Next, huge debts are incurred by thermal GenCos due to take-or-pay risk for fuel (gas) supply, escalation factors in the GSAs and GTAs, in addition to the obnoxious efficiency factor imposed on them by NBET. Similarly, the lack of effective payment security, and a guarantee from the Federal Government via NBET in line with the PPAs to backstop payments due under the PPAs, result in huge debts on the balance sheet of the GenCos, and their incapacity to service and repay loans and credit facilities.

There are frequent grid collapses due to lack of spinning reserves and tools to manage the grid, while ancillary service rates are not comparable to market tariff rates; therefore, the GenCos are not

178. *Id.*
179. *Id.*

incentivized to put turbines on ancillary services and there is often no contract for the procurement of spinning reserve. Further, in some cases the tariffs associated with Black Start ancillary services are not commensurate with operational realities. The market performance challenge in terms of low remittance across the value chain means that GenCos are being owed a significant portion of their invoiced amounts. In some cases, there are communication challenges arising from the non-implementation of Supervisory Control and Data Acquisition (SCADA) systems. The System Operator still uses radio and telephone communication systems to control the grid network. Subsequently, poor communication has led to incessant system outages, taking a devastating toll on the GenCos who are not considered for the associated deemed capacity. There are also reports of inefficient implementation of the Generation Dispatch Tool (GDT) by the National Control Centre (NCC), which, if deployed, can enhance clear communication in real-time as well as record processes and instructions the SO issues to the GenCos. Next, the problem of gas pipeline vandalization significantly affects the Gas to Power value chain, even though incidents have reduced significantly over the past 5 years.[180]

Regardless of the challenges, noteworthy initiatives are emerging in the generation segment. For instance, some IPPs are coming up, while a framework defining the "Eligible Customer Regime" to foster the direct sale of power by the GenCos to off-takers for increased competition and ultimately promote the rapid expansion of generation capacity was recently established. [181] Besides, the recent Nigerian Electrification Roadmap for the strengthening of the transmission and distribution network and boosting generation capacity, which is a partnership between the Nigerian government and the German government, was recently consolidated.[182] The Roadmap is, in addition to the World Bank Power Sector Recovery Plan (PSRP),[183] currently being implemented to ensure the stability of the grid.[184]

180. *Id.*
181. *Id.* at 316.
182. *Id.*
183. *Id.* at 317. The PSRP was conceived by the Federal Government in partnership with other facilitators as a set of policy actions, operational and financial interventions in the NESI. This forms the framework for the provision of government interventions and funding to market participants.
184. *Id.*

2. Transmitting Generated Power

Generally, the transmission segment exists for efficiency and ease in the wheeling of electricity through to the distribution networks.[185] Within the network, the sub-transmission network is a medium to a high-voltage network to transport power over shorter distances from bulk power substations to distribution substations.[186]

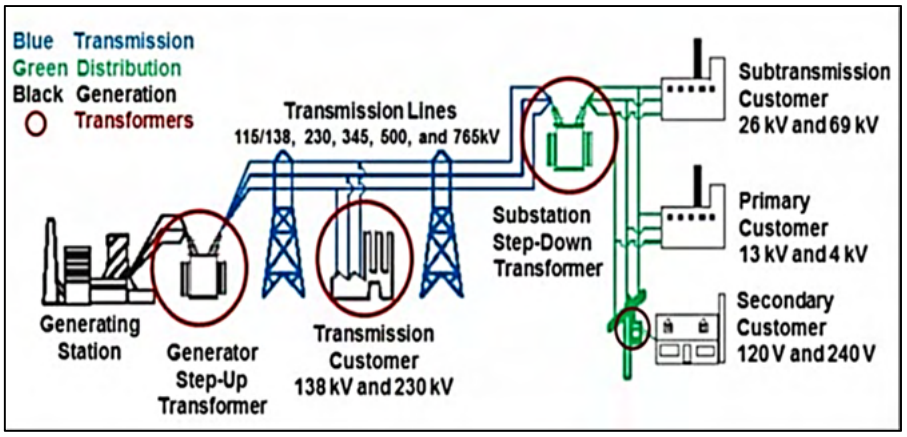

Figure 5: The Typical Electricity Supply Chain[187]

Figure 5 above illustrates the ideal power generation and transmission to distribution networks value chain. The transmission and sub-transmission systems are meshed networks with multiple-path structure so that more than one path exists from one point to another to increase the reliability of the transmission system.[188] This is done through circuit breakers, relays, and communication and control mechanisms.[189] The transmission segment may be a natural monopoly, but various power systems have adopted the model that is inclusive of independent transmission service providers.[190] The transmission segment is operated

185. See U.S. DEPARTMENT OF ENERGY OFFICE OF ELECTRICITY DELIVERY AND ENERGY RELIABILITY, UNITED STATES ELECTRICITY INDUSTRY PRIMER 11 (July 2015).
186. *Id.* at 21.
187. *Id.* at 13.
188. *Id.*
189. *Id.* at 15.
190. Oyenuga, *supra* note 86, at 23.

by the SO, which is responsible for planning, dispatch, and operation of the Power System, as well as the implementation of open access and new connections of generation plants or distribution loads to the transmission line.[191] Where the electricity market is not operated on a bilateral basis between the distribution and generation companies, the market is administered by a MO.[192] In Nigeria, where it is applicable, the roles of the MO include the administration of market settlement system, commercial metering system, payment, and commercial arrangements in addition to ensuring market participants' compliance with the Market Rules and Grid Code.[193]

Transmission in Nigeria is currently under government control and managed by the TCN.[194] The TCN's core mandate broadly covers the operation and management of high voltage (330/132kV) transmission system assets, generation dispatch functions (system operations), and provision of open access transmission services on the regulated tariff.[195] The TCN, through the Market Operator, is also responsible for managing the electricity market settlement system based on a set of Market Rules.[196] TCN is run by two departments, the Transmission Service Provider (TSP) and the System Operator (SO).[197]

The Nigerian transmission segment has encountered several bottlenecks that hindered any form of significant investment for several years.[198] These issues can be broadly classified into management issues, system improvement, and expansion funding issues and allowed revenue recovery issues.[199] TCN's network comprises about 6,680km of 3,30kV lines; 7,780km of 132kV lines; 330/132kV substations with installed transformation capacity of 10,166 MVA; and 132/32/11kV substations with installed transformation capacity of 11,660 MVA.[200] TCN is still plagued with high non-technical loss and low infrastructure coverage of

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191. *Transmission*, NIGERIAN ELEC. REG. COMM'N, www.nercng.org/index.php/home/nesi/404-transmission (last visited Aug. 29, 2020).

192. *Id.*

193. *Id.*

194. *Id.*

195. Ivie Ehanmo, *Private Investment in Electricity Transmission in Nigeria*, BUS. DAY (July 20, 2017), https://businessday.ng/legal-business/article/private-investment-electricity-transmission-nigeria/ [https://perma.cc/S2HC-62N9].

196. *Transmission*, *supra* note 191.

197. *Id.*

198. Ehanmo, *supra* note 195; *see 2014 Investment Climate Statement–Nigeria*, U.S. DEP'T OF STATE, archived at https://2009-2017.state.gov/e/eb/rls/othr/ics/2014/228973.htm.

199. Ehanmo, *supra* note 195.

200. *Id.*

the country.[201] The current transmission infrastructure serves less than 40% of the country.[202] Also, the reported wheeling capacity of the transmission has been around 5,000MW for some time due to aging network, obsolete substation equipment, forced outages, and right of way issues during project execution, as well as a lack of effectiveness in managing system reliability and inability to perform real-time operations among other factors.[203] Further, another factor that hinders investment in transmission is the current liquidity situation in the power sector.[204]

However, there are on-going reinforcements of the existing 330 kV and 132 kV lines and substations to enable the efficient wheeling of more electricity across Nigeria.[205] The Nigeria Transmission Expansion Project Phase 1 (NTEP1), which is a key feature of the national Transmission Rehabilitation and Expansion Programme (TREP) implemented by TCN, aims at upgrading the transmission substations and lines for increased power transmission to the DisCos.[206] The upgrade is funded by the FGN through the Ministry of Power and via loans from the African Development Bank and the Africa Growing Together Fund (AGTF), for the joint sum of $210 billion USD; the first disbursement was scheduled for July 2020.[207] Another notable initiative to address bottlenecks in the transmission segment of the value chain is the recent Nigerian Electrification Roadmap for the strengthening of the transmission and distribution network and an increase in the generation capacity.[208]

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201. *Id.*

202. *Id.*

203. *Id.* Other factors are "reactive power issues due to long and weak transmission lines in the North leading to constant under-frequency and voltage collapse, overloading of certain corridors and load flow balance of the network due to poor planning of the network, high incidences of vandalism, radial lines with no redundancies, community, and high technical and non-technical losses."

204. *Id.*

205. *Id.*

206. *Nigeria Transmission Expansion Project Phase 1 (NTEP1) Project Appraisal Report*, AFR. DEV. BANK (Nov. 29, 2019), https://www.afdb.org/en/documents/nigeria-nigeria-transmission-expansion-project-phase-1-ntep1-project-appraisal-report [https://perma.cc/4QP5VD6U].

207. *Id.*; *Analysis of the Legal and Commercial Framework of the Siemens-Nigeria Power Transaction in connection with the Presidential Power Initiative*, GEPLAW FOCUS (George Etomi & Partners, June 2020), https://geplaw.com/analysis-of-the-legal-and-commercial-framework-of-the-siemens-nigeria-power-transaction-in-connection-with-the-presidential-power-initiative/.

208. *Prospects for Reliable Electricity Supply*, *supra* note 151, at 317.

3. Electricity Distribution

As shown in Figure 5 above, the distribution process entails the conduct of electricity received from the transmission companies to the end-users at a lower voltage of 11kv or 33kv. Other distribution activities include billing, revenue collection, metering, and customer services.[209] As electricity markets become more liberalized and competitive, the distribution functions become further decentralized to include the retail service providers that assume some of the functions of the distribution companies.[210]

The regulation and operation of the distribution segment are critical to the liquidity of the entire sector. The interconnection between regulation, operation and liquidity underscores the relevance and role of revenue collection from the consumers.[211] Revenue collection is equally tied to the existence and implementation of cost-reflective tariffs, which will allow DisCos to recover their allowable revenue to invest in the network to meet customer demands while also providing efficient service delivery.[212]

a. Constraints to Distribution Networks and Services

Despite the successful privatization, the distribution segment of the value chain has witnessed peculiar efficiency and growth constraints.[213] First, the lack of cost-reflective tariffs, due to the mismatch of assumptions for tariff computation in the MYTO against market realities, results in a shortfall accumulating on the books of the DisCos.[214] This has hindered the ability of the DisCos to meet their market obligations, leading to shortfalls and liquidity challenges in the sector.[215] In order to resolve some of these issues, the NERC recently required the DisCos to plan and implement Service Reflective Tariffs in the sector, which seeks to break down customers into different customer categories and charge end-users based on the service delivery levels by the DisCos.[216] Second, the limited

209. *Id.* at 318.

210. DONNA PENG & RAHMAT POUDINEH, A HOLISTIC FRAMEWORK FOR THE STUDY OF INTERDEPENDENCE BETWEEN ELECTRICITY AND GAS SECTORS 15 (Oxford Institute of Energy Studies, 2015) https://www.oxfordenergy.org/publications/a-holistic-framework-for-the-study-of-interdependence-between-electricity-and-gas-sectors-2/ [https://perma.cc/4EEA-KXZB].

211. *Prospects for Reliable Electricity Supply*, *supra* note 151, at 319.

212. *Id.*

213. *Id.*

214. *Id.*

215. *Id.*

216. NIGERIAN ELEC. REG. COMM'N, NERC/198/2020, ORDER ON THE TRANSITION TO COST REFLECTIVE TARIFFS IN THE NIGERIAN ELECTRICITY SUPPLY INDUSTRY (2020), https://nerc.gov.

Capital Expenditure (CAPEX) allowance in the MYTO affects the ability of the DisCos to invest in the network(s), giving rise to increased ATC&C (Aggregate Technical, Commercial and Collection) losses.[217] The CAPEX challenge is also aggravated by reported incidents of electricity theft, which increases commercial losses.[218] Third, government Ministries, Departments, and Agencies (MDAs) constitute a considerable proportion of the customer base of the average DisCo. Thus, the removal of debts owed by MDAs from the collection loss component of the ATC&C losses with no mechanism to recover the debts from the MDAs is a challenge.[219] The last issue is the foreign exchange pass-through costs following the Central Bank of Nigeria's (CBN) decision to float the Naira against the dollar, which is at variance with cost recovery in the MYTO in terms of recovery timelines creates fiscal issues.[220]

Notwithstanding the challenges, various initiatives are emerging to resolve the bottlenecks in the distribution segment. A notable one includes the recent Nigerian Electrification Roadmap for the strengthening of the transmission and distribution network and an increase in the generation capacity. Notably, the distribution grid's nature is evolving to accommodate off-grid and independent power distribution models. There have been significant investments towards procuring more efficient models of service delivery to the consumers such as Distributed Generation, Mini-Grids, and Independent Distribution Network Operators, etc.

C. Regulating NESI—The Regulatory Framework

The regulatory framework that governs NESI is made up of primary and secondary legislation.[221] NESI is regulated by various institutions and agencies.[222] The primary legislation for the sector is the EPSRA, which

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ng/index.php/library/documents/NERC-Orders/NERC-Order-On-The-Transition-To-Cost-Reflective-Tariffs-In-The-Nigerian-Electricity-Supply-Industry/.

217. Ehanmo, *supra* note 195.

218. *Id.*

219. *Id.*

220. *Id.*

221. Lanre Aladeitan et. al, *Dual Regulatory Agencies in the Nigerian Electricity Supply Industry: An Overkill or Finding the Balance,* 14 OIL, GAS & ENERGY L. INTEL. (OGEL) 1 (2016), https://www.researchgate.net/publication/328450686_Dual_Regulatory_Agencies_in_the_Nigerian_Electricity_Supply_Industry_An_Overkill_or_Finding_the_Balance_Oil_Gas_and_Energy_Law_Intelligence_OGEL_2016, [https://perma.cc/P33M-S7D2].

222. *Id.* at 5.

sets out the policy principles for the regulation of the sector.[223] Secondary legislation and regulatory instruments are issued by NERC as the primary industry regulator according to the EPSRA, which includes permits, licenses, orders, guidelines, and regulations.[224] In this regard, an evolving set of regulatory instruments issued by NERC includes: NERC Regulation for the Procurement of Generation Capacity, 2014;[225] NERC Embedded Generation Regulations, 2012;[226] NERC Eligible Customer Regulation, 2017;[227]NERC Regulation for Mini-Grids, 2016;[228] NERC Regulation for Captive Power Generation, 2008; [229] NERC Regulation on National Content Development for the Power Sector, 2013;[230]NERC Independent Electricity Distribution Networks Regulations, 2012; [231] and NERC Investment in Electricity Networks Regulation, 2015.[232]

There are other institutions involved directly or indirectly in policymaking and regulation of the NESI. First, the Ministry of Power, headed by the Minister, has the responsibility of providing policy guidance for the NESI to ensure the provision of adequate and reliable power supply in Nigeria.[233] The Ministry's policy development is guided by the 2010

223. Electric Power Sector Reform Act No. 6 (2005) 92:77 S.O.G., A95, § 33 (Nigeria).

224. Electric Power Sector Reform Act No. 6 (2005) 92:77 S.O.G., A125, § 98(2) (Nigeria).

225. NIGERIAN ELEC. REG. COMM'N, REGULATIONS FOR THE PROCUREMENT OF GENERATION CAPACITY (2014), https://nerc.gov.ng/doclib/regulations/256-regulations-for-the-procurement-of-generation-capacity-2014/file.

226. NIGERIAN ELEC. REG. COMM'N (Embedded Generation) Regulations S.I. No. 66 (2012) 99:114 S.O.G., B1793, https://nerc.gov.ng/doclib/regulations/239-nerc-embedded-generation-regulations-2012/file.

227. NIGERIAN ELEC. REG. COMM'N, NERC-R-1111, ELIGIBLE CUSTOMER REGULATIONS (2017).

228. NIGERIAN ELEC. REG. COMM'N, NER-R-110/17, REGULATION FOR MINI-GRIDS (2016), https://nerc.gov.ng/index.php/library/documents/Regulations/NERC-Regulation-for-Mini-Grid/.

229. NIGERIAN ELEC. REG. COMM'N, NER-R-0108, PERMITS FOR CAPTIVE POWER GENERATION REGULATIONS (2008), https://nerc.gov.ng/nercdocs/Regulation-for-Captive-Power-Generation.pdf.

230. NIGERIAN ELEC. REG. COMM'N, REGULATIONS ON NATIONAL CONTENT DEVELOPMENT FOR THE NIGERIAN ELECTRICITY SUPPLY INDUSTRY (2013), http://www.nercng.org/nercdocs/Regulations%20on%20National%20Content%20Development%20for%20the%20Nigerian%20Electricity%20Supply%20Industry%202013.pdf [https://perma.cc/TRD4-L3SM].

231. NIGERIAN ELEC. REG. COMM'N, No. 0212, REGULATIONS FOR INDEPENDENT ELECTRICITY DISTRIBUTION NETWORKS (2012), http://www.nercng.org/nercdocs/NERC-Regulation-for-IEDN-2012.pdf [https://perma.cc/QA8X-G3NL].

232. NIGERIAN ELEC. REG. COMM'N, REGULATIONS FOR INVESTMENTS IN ELECTRICITY NETWORKS IN NIGERIA (2015), https://nerc.gov.ng/doclib/regulations/244-nerc-investment-in-electrcicity-networks-regulation-2015/file.

233. Ifeyinwa Ufondu et. al, *Electricity Regulation in Nigeria*, BENCHMAC & INCE (2019), https://www.lexology.com/library/detail.aspx?g=88f16847-8f84-46e4-9b33-92b4f477e23f [https://perma.cc/3WT7-N3ZF].

Roadmap for Power Sector Reform, the 2001 National Electric Power Policy, the 2005 Electric Power Sector Reforms Act, and the Nigerian Federal Government's Transformation Agenda on Power.[234]

Second, the NERC is the primary regulator for the NESI established under section 31 (1) and (2) of EPSRA and headquartered in Abuja.[235] The NERC is responsible for licensing and regulating persons involved in the generation, transmission, system operation, distribution, and trading of electricity in Nigeria.[236] Other duties of the Commission include protecting consumers' interests; establishing and approving adequate operating codes; security, reliability, safety and quality standards; establishing and reviewing electricity tariffs (MYTO II—The Order and Model); and promoting competition and private sector participation in the market where feasible.[237]

Third, the previously mentioned the NBET plays a key role in the transitional market. The NBET, established in line with the provisions of the EPSRA, is an electricity trading licensee that engages in the purchase of electrical power and ancillary services (from independent power producers and the successor generation companies) and subsequent resale to distribution companies and eligible consumers.[238] The role of NBET is essentially to give credit enhancement to the NESI via the execution of bankable PPAs with the GenCos and IPPs.[239] It is currently the sole electricity buyer; however, it is envisaged that the distribution companies

234. *Id.*

235. Electric Power Sector Reform Act No. 6 (2005) 92:77 S.O.G., A94, § 31 (Nigeria); Electric Power Sector Reform Act No. 6 (2005) 92:77 S.O.G., A94, § 32(2) (Nigeria).

236. Electric Power Sector Reform Act No. 6 (2005) 92:77 S.O.G., A94, § 32(2) (Nigeria); *Doing Business in Nigeria*, *supra* note 145.

237. Electric Power Sector Reform Act No. 6 (2005) 92:77 S.O.G., A94, § 32 (Nigeria); *see also Regulating Gas Supply to Power*, *supra* note 4; Aladeitan, supra note 221. The Nigerian Electricity Management Services Agency (NEMSA) was established by NEMSA Act 2015 to carry out the functions of enforcing technical standards and regulations made by NERC and the Minister, as well as conducting technical inspection, testing, and certification of all electrical installations, meters, and instruments. While NEMSA's statutory objectives appear to be centered on technical inspection and certification of electric power installations and facilities, some of the provisions of the NEMSA Act creates overlaps and conflicts with some of the functions of NERC.

238. Nigerian Electricity Management Services Agency, NEW ENERGY RSCH. PROJECT (NERP), http://nerp.abv.ng/index.php/agency/nigerian-electricity-management-services-agency/ [https://perma.cc/Q633-7UXY] (last visited Sept. 17, 2020).

239. *Id.*

upon attaining commercial viability, will also be able to procure power directly from the generation companies.[240]

Next, the Rural Electrification Agency (REA) was set up according to section 88 (1) of the EPSRA to administer the Rural Electrification Fund (REF), which is a designated fund to promote, support, and provide rural electrification programs through public and private sector participation to achieve more equitable regional access to electricity, maximize the economic, social and environmental benefits of rural electrification subsidies, promote the expansion of the grid and development of off-grid electrification, and stimulate innovative approaches to rural electrification.[241]

Other key institutions are the Operator of the Nigerian Electricity Market (ONEM) and the Nigeria Electricity System Operator (NESO) respectively. The ONEM is licensed to function as the market operator of the wholesale electricity market of the NESI and is a semi-autonomous body under the TCN.[242] It is responsible for the operation of the electricity market and settlement arrangements.[243] The NESO is a semi-autonomous body under the TCN, providing system operation services to the NESI.[244] The NESO is primarily responsible for the planning, dispatch, and operation of the transmission system, and for the security and reliability of the electricity network grid.[245]

Another highlighted institution is the National Power Training Institute of Nigeria (NAPTIN). This body was established in 2009 to serve as a focal point for human resource development and workforce capacity building and act as a research center on matters relating to power in Nigeria.[246] A key objective of the NAPTIN is to design, develop, and

240. *About Us: What We Do*, NIGERIAN BULK ELEC. TRADING PLC, https://nbet.com.ng/about-us/what-we-do/ (last visited Aug. 17, 2020).

241. *About Us*, RURAL ELECTRIFICATION AGENCY, https://rea.gov.ng/theagency/ (last visited Aug. 17, 2020).

242. *About Us: Overview*, OPERATOR OF THE NIGERIA ELE. MKT. (ONEM NIGERIA), http://www.onemnigeria.org/index.php?option=com_content&view=article&id=53&page=about [https://perma.cc/5PXN-EHVE] (last visited Dec. 22, 2020).

243. *Services*, OPERATOR OF THE NIGERIA ELEC. MKT. (ONEM NIGERIA), http://www.onemnigeria.org/index.php?option=com_content&view=article&id=43&page=services [https://perma.cc/MF6X-6QZC] (last visited Aug. 17, 2020).

244. *About Us*, NIGERIAN ELEC. SYS. OPERATOR, https://nsong.org/AboutUs/History [https://perma.cc/799T-PYD4] (last visited Aug. 17, 2020).

245. *Id.*

246. *About Us*, THE NAT'L POWER TRAINING INST. OF NIGERIA, http://www.naptin.gov.ng/about-us [https://perma.cc/6H96-ALQX] (last visited Aug. 30, 2020).

deliver a wide variety of training courses that will enhance the skills and capacity of both technical and non-technical power utility personnel.[247] The Energy Commission of Nigeria (ECN) is tasked with the strategic planning and coordination of national energy policies.[248] The Presidential Task Force on Power (PTFP) is tasked with ensuring the realisation of the reform of the Nigerian power sector.[249]

D. Challenges with On-Grid Electricity Supply in Nigeria

As pointed out above, the supply of electricity via the national grid faces significant challenges that require bespoke policy and regulatory interventions followed by increased investments in the right solutions. Beyond the challenges associated with power generation, the weak state of the transmission and distribution (T&D) network has significant implications for reliability and promoting universal energy access through the grid without resolving the issues at stake.[250] The TCN has made several investments towards improving its network capacity to about 8,100 MW,[251] and in recent times, it aims at increasing the capacity to 10,000 MW.[252] However, the gains are yet to be felt because beyond wheeling capacity challenges at the transmission level, the distribution network is lacking in a similar capacity.

Over 55% of Nigeria's population lacks electricity access and going by the rule of thumb, Nigeria needs over 200,000 MW to attain full electricity access rate. Recently, however, as indicated earlier, the Nigerian government has entered a partnership with the German government for the strengthening of the T&D network and an increase in the generation

247. Background, THE NAT'L POWER TRAINING INST. OF NIGERIA, http://www.naptin.gov.ng/index.php/about-us/who-we-are/background [https://perma.cc/HZA7-34WX] (last visited Dec. 22, 2020).

248. ENERGY COMM'N OF NIGERIA, https://www.energy.gov.ng/ [https://perma.cc/NR2F-3VTR] (last visited on Dec. 22, 2020).

249. Engr. Beks Dagogo-Jack, Chairman, Presidential Task Force on Power, Nigeria, Status Report on The Nigeria Power Sector Reform 2 (Nov. 19-21, 2012), https://www.esi-africa.com/wp-content/uploads/Beks_Dagogo.pdf [https://perma.cc/8WWM-53YQ].

250. *Prospects for Reliable Electricity Supply*, supra note 151, at 322.

251. TCN NEWS, *TCN Announces New National Peak of 5,375MW*, TRANSMISSION CO. OF NIGERIA (Feb. 11, 2018), https://tcn.org.ng/blog_post_sidebar31.php.

252. TCN News, *TCN Targets 10,000MW with Seven Critical Investment in Transmission Lines Soon*, TRANSMISSION CO. OF NIGERIA (July 16, 2019), https://tcn.org.ng/blog_post_sidebar48.php.

capacity.[253] Beyond the network challenges, the current financial and liquidity issues in the sector affect investor appetites.

1. The Funding and Liquidity Challenges

There is a mismatch between the MYTO (the tariff setting framework) and market and operating realities. For example, the MYTO uses an exchange rate of 197 naira to US$1.0 as of October 2015 (later increased to 198 naira to US$1 in 2016) in computing tariffs amongst other parameters; however, utilities are billed for energy received from the Bulk Trader based on an exchange rate of 305 naira to US$1 based on contractual terms between the Bulk Trader and Generating Companies.[254] MYTO tariffs were expected to be trued up since the privatization of the sector in 2013 to reflect the true level of Aggregate Technical, Commercial, and Collection (ATC&C) losses, which would determine the Performance Targets and tariffs to be charged by the utilities to end-users for revenue recovery to enable them to achieve assigned targets as enshrined in the Performance Agreement(s).[255] Other assumptions expected but not trued up include generation, foreign exchange, customer numbers/base growth rates, gas prices, and inflation (US and NGN).[256] Therefore, tariff assumptions do not reflect market realities, thus occasioning revenue shortfalls caused by the non-payment of cost-reflective tariffs by consumers.[257] This has, in effect, hindered access to funding and investments in the sector.[258]

The shortfalls in generation, in comparison to the assumptions in the MYTO due to gas and transmission constraints, create security of

253. *Nigeria, Siemens Sign Electricity Agreement to Generate 11,000 MW by 2023*, PREMIUM TIMES (July 22, 2019), https://www.premiumtimesng.com/news/top-news/342295-nigeria-siemens-sign-electricity-agreement-to-generate-11000mw-by-2023.html [https://perma.cc/AXS5-8TPB].

254. *See generally*, NIGERIAN ELEC. REG. COMM'N, NERC/143, MULTI YEAR TARIFF ORDER-2015 FOR THE TRANSMISSION CO. OF NIGERIA FOR THE PERIOD 1ST JAN. 2016 TO 31ST DEC. 2024 (2015).

255. *Electricity Tariff in Nigerian Electricity Supply Industry*, NIGERIAN ELEC. REG. COMM'N, https://nerc.gov.ng/index.php/home/myto (last visited Aug. 31, 2020); *Prospects for Reliable Electricity Supply*, *supra* note 151, at 323.

256. *Prospects for Reliable Electricity Supply*, *supra* note 151, at 323.

257. Ass'n of Power Generation Companies, *Opinion: Lack of Synergy Among Stakeholders Is Killing the Power Industry*, 3 GENCOS HEARTBEAT, no. 1, 2019, at 20, https://apgc.org.ng/wp-content/uploads/2020/03/APGC-Newsletter-Vol.-302.pdf; *Prospects for Reliable Electricity Supply*, *supra* note 151, at 323.

258. Ass'n of Power Generation Companies, *Overview of Siemens Proposal in the Nigerian Electrification Roadmap*, 3 GENCOS HEARTBEAT, no. 1, 2019, at 16, https://apgc.org.ng/wp-content/uploads/2020/03/APGC-Newsletter-Vol.-302.pdf.

supply issues.[259] Incorporating current generation levels in calculating tariffs would require around a 50% increase in tariffs, which could be higher with adjustments to inflation and forex.[260] The challenges may lead to inconsistencies in power pricing and cost recovery, which have commercial implications for the viability of a contract-based market. The trend may be further complicated by a mismatch between the contractual terms of the PPAs between the GenCos and the NBET on the one hand, and the implementation of the tariffs paid by consumers under the MYTO on the other hand.[261] Generation costs are adjusted by NBET every month as a result of the changes in indices and indexations in the PPA's (e.g., Forex, fuel prices, which affect energy and capacity prices), but Distribution Companies (DisCos) are unable to pass on the adjusted generation costs to customers and recover the costs as the six (6) monthly tariff reviews are not reliably implemented.[262]

2. Resolving Tariff Review Disputes

Disputes and issues regarding the implementation and implications of tariff increase on regular consumers came under judicial consideration in recently.[263] In *Toluwani Adebiyi v. Nigerian Electricity Regulatory Commission & Ors*,[264] the Federal High Court restrained the NERC from implementing the increase in electricity tariffs.[265] The decision of the court was based on technicalities, i.e. procedural non-compliance with the law by NERC in failure to publish the tariff change in the official gazette.[266] It was substantially based on the moral claim by the plaintiff that NERC's action was illegal, null, and void given that there was no "marked improvement" in electricity supply "as required by law" to justify an upward review of tariffs.[267] Also, there was a recent case

259. *Id.*

260. Ass'n of Power Generation Companies, *Nigerian Power Crises: A Critical Analysis of the Economic and Commercial Impact*, 3 GENCOS HEARTBEAT, no. 1, 2019, at 10, https://apgc.org.ng/wp-content/uploads/2020/03/APGC-Newsletter-Vol.-302.pdf.

261. Ivie Ehanmo, MYTO v. PPA*: Resolving Inconsistencies in Power Pricing and Cost Recovery*, LINKEDIN (Dec. 20, 2016), https://www.linkedin.com/pulse/myto-v-ppa-resolving-inconsistencies-power-pricing-cost-ivie-ehanmo/ [https://perma.cc/NX4J-ATJQ].

262. *Id.*

263. Nigerian Elec. Regul. Comm'n v. Barrister Toluwani Yemi Adebiyi [2017] LPELR-42902(CA) (Nigeria).

264. *Id.*

265. *Id.*

266. *Id.*

267. *Id.*

where the Incorporated Trustees of Human Rights Foundation sued NERC, following the issuance of the Minor Tariff Review Order (MYTO) 2015 And Minimum Remittance Order for 2020 that directed the increase in electricity tariffs from 1 April 2020.[268] Consequently, the court issued an order for the parties to maintain status-quo thus in effect, thus, preventing NERC from implementing the planned upward review in tariffs.[269] The basis of the suit was that "the implementation of the purported minor review of the Multi-Year Tariff Order would create "unquantifiable hardship and damages" on electricity consumers.[270] Although NERC proceeded to reverse the tariff increase (not because of the court's ruling), Although, such judicial interventions are justifiable from a public policy and consumer protection perspective, they can be said to have slowed down the drive for the review process and implementing a fully cost-reflective tariff.[271]

3. Institutionalized Constraints

Arguably, institutional issues leading to misalignment of contract structures and regulation is a constraining factor in the development of the conventional grid-based systems. For instance, the MYTO targets are at odds with the targets stipulated in the Performance Agreement which formed the basis of investors bids during the privatization process.[272] In addition, increased debts from the Ministries, Departments, and Agencies (MDAs) are not recognized in tariffs and thus resulting in higher losses.[273] Also, the lack of cost-reflective tariffs has occasioned a rippling effect across the value chain as market participants are unable to cover costs, earn the allowed revenue, and meet their market obligations.[274] A plausible solution to that (as mentioned earlier) would be to identify different classes of consumers for cost allocation and tariff review purposes while ensuring the process is just and fair and supported by

268. *Court Orders NERC to Halt Increase of Electricity Tariff*, SAHARA REPS. (Jan. 7, 2020), http://saharareporters.com/2020/01/07/court-orders-nerc-halt-increase-electricity-tariff [https://perma.cc/5X56-PT58].

269. *Id.*

270. *Id.*

271. *Prospects for Reliable Electricity Supply*, *supra* note 151, at 323.

272. Ehanmo, *supra* note 143.

273. *Id.*

274. *DB: Discos Pay NBET; Licence Fee Waiver; AfCFTA to Begin in January*, STEARSBUSINESS (May 8, 2020), https://www.stearsng.com/article/db-discos-pay-nbet-licence-fee-waiver-afcfta-to-begin-in-january#:~:text=Discos%20paid%20only%2027%25%20of%20invoices%20due%20for%20two%20months&text=However%2C%20the%20discos%20have%20historically,the%20indebtedness%20by%20the%20discos.

making proper information available to all consumers categories and public stakeholders. Such an approach would be useful considering the situation in which the DisCos need to be viable rather than staying heavily indebted to NBET, who in turn are in debt to the GenCos, who are then unable to pay the gas producers.[275]

The poor state of the grid has given rise to the development and implementation of several off-grid structures though currently at a nascent stage, to increase access to energy in the country especially in unserved and underserved areas within Nigeria.[276]

E. The Rise of the Under-Grid and Off-Grid Solutions

The term "off-grid" here refers generally to systems developed in areas that are too far away to connect to the national electrical grid without significant additional investments, while the "under-grid" implies systems that are in areas close enough to connect to a low-voltage line at a relatively low cost.[277] Kenneth Lee estimates that about 95 million people live in the "under-grid" areas in Nigeria, Kenya, Tanzania, Ghana, and Liberia and agreeably opine that if governments wish to leverage existing grid infrastructure, subsidies, and new approaches to financing are necessary.[278] For areas regarded as "off-grid," it is important to consider household and business demand for connections, as well as potential economies of scale in costs management and pursuing alternatives to grid-based energy supply.[279]

Nigeria has been classified as the third ranked country out of five with about 41% of rural areas having access to electricity, in a study

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275. *Id.*

276. Jan Corfee-Morlot, Paul Parks, James Ogunleye & Famous Ayeni, *Achieving Clean Energy Access in Sub-Saharan Africa*, FIN. CLIMATE FUTURES: RETHINKING INFRASTRUCTURE (Jan. 31, 2019), https://www.oecd.org/environment/cc/climate-futures/case-study-achieving-clean-energy-access-in-sub-saharan-africa.pdf [https://perma.cc/MQC7-P2LS].

277. Kenneth Lee et al, *Electrification for "Under Grid" households in Rural Kenya*, 1 DEV. ENG'G 26, 27 (2016); *see also* Destenie Nock, Todd Levin & Erin Baker, *Changing the Policy Paradigm: A Benefit Maximination Approach to Electricity Planning in Developing Countries*, APPLIED ENERGY 264 (2020) on the potential pathways to addressing the network planning and energy access issues that seem common to developing countries in the region.

278. Kenneth Lee et al, supra note 277; Obinna F Muoh, *When 95 Million Nigerians are Living Without Electricity Something Needs to Change*, BUS. INSIDER (July 14, 2016) https://www.businessinsider.com/95-million-nigerians-are-living-without-electricity-and-something-needs-to-change-2016-7 [https://perma.cc/RN3K-PNXS].

279. Wayne Energy Consult, *Off-Grid Renewable Energy Sector Deep Dive*, WORLD BANK GRP. 12 (July 2019) (unpublished report) (on file with author).

conducted by the World Bank.[280] Nigeria's performance against other countries (Mexico and four other sub-Saharan countries, Kenya, Uganda, Tanzania, and Ghana) was measured in the area of off-grid energy access, and this hinged on certain parameters (access, reliability and quality, efficiency and affordability).[281] In terms of reliability and quality, based on a citizen's poll, Nigeria ranked the worst out of the five countries.[282] In terms of efficiency, the analysis showed that Nigeria would be 80% more efficient when compared to the other five countries if transmission or distribution losses (such as those discussed earlier) are eliminated. Regarding affordability, Nigeria ranked third out of the five countries.[283] Nigeria's off-grid power structure is expected to improve with the provision of off-grid renewable solutions in the future as the off-grid market is currently in its nascent stage.

Access to "modern energy services" entails

> the benefits to be derived by people from an energy system, which itself comprises an energy supply sector and the end-use technologies that convert the energy derived from the particular energy carrier . . . Energy services include modern cooking fuels, improved cookstoves, electricity, and mechanical power . . . for doing work in agricultural, industrial, and other sectors . . .[284]

As posited by Omorogbe,

> [m]ost electricity grids in Africa cover less than half of the respective countries, and poor communities are the proposed beneficiaries, expensive grid extensions are unlikely to be viable alternatives. The solution is off-grid decentralized energy powered by renewable energy in all areas that are not in petroleum producing areas such as the Nigerian Niger delta or Angola. Apart from the need to combat climate change, promoting the use of renewables leads to cleaner cities and urban environments. The quality of life in cities such as Lagos, which suffer from the problems of epileptic power supply and atmospheric pollution from millions of generators in use whenever the regular blackouts occur, can only improve if there are cleaner

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280. *Id.* at 6.

281. *Id.*

282. *Id.* at 10; Omorogbe, *supra* note 6, at 9-10; INT'L ENERGY AGENCY, WORLD ENERGY OUTLOOK 2012 530 (2012).

283. FED. MINISTRY OF SCI. & TECH., ENERGY COMM'N OF NIGERIA, DRAFT NATIONAL RENEWABLE ENERGY AND ENERGY EFFICIENCY POLICY 2 (Mar. 2014), https://www.energy.gov.ng/Energy_Policies_Plan/natonal_renewable_energy_and_energy_efficiency_policy.pdf.

284. *Id.* The World Energy Outlook 2012 defines energy access as a household having reliable and affordable access to clean cooking facilities and a first electric supply connection, with a minimum level of consumption of 250 kilowatt hours (kWh) per year for a rural household and 500 kWh per year for an urban household.

> forms of energy in use. The challenges are to create structures that promote the use of renewables as an alternative to hydrocarbons for the various self-generation efforts and to stimulate the use of low-cost financing and grants that promote socio-economic objectives such as modern energy access for poor communities.[285]

Before exploring the nitty-gritty of the regulatory framework for off-grid solutions, it is useful to briefly highlight the potentials for sourcing such off-grid solutions from low to zero-carbon sources, such as renewables, nuclear energy, and electricity.

1. Alternatives to Conventional Sources

Nigeria's annual average solar radiation ranges from 3.5kWh/m^2 in the south to 7.0kWh/m^2 in the northern arid regions.[286] Wind speed ranges from a low 1.4-3.0 m/s in the south to 4.0-5.12 m/s in the extreme north.[287] The Nigerian Renewable Energy Master Plan 2011 (REMP) suggests a strategy to increase the share of renewable sources in electricity from 13% in 2015 to 23% by 2025 and 36% by 2030.[288] The REMP also outlines relevant fiscal and market incentives to support renewable energy deployments such as a moratorium on import duties for renewable energy technologies and the establishment of further tax credits, capital incentives, and preferential loan opportunities for renewable energy projects.[289]

On nuclear energy, it is noted that uranium-rich pyrochlore was discovered in significant quantities in the North Central Jos Plateau region in 1947, although there is currently no commercial extraction program for the uranium.[290] Two nuclear research centers were established in the 1970s, and another nuclear science and technology center was also established in 1993.[291] Some considerable efforts have been made by the Government in establishing the needed institutional and international co-operation framework for developing nuclear energy for electricity generation in the mid to long-term.[292] Developing these 'alternative' resources for plausible

285. *Id.*
286. THE INT'L ENERGY AGENCY, NIGERIA RENEWABLE ENERGY MASTER PLAN (July 3, 2013), https://www.iea.org/policies/4974-nigeria-renewable-energy-master-plan [https://perma.cc/SC8V-W8VA].
287. *Id.*
288. *Id.*
289. *Id.*
290. *Id.*
291. *Id.*
292. *Id.*

off-grid and under-grid solutions will depend on the context, available local expertise, and the enabling of adequate commercial interests.

2. Enabling the Emerging Energy Systems

The policy and regulatory frameworks underpinning the emerging off-grid power supply systems in Nigeria are primarily steered by NERC.[293] The Federal Government has outlined its commitment and approach to rural electrification in the several official policies and plans.[294] The main regulatory institutions that are responsible for the development of the off-grid sub-sector are the NERC and the Rural Electrification Agency (REA).[295] The REA is primarily responsible for the development of rural off-grid power supply solutions facilitated by the government.[296] These off-grid projects are designed to be renewable-energy based, given that renewable energy has been adopted as the primary energy source for facilitating energy access in rural areas.[297] The REA is charged with the electrification of rural areas and administering the Rural Electrification Fund (REF).[298] Potential investors looking to venture into mini-grid projects would have to adhere to certain criteria or eligibility requirements proposed by the REA to benefit from the REF, which provides capital grants of up to 75% of project costs, including technical support to rural electrification.[299]

a. Regulatory Instruments and Provisions

It is important to highlight the relevant regulatory instruments that are applicable to the development of off-grid projects. First, the Captive

293. *Rural Electrification Policy-Ensuring Right Policies in Place*, RURAL ELEC. AGENCY, https://rea.gov.ng/rea-policy-objectives/ [https://perma.cc/7BMP-WEZL] (last visited Dec. 21, 2020) [hereinafter *Ensuring Right Policies in Place*].

294. RURAL ELEC. AGENCY, NIGERIA MINIGRID INVESTMENT BRIEF 7 (Dec. 2017), https://rmi.org/wp-content/uploads/2017/12/Nigeria_Minigrid_Investment_Brief_REA_RMI.pdf [https://perma.cc/4N2E-CZJU].

295. INT'L RENEWABLE ENERGY AGENCY [IRENA], *Off-grid Renewable Energy Solutions to Expand Electricity Access: An Opportunity Not to be Missed*, at 15 (2019), https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Off-grid_RE_Access_2019.pdf, [https://perma.cc/VX3S-2M3Z].

296. *Ensuring Right Policies in Place*, *supra* note 293.

297. REF: Rural Electrification Fund, RURAL ELEC. AGENCY, http://rea.gov.ng/rural-electrification-fund/ [https://perma.cc/KV7C-JAPD] (last visited Dec. 21, 2020).

298. *Prospects for Reliable Electricity Supply*, *supra* note 151, at 321.

299. *Id.* at 326.

Power Regulations, 2008[300] is one of the most widely used and applicable legal instruments for off-grid solutions deployed by companies and large organizations in driving industrial processes.[301] The regulations define captive power generation as "generation of electricity exceeding 1 MW for consumption by the generator, and which is consumed by the generator itself, and not sold to a third-party."[302] In this regard, power generation is intended for self-consumption and would not be distributed through the grid.[303] The regulations also provide for permitting requirements to be adhered to by an intending captive power operator.[304] Where the captive plant operator intends to supply power in excess of 1 MW to a third party, the licensing requirements state that a generation license must be obtained.[305]

The second relevant regulatory instrument is the Eligible Customer Regulations, 2017 (ECR17).[306]In order to fix the bottleneck created with the role of NBET and the creditworthiness challenge of off-takers, the Federal Government declared categories of persons to be regarded as Eligible Customers pursuant to Section 27 of the EPSRA.[307] Following the declaration, the NERC issued the ECR17.[308] An eligible customer is defined under Section 100 of the EPSRA as "a customer that is eligible, according to a directive or directives issued by the Minister, to purchase power from a licensee other than a distribution licensee."[309] Thus, ECR17 provides for four (4) categories of customers who can apply to be declared "eligible" for the procurement of power directly from the generation companies instead of the distribution companies.[310] However, only one class of the customer classification applies to the off-grid power sector i.e.

300. NIGERIAN ELEC. REG. COMM'N, NERC-R-0108, PERMITS FOR CAPTIVE POWER GENERATION REGULATIONS (2008), https://nerc.gov.ng/index.php/library/documents/Regulations/Regulation-for-Captive-Power-Generation/.

301. *Id.*

302. NERC-R-0108 § 2(1).

303. *Id.*

304. Section 5(4) of the Eligible Customer Regulations.

305. Section 8(b) of the Captive Power Regulations.

306. NERC-R-0108 § 3.

307. NERC-R-0108 § 8(b).

308. NIGERIAN ELEC. REGUL. COMM'N, NERC-R-1111, ELIGIBLE CUSTOMER REGULATIONS (2017).

309. Electric Power Sector Reform Act No. 6 (2005) 92:77 S.O.G., A93, § 27 (Nigeria).

310. NIGERIAN ELEC. REGUL. COMM'N, NERC-R-1111, ELIGIBLE CUSTOMER REGULATIONS (2017).

"Customers who consume more than 2 MW/hr for one month and have a direct metered connection to the generation licensee's facility."[311]

A notable implication of the ECR17 is that it creates the framework for the existing generation companies, IPPs, and prospective licensees to sell power directly to underserved 'eligible' customers. Such customers would have to fall under the requisite monthly consumption threshold and negotiate with the power generator(s) under the "willing-buyer willing-seller" arrangement.[312] Thus, the parties can agree to the supply of power from the generation plant directly to the customer's facility via an Independent Distribution Network, without connection through the national transmission grid.[313] The objectives of the ECR17 are to provide standard rules to facilitate: (1) competition in the supply of electricity, promotion of the rapid expansion of generation capacity, and opportunity for improvement in quality of supply; [314] (2) third party access to transmission and distribution infrastructure as a precursor to full retail competition in the NESI; [315] (3) the option for licensed generation companies with uncontracted capacity to access unserved and underserved customers without having to go through the government owned NBET, and thus improving the prospects of dealing with a buyer who is willing and able to pay; [316] (4) the stability and operational efficiency of generation companies arising from the flatter load profiles of Eligible Customers and possibly lower technical losses, depending on the required network interconnection.[317]

A third regulatory instrument worth mentioning is the Mini-Grid Regulations, 2016 (MR16).[318] The MR16 aims at enabling an off-grid framework that provides streams of investment and solutions to the

311. NERC-R-1111 § 5(4).

312. Electric Power Sector Reform Act No. 6 (2005) 92:77 S.O.G., A127, § 100 (Nigeria).

313. Ayodele Oni, *Practical Issues for Investors: The Declaration of Eligible Customers*, BLOOMFIELD L. PRAC. (Oct. 26, 2017), https://www.lexology.com/library/detail.aspx?g=ea630a08-a758-4ae9-b5d3-ce0b77b6303d.

314. Ken Etim et. al, *The Nigerian Electricity Supply Industry: Recent Developments and Prospects*, BANWO & IGHODALO 3 (Feb. 25, 2018), https://www.banwo-ighodalo.com/grey-matter/the-nigerian-electricity-supply-industry-recent-developments-and-prospects?utm_source=Mondaq&utm_medium=syndication&utm_campaign=LinkedIn-integration [https://perma.cc/XS49-U3VT].

315. *Id.*

316. NIGERIAN ELEC. REG. COMM'N, NERC-R-1111 § 2, ELIGIBLE CUSTOMER REGULATIONS (2017).

317. NERC-R-1111 § 2.

318. *Nigerian Electricity Regulatory Commission Mini-Grid Regulation 2016*, INT'L ENERGY AGENCY (Sept. 26, 2017), https://www.iea.org/policies/6375-nigerian-electricity-regulatory-commission-mini-grid-regulation-2016 [https://perma.cc/NF4H-SYJX].

challenges of the on-grid electricity supply in the NESI.[319] It provides a clear investment pathway that can be exploited by existing and prospective generation licensees in the industry.[320] A mini-grid is defined as an "electricity supply system with its power generation capacity, supplying electricity to more than one customer and can operate in isolation from or be connected to a Distribution Licensee's network."[321] The mini-grid must have a generating capacity that ranges between 0 kW and 1 MW.[322] The MR16 aims to boost investments in off-grid rural and urban electrification infrastructure investments, as well as renewable photovoltaic (PV) power by creating a hybrid of the generation capacity of mini-grids.[323] Mini-grid projects are governed by the tariff methodology set out in the MYTO Mini-Grid model.[324] The applicable tariff for grid supply is the Multi-Year Tariff Order (MYTO) 2015, while the tariff for off-grid supply through the MR16 will be determined by the mini-grid model, subject to the negotiations of parties to the project.[325] Outside the mini-grid structure, tariffs for off-grid projects are determined by parties on a willing-buyer, willing-seller basis.

b. Challenges with Off-Grid Power Supply

The market potential of Nigeria for off-grid solutions was adjudged to be one of the best in Africa due to customer willingness and ability to pay.[326] However, some barriers and plausible challenges exist, which may be responsible for the relatively slow uptake of decentralized renewable energy and off-grid solutions.[327] There is a considerable challenge regarding limited access to affordable project finance by investors and renewable energy developers.[328] Generally, this is a result of a lack of

319. *Id.*

320. *Id.*

321. NIGERIAN ELEC. REGUL. COMM'N, NER/-R-110/17 § 3(1), REGULATION FOR MINI-GRIDS (2016), https://nerc.gov.ng/index.php/library/documents/Regulations/NERC-Regulation-for-Mini-Grid/.

322. *Id.*

323. *Prospects for Reliable Electricity Supply*, *supra* note 151, at 328.

324. *MYTO Mini Grid Model*, NIGERIAN ELEC. REGUL. COMM'N, https://nerc.gov.ng/index.php/library/documents/Regulations/MYTO-Mini-Grid-Model/.

325. NIGERIAN ELEC. REGUL. COMM'N, NER/-R-110/17 § 7(1)(g).

326. Wayne Energy Consult, *supra* note 279, at 10.

327. *Id.*; *see also* NIGERIAN ELEC. REGUL. COMM'N, 2018 ANNUAL REPORTS & ACCOUNTS, 34, 52 (Dec. 31, 2018), https://nerc.gov.ng/index.php/component/remository/NERC-Reports/NERC-Annual-Report-and-Accounts-2018/?Itemid=591.

328. Wayne Energy Consult, *supra* note 279, at 12.

proven, scalable business models given that each off-grid success story is backed by tailor-made solutions to the specific project and limited availability of data for the assessment of demand, which usually leads to inaccurate customer enumeration and consumption growth projections.[329] There is also the challenge of foreign exchange risk, given the disparity between the cost of equipment importation, feedstock production, and cost of service delivery.[330] Another challenge is that renewable energy-based off-grid projects are generally known for their high initial cost structure, which would eventually be passed on to the customers via a cost-reflective tariff.[331] The assumptions regarding high project cost for the developer and requirements of affordability by the customer could be a constraining factor, leading to buy-in by only a small fraction of customers.[332]

The unfavorable import policy of the government is another challenge.[333] Currently, there is no exemption from duty taxes on imported equipment, machinery, spares, and consumables.[334] Also, for solar-powered off-grid projects, 25% combined import duties and value-added tax (VAT) is charged on imported solar components[335] (only solar panels are import-duty exempt).[336] These undesirable policies do not induce fast-paced growth in the sector. An additional concern involves the grid expansion policies which do not provide for clear, adequate compensation of mini-grid developers in the event of national grid expansion.[337] This poses a significant threat to investment in mini-grid projects since on-grid electricity provides a subsidized cost of electricity to the consumer and a switch to grid supply will result in a loss to the developer.[338] Other considerable issues include the lack of technical expertise and experience relating to the emerging off-grid technologies,[339] and insufficient consumer awareness and trust.[340] The limited number of Nigerians who are aware of off-grid solutions often

329. The World Bank, Nigerian Electrification Project, at 10, Report No. PAD2524 (May 31, 2018), https://nerc.gov.ng/index.php/library/documents/NERC-Reports/NERC-Annual-Report-and-Accounts-2018/ [https://perma.cc/Y9GF-XTL7].

330. Wayne Energy Consult, *supra* note 279, at 46.

331. The World Bank, *supra* note 329, at 32.

332. Wayne Energy Consult, *supra* note 279, at 46.

333. *Id.*

334. *Id.* at 12.

335. *Id.*

336. *Id.*; The World Bank, supra note 329, at 10.

337. Wayne Energy Consult, *supra* note 279, at 11-12, 48.

338. *Id.* at 11-12.

339. *Id.* at 17.

340. *Id.* at 17-18.

have a deep sense of distrust for solar technologies linked to a precedent of failed government-sponsored programs and the low-quality solar products flooding the market.[341]

F. Outlook for Reliable Energy Supply

Despite the apparent challenges with grid-based electricity supply and off-grid electricity systems, the government is taking steps to balance demand and supply via the grid and expanding access to electricity across the country.[342] In addition, there are various projects been initiated by the private sector and international development finance institutions (DFIs) such as the United States Agency for International Development (USAID), the UK Department for International Development (DFID), and GIZ, under its Nigeria Energy Support Program (NESP).[343] The recent legal and regulatory developments discussed above also enhances interests in such projects. For instance, the MCR17 framework discussed above regarding eligible customers, inter alia, sets out the following classes of customers that may declare eligibility for direct access to producers:[344]

- Customers with at least 2 MW/h consumption connected to the metered 11 kV or 33 kV delivery point through the DisCos' network;[345]
- Customers with at least 2 MW/h consumption connected to a metered 132 kV or 330 kV delivery point on through the TCN's network;[346]
- Customers with at least 2 MW/h consumption connected directly to the metered 33 kV delivery point on TCN's network to be supplied through the DisCos' network;[347]
- Customers with at least 2 MW/h consumption directly connected to a GenCo to be supplied through a DisCos' network.[348]

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341. *Id.*; *see also Nigeria: Power Africa Fact Sheet*, USAID, https://www.usaid.gov/powerafrica/nigeria [https://perma.cc/6HA3-2SXW] (last visited Dec. 23, 2020).

342. *Prospects for Reliable Electricity Supply*, *supra* note 151, at 330.

343. *Id.*

344. NIGERIAN ELEC. REG. COMM'N, NERC-R-1111 § 5, ELIGIBLE CUSTOMER REGULATIONS (2017); Julien Barba, *Eligibility Customers Regime: The Implementation of an "Open Access" Electricity Market in Nigeria?*, LEXOLOGY (Jan. 2, 2018), https://www.lexology.com/library/detail.aspx?g=529c2d0e-de5b-48b3-8361-244d234dbc91.

345. Etim, *supra* note 316, at 3.

346. *Id.*

347. *Id.*

348. *Id.*

It is expected that the ECR17 will foster easier access and competition in the NESI through the declaration of eligibility by large residential, commercial, and industrial electricity consumers. Under this regime, the declaration entails that these strategic customers leverage the opportunity to receive reliable power supply from GenCos and IPPs. Although the DisCos may become participants under certain categories, the consequence of the regime is that the "Eligible Customers" are permitted to bypass the DisCos and resort to the GenCos and IPPs for the provision of improved power supply services. The steady growth in businesses in the country, coupled with the present challenges of grid supply, is expected to foster increased participation of customers, GenCos, and DisCos in this regime. The introduction of the policy underscores the ongoing transitional phase from a centralized traditional monopoly framework and expected development of a more competitive wholesale markets and decentralized NESI. That would hopefully spearhead economic growth.[349]

1. Electricity Distribution Franchising

NERC has proposed electricity distribution franchising as a novel commercial framework for addressing the challenges in the NESI.[350] The commercial arrangement between investors and DisCos will be governed by a franchising regulation, and NERC had commenced a consultation process with stakeholders.[351] The term "Electricity Distribution Franchise" refers to a franchise business model operated by a DisCo and a third-party investor (Franchisee) where the Franchisee, acting as the representative of the DisCo, provides electricity distribution and retail services to customers within the DisCo's franchise area at a stipulated tariff.[352] In effect, NERC envisages the augmentation of the quality of service delivery to customers by the franchisees, operating on behalf of the DisCo.[353] The objective is to address challenges in funding and infrastructure gaps, power supply

349. REVISITING REFORMS, *supra* note 3, at 67-68.

350. NIGERIAN ELEC. REGUL. COMM'N, CONSULTATION PAPER ON THE DEVELOPMENT OF A REGULATORY FRAMEWORK FOR ELECTRICITY DISTRIBUTION FRANCHISING IN NIGERIA 4 (2019), https://nerc.gov.ng/index.php/library/documents/Consultation-Papers/Consultation-Paper-on-Electricity-Distribiution-Franchising-April-2019/ [hereinafter ELECTRICITY DISTRIBUTION FRANCHISING].

351. *Id.* at 4-5.

352. Olusola Bello, *Understanding Electricity Distribution Franchising in Nigeria*, BUS. DAY (June 6, 2019), https://businessday.ng/energy/power/article/understanding-electricity-distribution-franchising-in-nigeria/ [https://perma.cc/VN6A-BLEN].

353. ELECTRICITY DISTRIBUTION FRANCHISING, supra note 350, at 4.

deficit, low customer satisfaction, and technological deficiencies within each DisCo's network area.[354]

As a novel concept in the NESI, interested investors may undertake single functions or the entire distribution function under any of the following business models: (a) metering, billing, and collection; (b) total management of Electricity Distribution Function; and (c) distributed generation.[355] Thus, a DisCo may franchise out the entire management of its distribution function in a given area within its franchise area, or it may only franchise out specific retail or distribution functions to the franchisee.[356] The franchisee will, in turn, pay the DisCo a franchise fee for its commercial operations within the DisCo's franchise area.[357] While the consultation paper suggests several potential business models for distribution franchising, the distributed energy resources generation (DG) model is particularly relevant for promoting increased energy access to underserved communities in the under-grid areas.[358] The DG model enables a franchisee to deploy additional generation supply to meet an electricity deficit at the local distribution network level, in addition to managing the network's distribution function and metering, billing, and collection operations.[359] The central idea is to better serve these customers and their communities through mini-grids that utilize existing distribution and incorporate distributed energy resources.[360]

Where the regulatory framework for franchising is approved and executed, the NESI will witness significant changes in the operations of the distribution segment of the value chain.[361] Improved power supply, strong network equipment, quality service delivery, and enhanced effectiveness at cost-reflective rates can be expected.[362] It is opined that

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354 *Id.* at 5-6; *NERC'S Guidelines on Distribution Franchising*, OLANIWUN AJAYI LP 1 (July 9, 2020), http://www.olaniwunajayi.net/wp-content/uploads/2020/07/NERCS-GUIDELINES-ON-DISTRIBUTION-FRANCHISING-.pdf [https://perma.cc/7MY2-WF5P].

355. ELECTRICITY DISTRIBUTION FRANCHISING, supra note 350, at 5-6.

356. *Id.* at 4-5.

357. *Id.* at 7.

358. Sachiko Graber et. al, *Under the Grid: Improving the Economics and Reliability of Rural Electricity Service with Undergrid Minigrids*, ROCKY MOUNTAIN INST. 7, 15, 17 (2018), https://rmi.org/wp-content/uploads/2018/11/rmi-undergrid-report.pdf [https://perma.cc/E4TB-WARS].

359. Sachiko Graber et al. (Rocky Mountain Institute), UNDER THE GRID: IMPROVING THE ECONOMICS AND RELIABILITY OF RURAL ELECTRICITY SERVICE WITH UNDERGRID MINIGRIDS, (2018).

360. *Id.* at 10.

361. *Id.*; *Prospects for Reliable Electricity Supply*, *supra* note 151, at 330.

362. *Id.* at 331.

the present challenges, which are lower-hanging fruits including cost-reflective tariffs, the security of supply, and the contractual framework of the market, should be addressed before the implementation of this regulation.[363] NERC has enforced the rights of DisCos in instances where independent power producers encroach into and supply power to customers within the DisCos' franchise areas, without engaging the DisCos within the framework of distribution franchising. In the case between *PIPP LVI Disco Limited v. Eko Electricity Distribution Company Plc* (EKEDP),[364] NERC received a complaint from EKEDP regarding PIPP's encroachment and supply of power to thirteen residential and commercial customers.[365] NERC found that PIPP was in breach of the terms and conditions of its distribution license and failed to amend or seek NERC's approval before the supply arrangement commenced.[366]

Consequently, by Order No: NERC/GL/168, NERC directed the immediate suspension of electricity supply to the thirteen customers, as it was in contravention of the law.[367] Additionally, NERC ordered PIPP to pay compensation for loss of revenue for each day of the supply of electricity to the said customers, EKEDP.[368] PIPP was also fined the sum of ₦10,000 for each day that electricity was supplied to the customers, for as long as the date of full compliance with the Order.[369]

2. Renewable Energy Policies and Initiatives

NERC employs the use of policies and regulations to drive investment in electricity generation from renewable energy sources. In 2015, the Federal Government approved the National Renewable Energy and Energy Efficiency Policy (NREEEP) as well as the National Determined Contribution (NDC), which established Nigeria's commitment to reducing greenhouse gas emissions.[370] The objective of NREEEP is the share increase of on-grid renewable energy in the total

363. *Id.*

364. EKO DISTRIBUTION V. PIPP LVI DISCO LTD., NIGERIAN ELEC. REGUL. COMM'N, ORDER NO. NER/GL/168 (May 9, 2019), https://www.nercng.org/index.php/library/documents/NERC-Orders/NERC-Order-against-PIPP-LVI-DisCo-Ltd/.

365. *Id.*

366. *Id.*

367. *Id.*

368. *Id.*

369. *Id.*

370. INTER-MINISTERIAL COMMITTEE ON RENEWABLE ENERGY AND ENERGY EFFICIENCY, ECONOMIC COMMUNITY OF WEST AFRICA, SUSTAINABLE ENERGY FOR ALL ACTION AGENDA 26 (July 2016), https://www.seforall.org/sites/default/files/NIGERIA_SE4ALL_ACTION_AGENDA_FINAL.pdf [https://perma.cc/V7B8-XBH5].

electricity supply, from 1.3% as of 2015 to 16% in 2030.[371] However, the approval of the National Renewable Energy Action Plan (NREAP) 2016 saw the review of the target to 30% renewable energy by 2030.[372]

The NERC Feed-in Tariffs Regulation 2015 was released in furtherance to NREEEP, and it aims to stimulate investment in power generation from renewable energy sources.[373] The goal is to deploy large-scale renewable energy for the reduction of carbon dioxide (CO_2) emissions.[374] The regulation will distinguish between small and large renewable energy projects and aims to supplement an additional 2,000 MW to the national grid supply by 2020.[375] It provides that the DisCos and NBET will procure 50% of the total projected energy demand from renewable sources.[376] The MR16 seeks to drive investments in power generation and supply via mini-grids at unserved and underserved locations through a combination of fossil-fuel-based technologies and renewable energy technologies.[377]

The MR16 provides that a mini-grid applies only to any isolated or interconnected mini-grid between 0 kW and IMW.[378] Under the regulation, and for both mini-grid developers and DisCos to take maximum advantage of the business opportunities presented therein, interconnected mini-grids exist as a strategic investment vehicle.[379] As an integrated local generation and distribution system, an interconnected mini-grid helps provide blended, consistent, and affordable electricity to unserved or underserved

371. *Id.*

372. *Id.*

373. NIGERIAN ELEC. REGUL. COMM'N, REGULATIONS ON FEED-IN TARIFF FOR RENEWABLE ENERGY SOURCED ELECTRICITY IN NIGERIA § 1, 3 (2015), http://dl.icdst.org/pdfs/files3/ff96d69fc61527a9ecef88eb86be1d6a.pdf [https://perma.cc/S82B-XL3M] (last visited Dec. 21, 2020).

374. Usman Abba-Arabi, *NERC's Regulation Envisages 2,000MW of Renewable Sourced Electricity by 2020*, NIGERIAN ELEC. REGUL. COMM'N (Jan. 11, 2015), https://nerc.gov.ng/index.php/media-library/press-releases/315-nerc-s-regulation-envisages-2-000mw-of-renewable-sourced-electricity-by-2020 [https://perma.cc/KM9V-EXM7].

375. *Id.*

376. *Id.*; REGULATIONS ON FEED-IN TARIFF FOR RENEWABLE ENERGY SOURCED ELECTRICITY IN NIGERIA § 8(h).

377. NIGERIAN ELEC. REGUL. COMM'N, NER/-R-110/17 § 6, REGULATION FOR MINI-GRIDS (2016), https://nerc.gov.ng/index.php/library/documents/Regulations/NERC-Regulation-for-Mini-Grid/; Fatima Aigbomian, *The NERC Mini-Grid Regulations and the Nigerian Mini-Grid Market: Opportunity for Investment*, PRIMERA AFR. LEGAL (Feb. 18, 2019), https://primeraal.com/news/mini-grid-regulation/.

378. NER/-R-110/17 § 3(1).

379. NER/-R-110/17 § 20.

areas, thus having the potential to contribute significantly to the improvement of electricity supply in NESI.[380]

The occurrence of the COVID-19 pandemic has resulted in the increased use of off-grid renewable energy for improved energy access, particularly for health centers and isolation centers through the deployment and installation of solar solutions and technologies.[381] These key projects continue to raise the levels of awareness on the importance of alternative energy projects in closing the energy gap and ensuring reliable power supply.[382] Further, it demonstrates the key role these alternative energy systems play in improving power supply and developing the economy, particularly during emergencies.[383] It can be argued that the NESI is mature enough to have a more comprehensive, well-thought-out framework providing for the development and utilization of utility-scale and small-scale renewable energy systems.[384] However, such a framework would need to be efficiently incorporated and adapted to fit into the existing overarching energy policy and framework for access and supply generally in an integrated manner.[385] As posited by the Sustainable Energy for All (SEforALL) initiative,[386] an Integrated Electrification Pathway (IEP) to universal energy access would entail a "set of inclusive planning approaches and policy measures that support using grid, mini-grid, and off-grid technologies to provide electricity and the associated energy services necessary to meet human needs and contribute to sustainable development."[387]

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380. Babalwa Bungane, *Nigeria: NERC Favors Mini Grid Regulation*, ESI AFR. (Oct. 11, 2016), https://www.esi-africa.com/regional-news/west-africa/nigeria-nerc-favours-mini-grid-regulation/ [https://perma.cc/W9BS-WRRB]; Abdulmumini Yakubu et al., *Minigrid Investment Report: Scaling the Nigerian Market*, THE NIGERIAN ECO. SUMMIT GRP. (NESG) 27 (2018), https://rmi.org/wp-content/uploads/2018/08/RMI_Nigeria_Minigrid_Investment_Report_2018.pdf [https://perma.cc/C3DJ-Y2J3].

381. Jean Marie Takouleu, *Nigeria: REA Urgently Installs Mini-grids for COIVD-19 Care Centres*, AFRIK21 (Apr. 21, 2020), https://www.afrik21.africa/en/nigeria-rea-urgently-installs-mini-grids-for-covid-19-care-centres/ [https://perma.cc/LG76-CEYG].

382. *Id.*

383. Abdulrasheed Isah & Gylych Jelilov, *The Impact of COVID-19 on the Off-grid Renewable Energy Sector in Nigeria*, INT'L ASS'N FOR ENERGY ECON. 59 (May 2020), https://www.researchgate.net/publication/341357764_The_Impact_of_COVID-19_on_the_Off-grid_Renewable_Energy_Sector_in_Nigeria.

384. *History*, NIGERIAN ELEC. REGUL. COMM'N, https://nerc.gov.ng/index.php/home/nesi/401-history [https://perma.cc/2QK6-4FPK] (last visited Dec. 22, 2020).

385. *See* Isah, *supra* note 383.

386. SUSTAINABLE ENERGY FOR ALL, INTEGRATED ELECTRIFICATION PATHWAYS FOR UNIVERSAL ACCESS TO ELECTRICITY: A PRIMER 5 (May 2019), https://www.seforall.org/publications/integrated-electrification-pathways-for-universal-access-to-electricity.

387. *Id.* at 6.

In the Nigerian context, it is opined here that such an integrated and inclusive approach would require an objective understanding and recognizing of some of the variability and intermittency challenges of the "trending" renewable sources, such as solar PV. Additionally, it would be important to determine which areas and sectors such technologies and energy systems could reasonably complement the grid-based networks, which are mostly powered by gas and hydro. Arguably, the emerging alternatives could play a key role in expanding energy access and electrification to rural and off-grid areas. Thus, reliability and security of energy supply, as well as affordability of prices to customers and cost-reflective tariffs to incentive investors, together with sustainability, should be noted as the three broad dimensions of any sound energy policy framework.[388] In all the strategic planning, it is essential to understand the peculiarities of power generation and how directing investments to or from one form or the other through policy requires an all-inclusive systems approach.[389]

For instance, base-load generation systems are designed to meet the minimum level of demand on an electrical supply system over twenty-four hours. [390] Consequently, it must be met by plants that can generate dependable power to consistently meet demand such as hydro, gas, and nuclear, rather than the variable sources that depend mostly on weather patterns and require significant storage to be comparatively reliable, such as solar. [391] The other types of generation systems are Peak and Intermediate, which should also work to compliment base-load generation.[392] It is noted that failure to outline a detailed and thorough framework within which these systems of generation and meeting energy

388. DECARBONIZATION AND THE ENERGY INDUSTRY, *supra* note 134, at 3; David Spence, *Tradeoffs and Tensions in the American Energy Transition*, *in* DECARBONIZATION AND THE ENERGY INDUSTRY LAW, POLICY AND REGULATION IN LOW-CARBON ENERGY MARKETS 15, 24 (Tade Oyewunmi et al. ed., 2020); Magnus Abraham-Dukuma, *Energy Trilemma: Climate Policy Pluralism in the United States: Domestic and International Implications*, 13 CARBON & CLIMATE L. REV. 63, 69 (2019).

389. DECARBONIZATION AND THE ENERGY INDUSTRY, *supra* note 134, at 5.

390. Matthew Cordaro, *Understanding Base Load Power: What It Is and Why It Matters*, NEW YORK AREA 2 (Oct. 7, 2008), http://nyarea.org/issue-briefs/understanding-base-load-power-matters/ [https://perma.cc/85BK-KAS9]. Peak load power plants (commonly referred to as peakers) provide power during peak system demand periods. They are highly responsive to changes in electrical demand and can be started up relatively quickly and vary the quantity of electrical output by the minute. Intermediate load plants fill the gap between base load and peaker plants.

391. *Id.* at 2-3.

392. *Id.* at 3.

access demands will work could lead to counterproductive implications, as seen in some developed economy contexts with blackouts and capacity adequacy or affordability issues.[393]

Even in the developed "rich" economies where standards of living are much higher, an inefficient roll-out of variable renewable energy sources such as wind and solar, without adequately factoring issues like cost of storage and curtailment or negative power pricing due to mismatch in demand and supply, net metering for off-grid systems, and how such relates with utility networks, leads to significant regulatory issues.[394] Thus, in planning a framework to roll out plans for renewable energy systems in the SSA and Nigerian context, it is important to adopt a realistic approach that comprehensively addresses the requirements and is amenable to the peculiarities of the society in question; addressing issues like affordability, the security of supply, and competing alternatives are essential.

About fourteen large scale planned solar projects never came to light since 2017 as a result of contractual misalignments between the government and the solar investors.[395] Although the off-grid space is more fortunate in this regard, gaps still exist in the overall legal, regulatory, and contractual framework for renewable energy. [396] Nevertheless, in recognition of the lacuna, stakeholders through the Nigerian Economic Summit Group (NESG) are pushing for a more specific detailed provisions in the existing legal, regulatory, and contractual framework for supporting investments in renewables and other alternative forms of energy.[397] To this end, the NESG and other industry stakeholders are undertaking a renewable energy legislative gap analysis that seeks to

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393. Jeremy Bowden, *Evolution of Combined Cycle Performance: From Baseload to Backup*, TRANSFORM (Jan. 8, 2018), https://www.ge.com/power/transform/article.transform.articles.2018.jan.evolution-of-combined-cycle-pe [https://perma.cc/N6KU-GPLZ]; Michael Shellenberger, *Why California's Climate Policies Are Causing Electricity Blackouts*, FORBES (Aug. 15, 2020) https://www.forbes.com/sites/michaelshellenberger/2020/08/15/why-californias-climate-policies-are-causing-electricity-black-outs/?sh=3de9fb5b1591 [https://perma.cc/NR6V-HAYP]; Jeff St. John, *New York's Energy Transition (and Challenges) in 5 Charts*, GREENTECH MEDIA (June 10, 2020), https://www.greentechmedia.com/articles/read/the-challenges-of-greening-new-yorks-power-grid [https://perma.cc/76SN-F9JB].

394. David B. Spence, *Paradoxes of "Decarbonization"*, 82 BROOK. L. REV. 447, 476-78 (2017); William Boyd, *Public Utility and the Low-Carbon Future*, 61 UCLA L. REV. 1614, 1688-89 (2014); Amy L. Stein, *Distributed Reliability*, 87 U. COLO. L. REV. 887, 961-2 (2016); Kaisa Huhta et al., *Legal and Policy Issues for Capacity Remuneration Mechanisms in the Evolving European Internal Energy Market*, 23 EUR. ENERGY & ENV'T L. REV. 76, 83 (2014).

395. U.S. ENERGY INFORMATION ADMINISTRATION, *supra* note 72.

396. Yakubu, *supra* note 380, at 4, 6.

397. *Id.* (noting that "The market for minigrids in Nigeria is strong, and clear best practices are emerging" and "Nigeria's existing policy provides a backbone for minigrid development").

identify the shortfall and gaps in existing legislation, regulations, and policies in Nigeria relating to the electricity sector and renewable energy to proffer legislative and executive solutions to address the identified issues.[398]

3. Rural Electrification Agency (REA) Projects

The Energizing Projects are the interventions by the REA for the provision of increased electricity access to rural communities in Nigeria.[399] The interventions are expressed through the Energizing Economies Initiative (EEI)[400] and the Energizing Education Programme (EEP).[401] The EEI targets micro, small, and medium-sized enterprises (MSMEs) in economic clusters, while the objective of the EEP is the provision of reliable and stable electricity supply to target federal universities and university teaching hospitals.[402]

In the fourth quarter of 2018, the World Bank, in collaboration with the Federal Government and the REA, commenced the Nigerian Electrification Project (NEP).[403] The project is a US$350 million facility from the World Bank to the Nigerian government for off-grid development to increase electricity access for households; for MSMEs; and for students and patients at federal universities and university teaching hospitals throughout Nigeria. NEP has four components: solar hybrid mini-grids for rural economic development; stand-alone solar systems for homes, farms, and enterprises; power systems for public universities and teaching hospitals; and technical assistance.[404]

In 2019, the REA launched the Mini-Grid Acceleration Scheme (MAS) and the Interconnected Mini-Grid Acceleration Scheme

398. *Id.* at 6; Aigbomian, *supra* note 377.

399. ENERGIZING ECONOMIES INITIATIVE, RURAL ELECTRIFICATION AGENCY, ENERGIZING ECONOMIES EXECUTIVE SUMMARY 2 (2019), http://rea.gov.ng/wp-content/uploads/2019/02/EEI-Executive-Summary.pdf [https://perma.cc/CHZ8-W9BJ].

400. *Id.*

401. Energizing Education Programme, RURAL ELECTRIFICATION AGENCY, https://rea.gov.ng/energizing-education-programme-2/ [https://perma.cc/X9M4-MK5Q] (last visited Dec. 23, 2020).

402. ENERGIZING ECONOMIES INITIATIVE, *supra* note 399, at 2; Energizing Education Programme, *supra* note 401.

403. *Id.*

404. *Id.*

(IMAS).[405] Both schemes are supported by the European Union (EU) and the German Government through the Nigerian Energy Support Programme (NESP) implemented by Deutsche *Gesellschaft für Internationale Zusammenarbeit* (GiZ).[406] The MAS, via a tender process, allows winning bidders to build a total of 24 mini-grids to meet the required minimum connections of 3,500 [per lot], with each mini-grid not exceeding 1 MW, built-in 5 states across the country, and expected to be operational by the end of July 2020.[407] Meanwhile, the IMAS, via a tender process, allows local mini-grid companies to deploy interconnected mini-grid projects alongside the DisCos. It is aimed at providing a minimum of 15,000 customers across 10 different electricity distribution regions including residential, public, commercial or productive users across Nigeria with access to reliable electricity services at an affordable tariff via privately-led solar interconnected mini-grid projects by the end of September 2020, and is funded with in-kind partial grants of 3 million Euros.[408] It is to cover meters and up to 50% of grid refurbishment and grid extension (cables and poles) plus technical assistance.[409] The MAS is also to be funded with an in-kind capital grant in the form of procured distribution and metering equipment and technical assistance.[410] Tariffs under both schemes will follow the MYTO model.[411]

4. Off-Grid Financing and Government Initiatives

Recently, the Federal Ministry of Power (FMoP) undertook a pilot scheme tagged 3D 24/7 to power an unserved community in Sokoto State.[412] The initiative was undertaken to create a prototype that the FMoP believes can be replicated to increase rural electrification rates.[413] The

405. Ilias Tsagas, *World Bank: Nigeria's Mini-grid Sector Set to Boom*, PV MAG. (Oct. 7, 2019), https://www.pv-magazine.com/2019/10/07/world-bank-nigerias-mini-grid-sector-set-to-boom/ [https://perma.cc/7D7Q-44ME].

406. *Id.*

407. Ilias Tsagas, *Nigeria to Install New PV Mini-Grids as Domestic Off-Grid Sector Surges*, PV MAG. (Dec. 27, 2019), https://www.pv-magazine.com/2019/12/27/nigeria-to-install-new-pv-mini-grids-as-domestic-off-grid-sector-surges/.

408. *Id.*

409. *Id.*

410. *Id.*

411. *Id.*

412. Dolapo Kukoyi et al, *Nigeria*, THE RENEWABLE ENERGY L.J. ed. 3 (2020), https://thelawreviews.co.uk/edition/the-renewable-energy-law-review-edition-3/1229904/nigeria.

413. *Torankawa Grid Solar Power in Sokoto*, NIGERIAN INV. PROMOTION COMM'N (Feb. 14, 2019), https://nipc.gov.ng/2019/02/14/federal-government-commissions-n146m-torankawa-grid-solar-power-in-sokoto/ [https://perma.cc/4HNT-VAJ5] [hereinafter NIGERIAN INV. PROMOTION COMM'N].

financing for this project came from the proceeds of the green bond employed for the project and the Energising Education project of the REA.[414] The community also contributed to the project by donating the land needed for the solar plant to the project developer.[415]

The Lagos State Government (LASG), under the Rural Electrification scheme, and Light Up Lagos Project have provided community and state agency electrification, as well as street lighting initiatives.[416] This was procured under the Public-Private Partnership.[417] Financing for the plants was undertaken by the local lenders and financiers of the private developers, but with payment assurance guarantees backed by the LASG.[418] The government also simplified the process of land acquisition and encourages private citizens who can afford the same to adopt a streetlight and benefit from concessions on the land use charge.[419] Additionally, the Kaduna Government developed an off-grid approach to increase electricity access across the state to boost the agriculture and textile industries.[420] The strategy focused on policy, identification, and prioritization of projects, and its implementation will translate to government support.[421] Notably, renewable energy solutions providers have recently developed various mini-grid solutions across Nigeria.[422] Some of its mini-grid solutions have received state government funding support to ensure the viability of the project.[423]

5. Donor Funded Initiatives

Over the years, there have been several international donor funded programs in the power sector arena. First, the Solar Nigeria Programme was launched by the Nigerian government in 2014 together-

414. Kukoyi, *supra* note 412.

415. NIGERIAN INV. PROMOTION COMM'N, *supra* note 413.

416. Noor Kapdi & Robert Parring, *An Overview of the Lagos State Electric Power Sector Reform Law*, DENTONS (Apr. 4, 2018), https://www.dentons.com/en/insights/newsletters/2018/march/29/south-africa-newsletter/south-africa-newsletter-march/an-overview-of-the-lagos-state-electric-power-sector-reform-law-2018 [https://perma.cc/Y5BQ-G6KS].

417. DECARBONISATION AND THE ENERGY INDUSTRY, *supra* note 130, at 333.

418. *Id.*

419. *Id.*

420. *Id.*

421. *Id.*

422. *Id.* at 334.

423. Kapdi & Parring, *supra* note 416.

with the UK Department for International Development (DFID).[424] The aim was inter alia to establish a platform for providing solar power to public health and education facilities.[425] The Programme provides credit facilities, grants, and technical assistance to companies operating in the solar market.[426]

Second, the USAID Nigeria Power Sector Program (NPSP) entails a five-year program with the main objective of increasing electricity availability and access by strengthening the enabling environment for private sector investment in the power sector, including the development of business and consumer markets for off-grid solutions, with particular focus on solar home systems, mini-grids, and micro-grids.[427] The USAID Power Africa program assisted the Federal Government in the transactions leading to the Qua Iboe IPP-gas project, and currently is assisting with agreements on several solar projects.[428] It also supported the Azura Edo gas-to-power IPP project, which reached financial close in 2015, including a "$50 million investment by The Overseas Private Investment Corporation (OPIC)."[429] The Azura plant became operational in 2018.[430] In order to help resolve the challenge of commercial operations and losses, the programme, together with the U.S. Trade and Development Agency (USTDA), are collaborating with five distribution companies: Abuja, Benin, Eko, Ibadan, and Ikeja.[431] Further, General Electric, the U.S. African Development Foundation (USADF), and others are in partnership to take advantage of about nine Power Africa grants of $100,000 to entrepreneurs for innovative, off-grid energy projects in Nigeria.[432]

Last, there is also a notable Nigeria Energy Support Programme (NESP)[433] involving the European Union and the German government. The program is implemented by GiZ in collaboration with the Federal Ministry of Power, Works and Housing (FMPWH)), with the aim of

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424. *Building the Market for Solar Power in Nigeria*, ADAM SMITH INT'L, https://adamsmithinternational.com/projects/building-the-market-for-solar-power-in-nigeria/ [https://perma.cc/QWE6-VJ62] (last visited Dec. 23, 2020).

425. *Id.*

426. *Id.*

427. *Nigerian Power Sector Program*, USAID (Jan. 2019), http://rea.gov.ng/wp-content/uploads/2019/02/2.-NPSP_Briefing_Abuja.pdf [https://perma.cc/9Z99-XPWE].

428. *Nigeria: Power Africa Fact Sheet*, *supra* note 341.

429. *Id.*

430. *Id.*

431. *Id.*

432. *Id.*

433. *Nigerian Energy Support Programme II*, DEUTSCHE GESELLSCHAFT FÜR INTERNATIONALE ZUSAMMENARBEIT (GIZ) GMBH (last visited Dec. 23, 2020), https://www.giz.de/en/worldwide/26374.html [https://perma.cc/HAG3-FDHK].

supporting the development of solar mini-grid projects in Nigeria.[434] The first phase of the NESP took place between 2013 and 2017, while the second phase commenced in January 2019.[435]

IV. CONCLUSION

Over the past two to three decades, several countries in the SSA region (including Nigeria, South Africa, Kenya, etc.) have actively pursued energy sector reforms in the context of their peculiar regulatory frameworks to allow more private sector participation, encourage competition in generation and retail, and restructure the traditional state-owned utility for more efficiency. These efforts have arguably led to a progressive trend and encountered challenges that underscore the need to develop local market structures and institutions and recognize the centrally applicable laws and regulations in the realization of defined energy policy plans and objectives. These core objectives are largely universal, to wit, the aim for reliable and secure energy supply, as well as affordable access for all to modern energy services at cost-reflective rates that allows public and private investors to earn reasonable returns. While each society and country in the SSA region have their peculiar resources, outlook, and challenges they prioritize in solving, the spotlight on trends and development in Nigeria provides a useful signpost to addressing some of the common issues.

The NESI represents an interconnected network of diverse operations, which when properly harnessed will deliver excellent value to the Nigerian populace in terms of increased affordable supply and access to energy. The privatization of the NESI was a step in the right direction, regardless of the present challenges highlighted above. The culmination of several factors will deliver the value required to make the power sector thrive, some of which include implementation of cost-reflective tariffs across the value chain to guarantee investors a clear sight of investment recovery; increased investments in the generation, transmission, and distribution networks; an increase in DisCos' CAPEX to ensure increased investments by DisCos in their networks, regulatory certainty, and stability; alignment of contract structures and regulation; consistency in power pricing and cost recovery; privatization of the transmission segment of the value chain, etc. The effective implementation of the above factors

434. *Id.*
435. *Id.*

will give credence to the ongoing initiatives and investments currently being undertaken in the sector to guarantee improved energy access and reliability of electricity supply in the country.

In an energy transition context, with the need to balance the need for reliable and secure energy supplies with affordability and viability of the energy markets alongside supplying sustainable and low-carbon energy, the evolving off-grid policy framework and innovations promoting the deployment of renewable energy solutions are promising.