Detail

Nigeria Power Guide

Volume 4, 2018 Edition

DETAIL COMMERCIAL SOLICITORS

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EXECUTIVE SUMMARY

This edition of the Nigeria Power Guide provides a comprehensive analysis of the current state of Nigeria's power sector. Sequel to the 2015 edition of the guide, this edition provides sector stakeholders and prospective investors with key updates on the activities and developments in the power sector from 2016 to date whilst also highlighting emerging opportunities.

The following topics are covered in this Guide:

a) POWER SECTOR AT A GLANCE

This section provides a snapshot of the legal and regulatory framework of the power sector value chain.

b) POWER SECTOR FACTS

This section provides a snapshot of the status of Nigeria's electricity supply industry, highlights the current grid capabilities, performance of the market participants and generation capacity projections for on-grid and off grid power.

c) POWER SECTOR UPDATES

This section highlights key achievements in the power sector in 2017, some of which include the development of the Economic Recovery and Growth Plan (ERGP) and the Power Sector Recovery Program (PSRP), two significant policies expected to be at the forefront of structural reforms in the sector.

d) HIGHLIGHTS OF NEW KEY POLICIES AND LEGISLATION

This section reviews the key policies and legislative enactments in the sector, some of which include the recently issued Eligible Customers Regulation and Mini Grid Regulations, and their potential impact on the current structure of the industry.

e) NIGERIAN ON-GRID POWER SECTOR IN REVIEW

This section discusses specific power projects in Nigeria, with emphasis on the prevailing challenges (project specific and general on-grid challenges) and practical recommendations. In view of progress with the Azura Edo IPP, scheduled to come on board by May 2018 and the Qua Iboe project expected to attain financial close mid-2018.

f) RENEWABLE ENERGY IN NIGERIA

This section provides a broad overview of Nigeria's renewable energy space. This section highlights the challenges and the strong growth potential for the development of renewable energy in Nigeria.

g) POWER SECTOR OUTLOOK

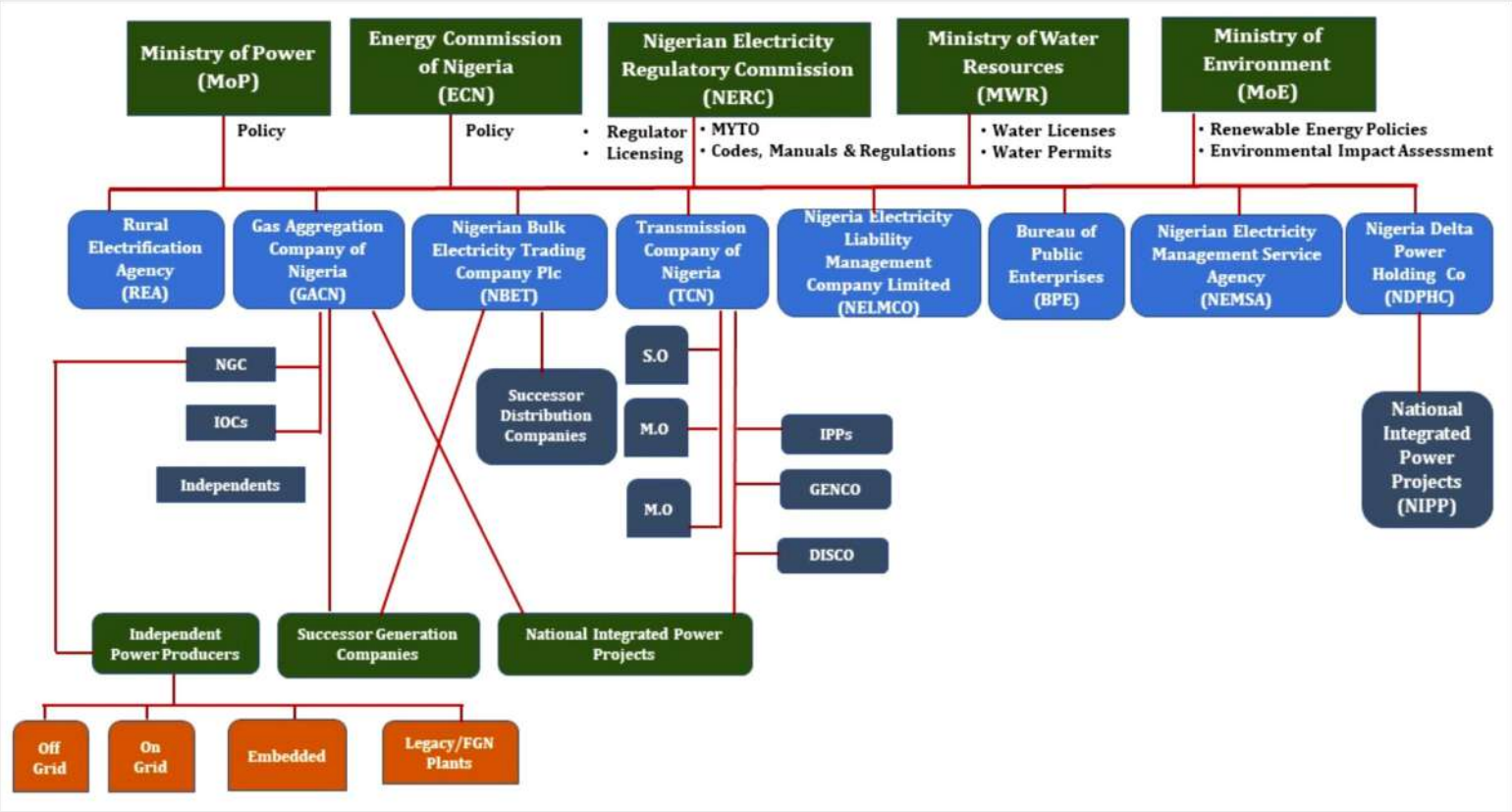
This section provides Detail's outlook on potential investment opportunities in the power sector. The Nigerian Power Sector is poised to witness more growth and investment particularly in off grid power generation whilst the on-grid challenges are being resolved. This section provides an outlook on the sort of off grid projects investors are looking at.

h) POWER GENERATION OPTIONS

This section provides a summary of the power generation options available in the Nigerian power sector.

SECTION A: NIGERIAN POWER SECTOR AT A GLANCE

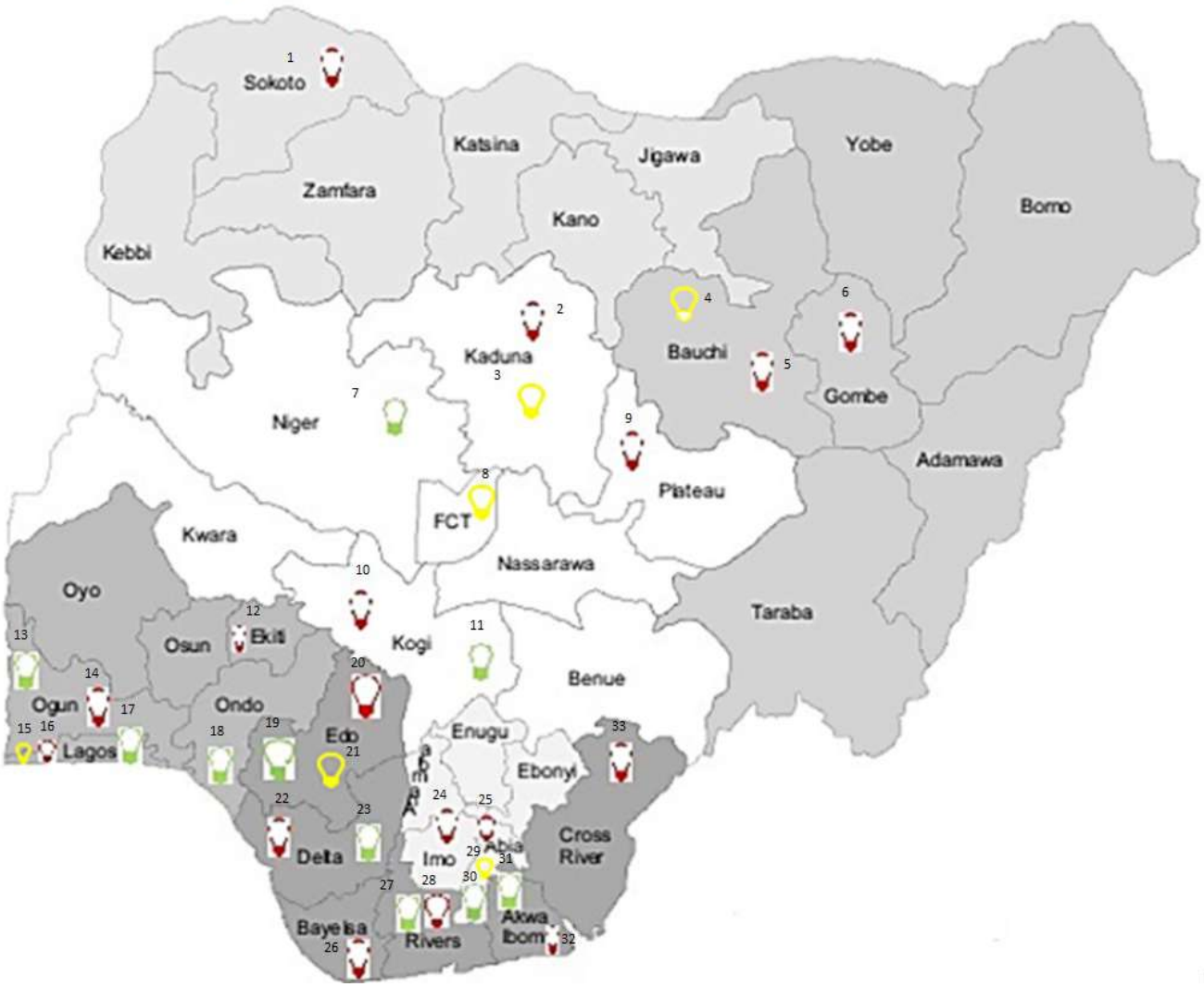
Figure 1: Legal and Regulatory Framework of the Nigerian Power Sector



SECTION B: POWER SECTOR FACTS

1. POWER GENERATION PROJECTS

Figure 2: Snapshot of Power Generation Statistics



POWER STATISTICS (*as of 11th December 2017*[34])
Peak Energy Generation – **4,785.2 MW**
Lowest Energy Generation - **3,474MW**
Installed Capacity – **11,165.40MW**
Available Capacity – **7,139.60MW**
Current Transmission Capability – **7,000MW**
Network Operational Capability – **5,500MW**
Peak Generation Ever Attained (2017) – **5,155.9MW**
Maximum Energy Ever Attained – **109,372.01MWH**

LEGEND

	Operational Generation Companies (***On-grid and Off- grid)***
	Non-Operational Generation Companies (***On-grid and Off- grid)***
	Embedded Power Generation Companies[35]

2. HIGHPOINTS FROM THE BUDGET REVIEW

2.1 On-Grid Generation projections

Generation Capacity Projections (2016-2020) as provided by the System Operator (SO) and NBET included in the MYTO 2015 are depicted in the chart below.[36]

Figure 3: MYTO Power Generation Projections

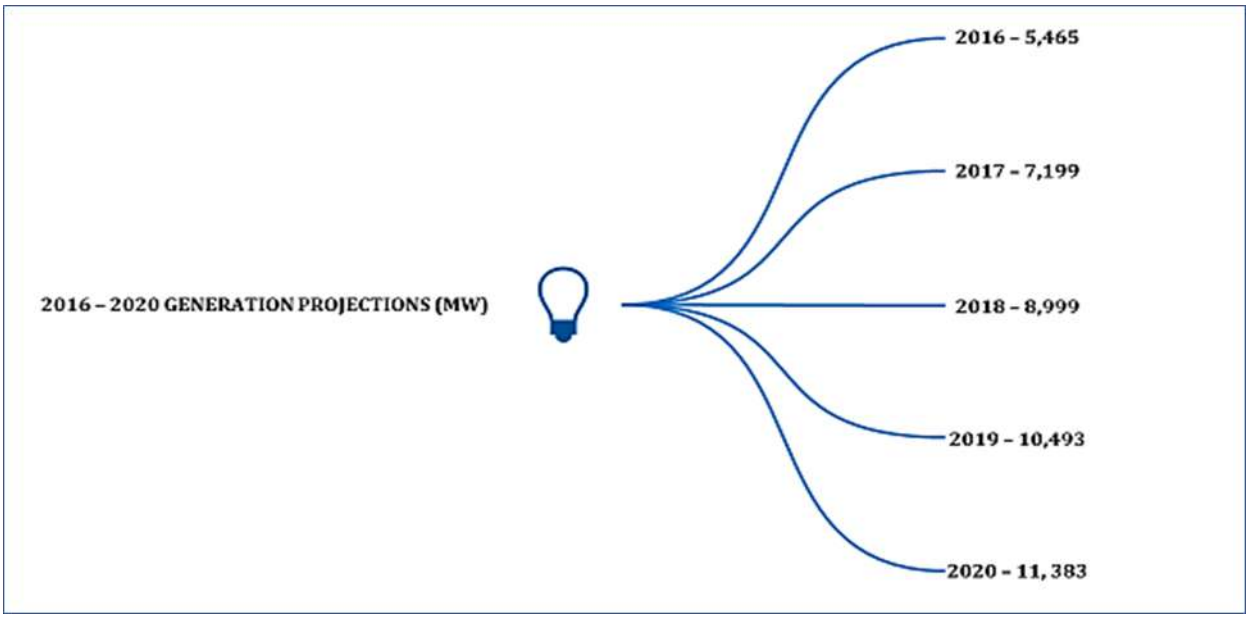


Figure 4: Generation breakdown of the MYTO 2015 [37]

POWER PLANT	2016 (MW)	2017 (MW)	2018 (MW)	2019 (MW)	2020 (MW)
Kainji	165	192	218	300	400
Jebba	202	241	287	364	462
Shiroro	242	289	344	436	554
Egbin	1006	1100	1100	1100	1100
Sapele	101	117	134	300	400
Delta	515	614	732	900	900
Afam IV-V	100	200	300	400	500
Geregu (Gas)	159	185	210	246	282
Omotosho (Gas)	254	303	336	336	336
Olorunsogo (Gas)	231	275	328	336	336
Geregu NIPP	213	248	282	330	378
Sapele NIPP	116	135	153	180	250
Alaoji NIPP	130	151	300	400	500
Olorunsogo NIPP	194	225	256	300	344
Omotosho NIPP	226	262	298	349	400
Ihovbor NIPP	279	333	397	504	508
Okpai	452	480	480	380	480
Afam VI	529	631	650	650	650
Ibom Power	100	119	142	180	190
Omoku	-	100	200	250	250
AES	50	200	200	200	200
Trans-Amadi	-	100	100	200	200
Rivers IPP	50	100	100	200	200
ASCO	50	100	100	100	100

POWER PLANT	2016 (MW)	2017 (MW)	2018 (MW)	2019 (MW)	2020 (MW)
Odupkpani (Calabar NIPP)	100	200	300	400	413
Gbarain NIPP	-	100	200	200	200
Egbema NIPP	-	100	200	200	200
Omoku NIPP	-	100	200	200	200
Azura	-	-	450	450	450
TOTAL	**5,465**	**7,199**	**8,999**	**10,493**	**11,383**

2.2 Off-Grid Generation projections

The National Renewable Energy and Energy Efficiency Policy (NREEEP) projects off-grid power generation from renewables to reach an estimated 12,500 MW in 2030. Nigeria intends to increase generation capacity using renewable energy sources including solar, biomass, wind and hydro.

Figure 5: NREEEP Renewable Energy Projections (2020)

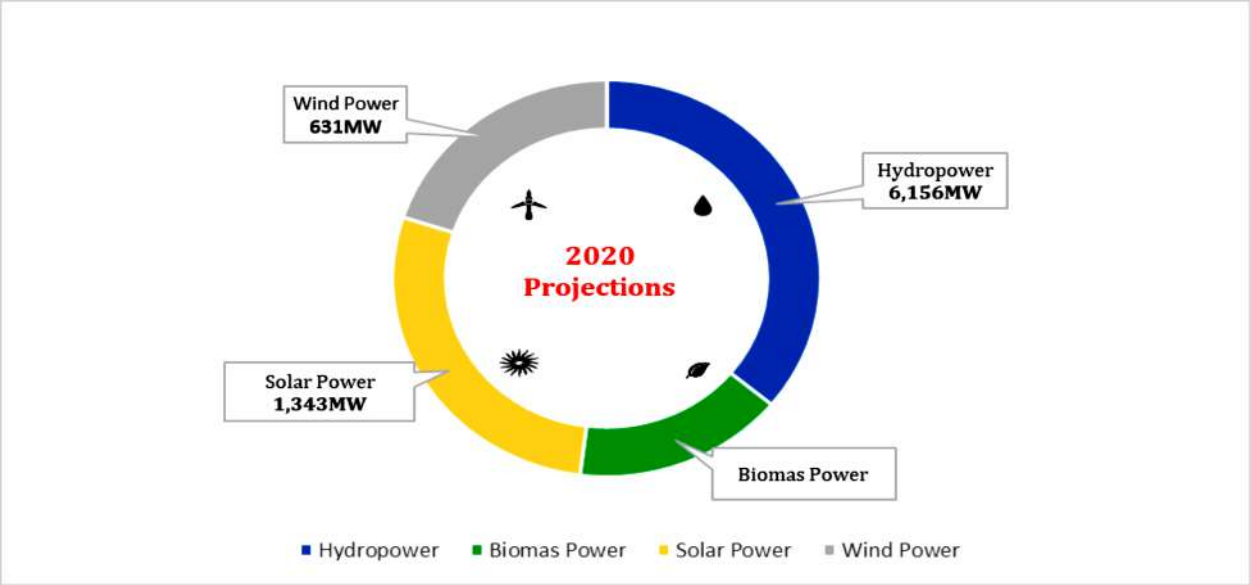
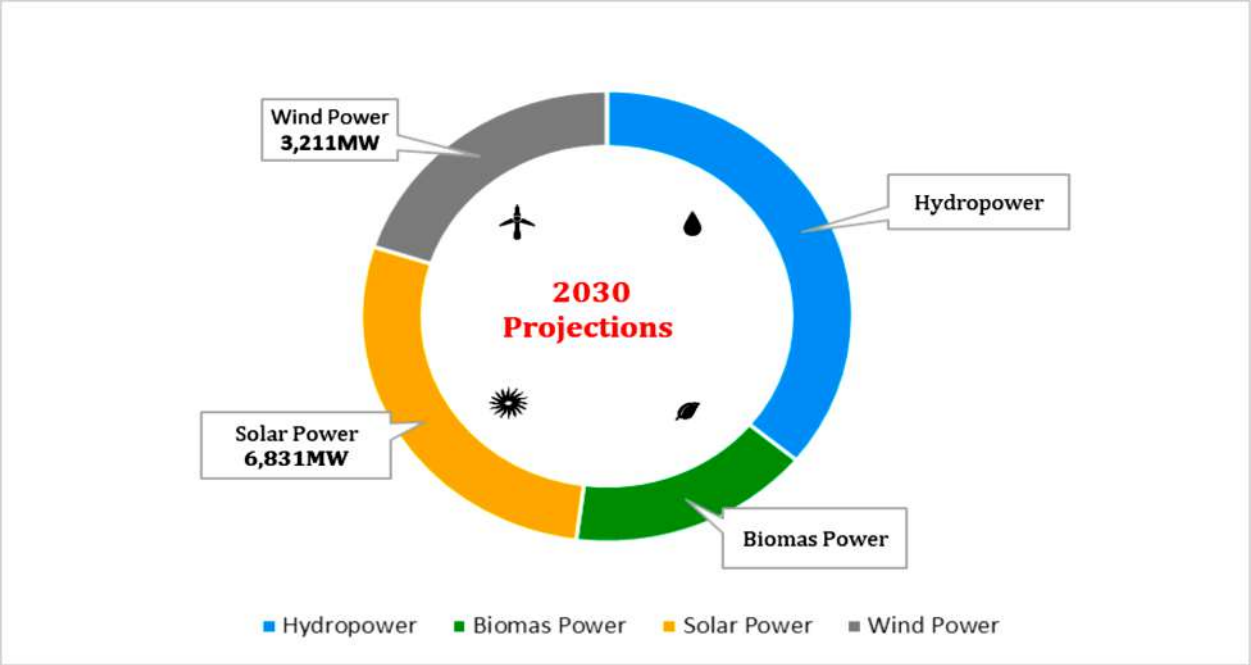


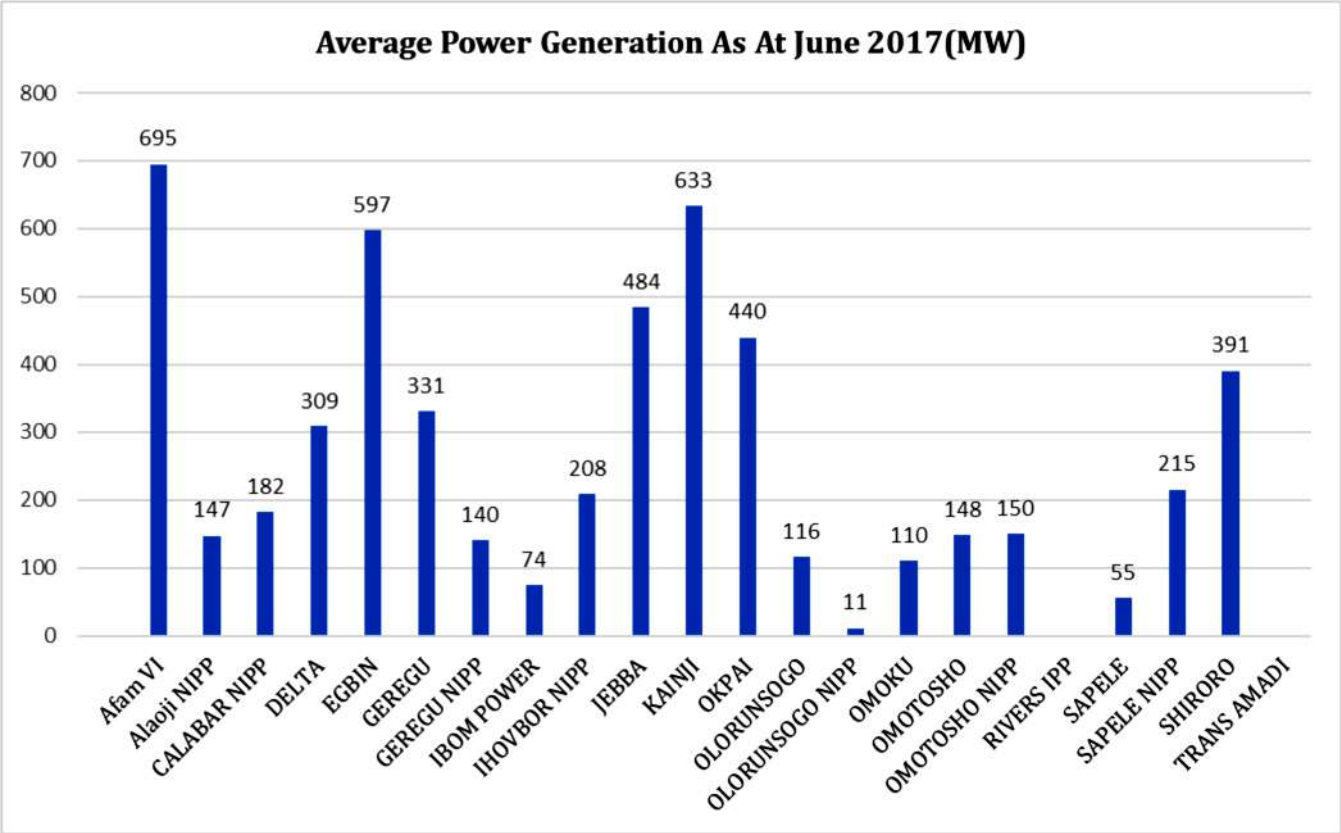
Figure 6: NREEEP Renewable Energy Projections (2030)



2.3 Genco Performance Score Card

The below chart highlights the average power generated by the Generating power stations as at June 2017.

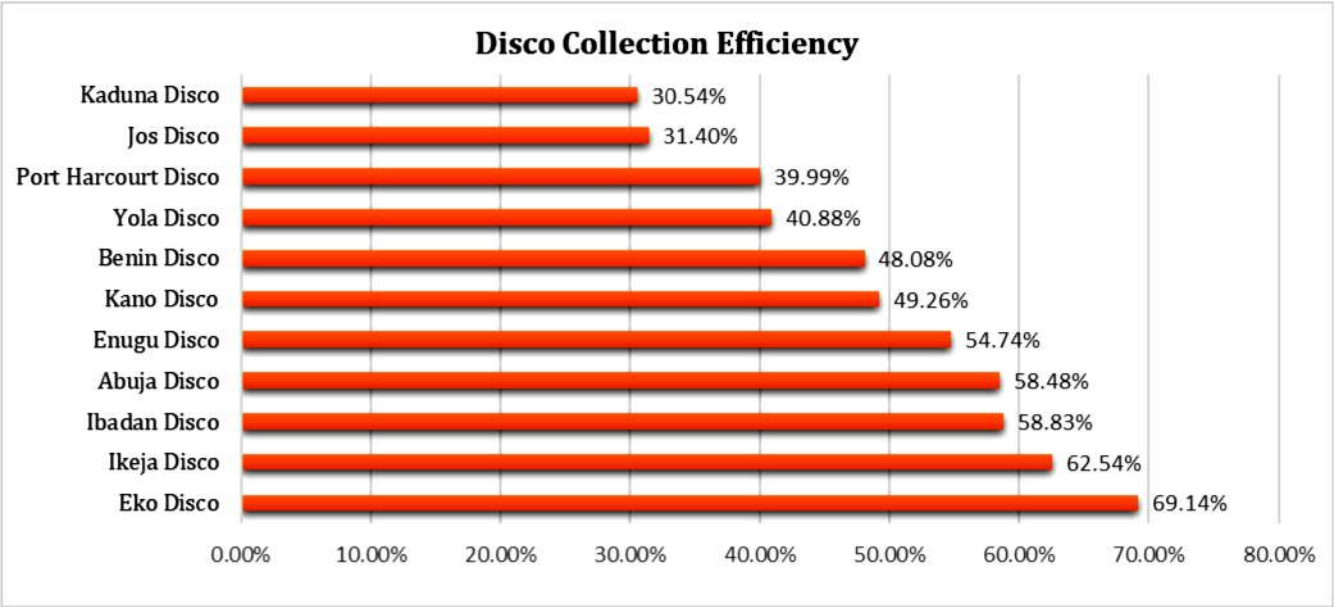
Figure 7: Generation data from operational power generation companies in Nigeria



2.4. Disco Performance Scorecard[38]

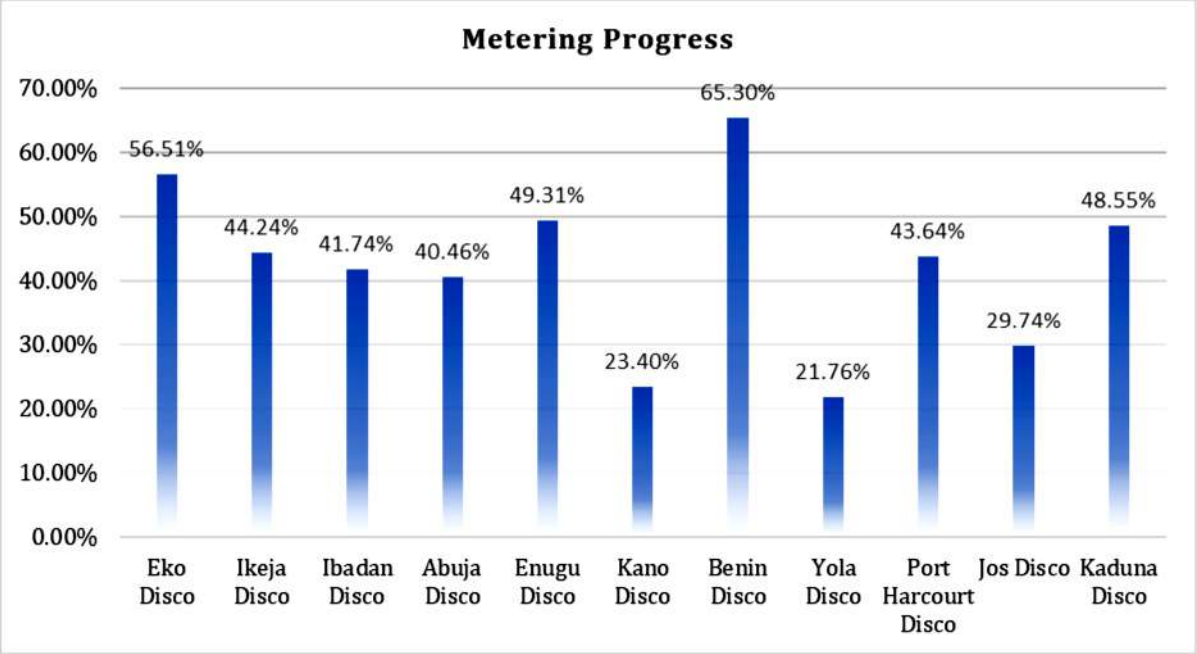
i. **Collection Efficiency** – This indicator considers the revenue generated by the Discos viz a viz the bills issued as of Q2 2016.

Figure 8: Disco Collection Efficiency



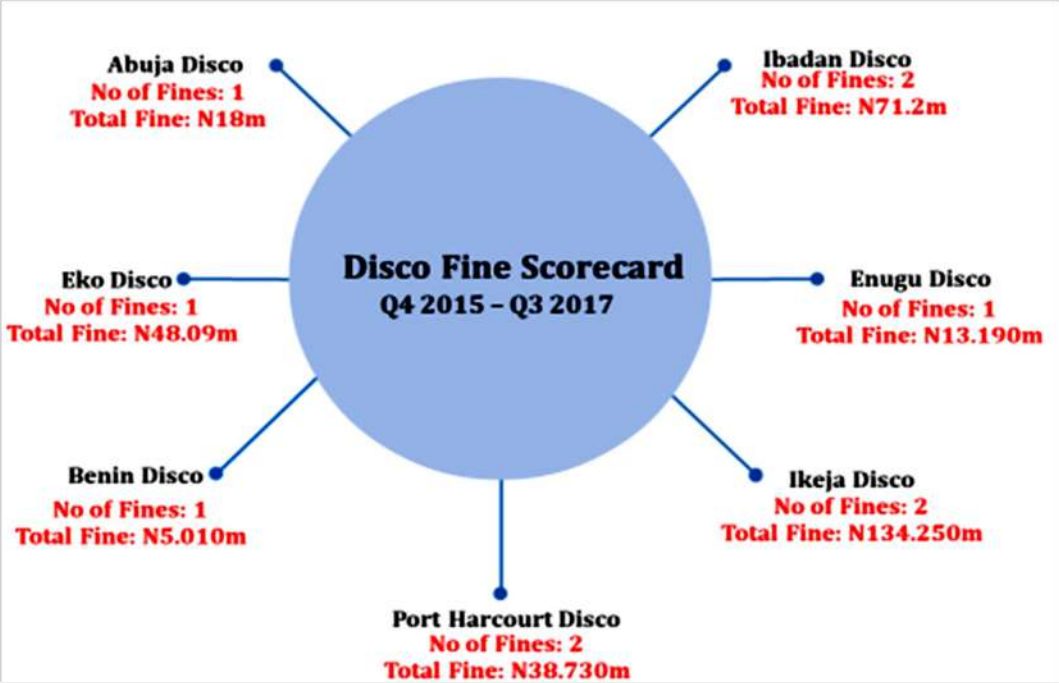
ii. **Metering Progress** – This indicator considers the number of customers that have been successfully metered as of Q2 2016.

Figure 9: Meter roll out success rate per Disco



iii. **Fines and Penalties**[39] – This indicator considers the number of Discos fined by the NERC between Q4 2015 and Q3 2017 and the total amounts payable in fines by each Disco.

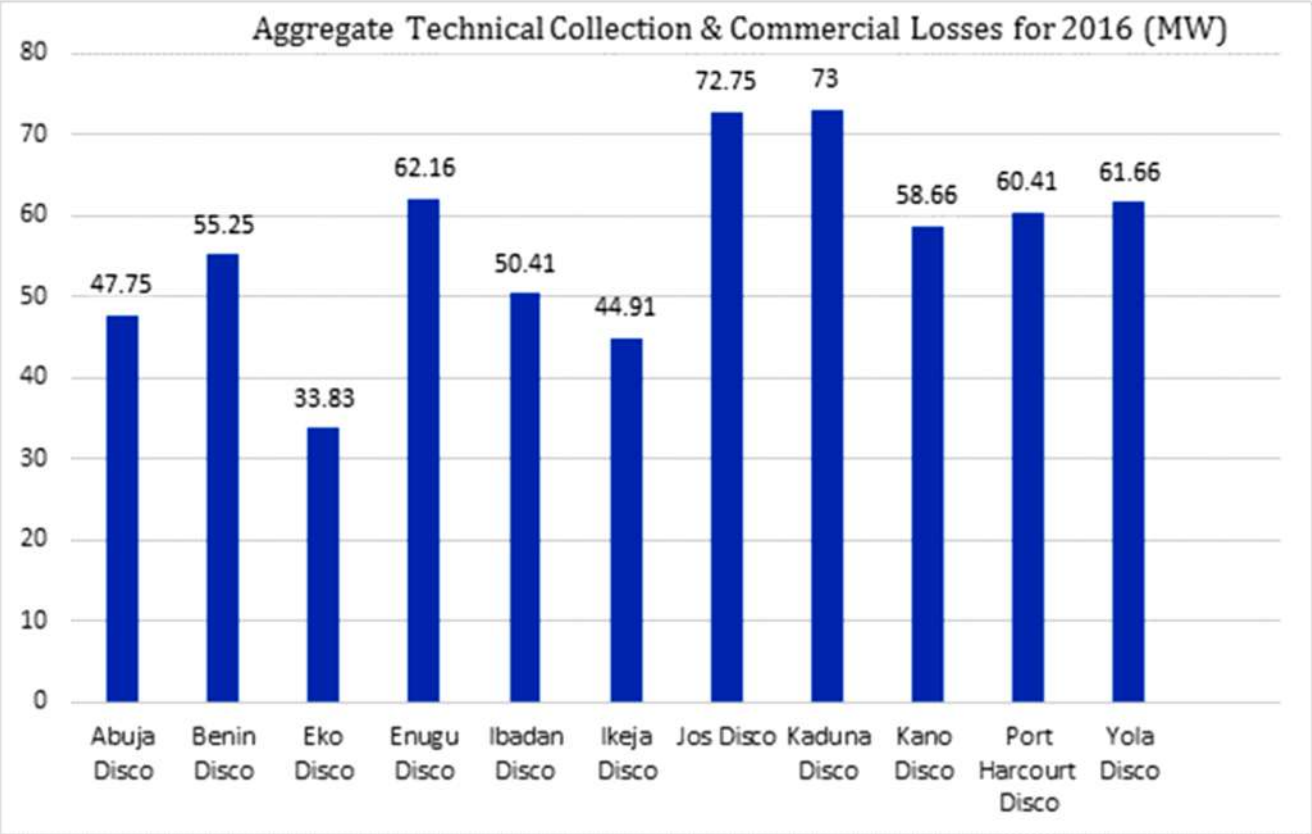
Figure 10: Total number of Disco fines between Q4 2015—Q3 2017



Note: The chart above considers only the publicized penalty and fine orders issued by NERC uploaded on the NERC website as of 23rd October 2017.

iv. **ATC & C Losses —**This chart provides statistical data on the Aggregate Technical Collection and Commercial Loses recorded by the 11 distribution companies across Nigeria as of Q4 2016.

Figure 11: Disco ATC&C Losses as of Q4 2016



SECTION C: POWER SECTOR UPDATES - 2017

1. Issuance of the Federal Government Economic Recovery and Growth Plan 2017 -2020

The Federal Government in February 2017 released the Economic Recovery and Growth Plan (ERGP) which provides a medium-term plan for sustainable development of different sectors of the economy, including the power sector. Pursuant to the ERGP, efforts will be concentrated on overcoming challenges relating to governance, funding, legal, regulatory, and pricing issues across the NESI value chain. The ERGP also aims to optimize the delivery of at least 10GW of operational capacity by 2020 by encouraging small-scale projects building capacity over the long term and investment in transmission infrastructure.

The policy objectives of the ERGP with respect to the power sector are as follows:

a) Improve energy efficiency and diversify the energy mix including through greater use of renewable energy;

b) Facilitate private sector investment in generation, transmission, and distribution;

c) Improve access to electricity to all Nigerians;

d) Increase rural electrification using off-grid renewable solutions;

e) Restore financial viability in the electricity market;

f) Implement a data-driven approach in power sector development planning; and

g) Eliminate sabotage of gas and power infrastructure

2. Appointment of NERC Commissioners

Following the successful screening of candidates by the Commission and approval of the President, six (6) Commissioners led by Engr. Sanusi Garba as the Vice Chairman, on Tuesday 7th February 2017 were appointed Commissioners of the Nigerian Electricity Regulatory Commission (NERC).

The President formally nominated Prof. James Momoh for the position of Chairman of NERC. The nomination has been presented to the National Assembly for confirmation.

3. 701 Billion Central Bank Guarantee to the Power Sector

The Federal Executive Council (FEC) on 1st March 2017 approved a N701 Billion payment assurance guarantee for the power sector to be provided by the Central Bank of Nigeria (CBN) to increase the liquidity position of the Gencos and Gas Supply Companies and hopefully increase revenue certainty and confidence in the power sector. The guarantee took effect from January 2017, and is to last for a two-year period until December 2018.

The objectives of the Payment Guarantee as highlighted by the Minister for Power, Works, and Housing are follows[40]:

a) Stabilizing generation to the grid;

b) Enabling NBET to meet its payment obligations under the PPAs with Gencos;

c) Provide assurance of payment to Gencos and gas suppliers for energy generated;

d) Imbibe confidence to investors and stakeholders in the Gencos and gas producers who supply gas to the power sector to encourage continuous investments in both sectors.

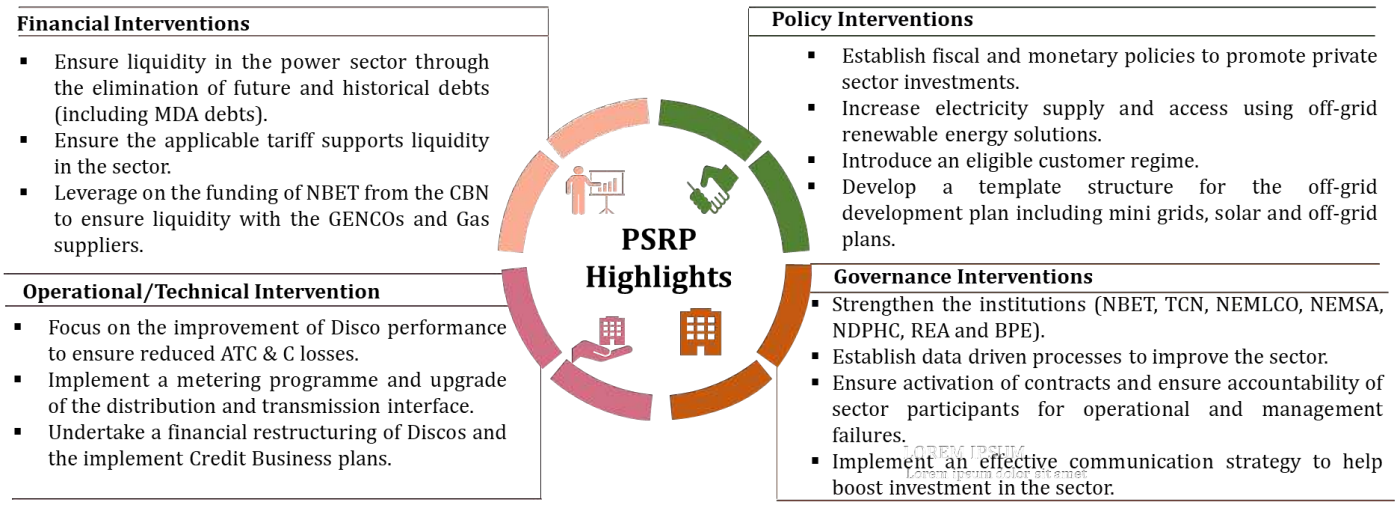
4. Power Sector Recovery Programme (PSRP)

The PSRP is a policy document created by the Federal Government of Nigeria in collaboration with the World Bank Group as an offshoot of the structural reforms proposed in the Economic and Recovery Growth Plan (ERGP) issued on Wednesday 22nd March, 2017. The PSRP proposed interventions to be implemented by the Federal Government over the next five (5) years primarily to achieve the following:

- Restore the financial viability of the Nigeria's power sector;
- Improve power supply reliability to meet growing demand;
- Strengthen the sector's institutional framework and increase transparency;
- Implement clear policies that promote and encourage investor confidence in the sector; and
- Establish a contract-based electricity market.

To achieve the above objectives, the PSRP has been divided into four (4) broad components depicted in **Figure 12.**

Figure 12: Key highlights of the Power Sector Recovery Programme (PSRP)



5. Notice of review of the Multi Year Tariff Order (MYTO) Methodology, 2017[41]

Following the challenges with the implementation of MYTO 2015, the commission has commenced the major review of the MYTO for 2017 in September 2017. Stakeholder consultations were held at all six (6) geo-political zones across the country between September and October 2017, and NERC is currently in the process of evaluating the comments provided and finalizing on the review. It is however doubtful, going by the Power Sector Recovery Plan (PSRP) (issued by the Federal Government in April 2017 in conjunction with the World Bank), that there will be any major tariff reviews until 2021. In the meantime, Government by the PSRP is committing to fund projected future deficits from 2017-2021.

6. Update on CBN NEMSF Facility

The CBN- NEMSF is structured as a 10-year loan to Discos to settle their payment obligations owed to the market during the Interim Rules Period (IRP) as well as Legacy Gas Debt obligations to the Gas Companies. The debt owed to the market by Discos is directly paid to each market participant on behalf of the Discos while the Discos will be responsible for repaying the loan.

The overarching goal of the CBN-NEMSF is to reset the economics of the power sector by way of:

a) Settling the IRP shortfalls and Legacy Gas Debts and resolving the liquidity issues in the sector occasioned by the inadequacies in the MYTO;

b) Bringing about a contract-based electricity market where transactions are governed by market rules and cost reflective tariffs; and

c) Facilitating tangible short-term improvement in electricity supply in the country.

In April 2015, the commission conducted a minor review of the Multi Year Tariff Order (MYTO) 2.1 which resulted in the removal of collection losses from the Discos' tariffs. In protest to this development, the Discos issued Force Majeure (FM) Notices under their respective Performance Agreements which halted the disbursement of the CBN-NEMSF.

Disbursement of the Facility restarted in the 4th quarter of 2015, following a series of productive stakeholder engagements. However, only about N120 billion of the Facility amount has been disbursed to date.

7. Update on the Transitional Electricity Market ("TEM"): Effectiveness of Industry Agreements

Majority of the sector Industry Agreements are yet to be fully effective due to a number of challenges, one of which is the inability of Discos and Gencos to provide the required payment security/letters of credit as stipulated under the respective PPAs in favour of the Gencos. With respect to the liquidity challenges on the Genco side, NBET had taken a progressive step towards driving this process through the introduction of a security trust on behalf of the Gencos. However, this has not been as effective as envisaged, given the fact that NBET is not properly capitalised to provide security for Genco risk and the Discos who have the underlying obligations on which the trust was based are technically insolvent and unable to meet their financial obligations which makes it a challenge to activate currents in such an environment.

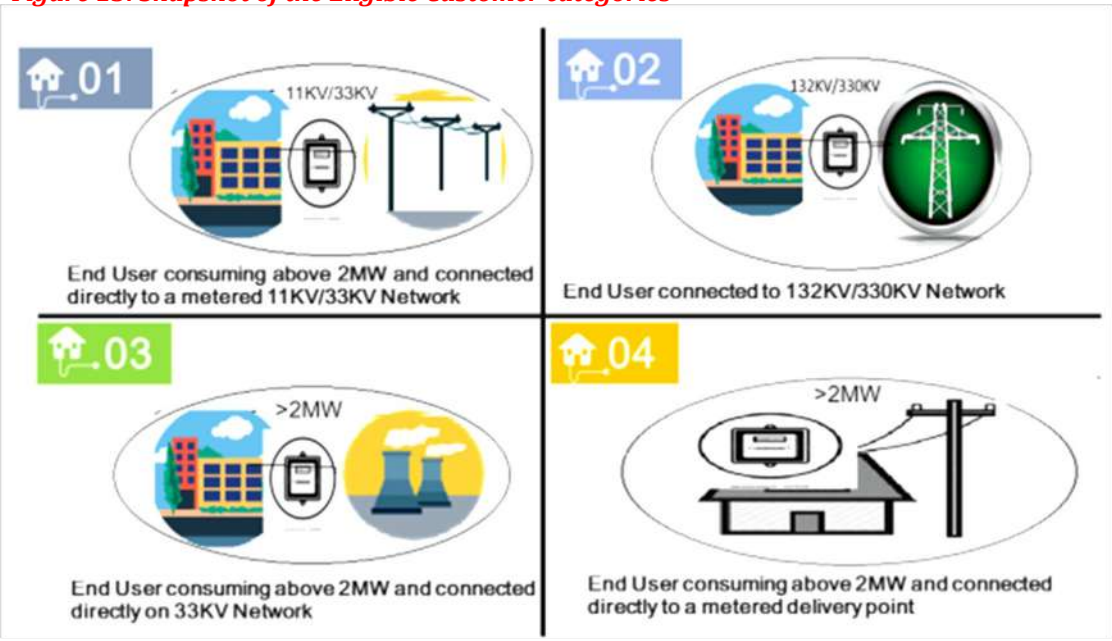
SECTION D: HIGHLIGHTS OF NEW KEY POLICIES AND LEGISLATION

I. Issuance of Eligible Customers Regulations 2017

Following the declaration by the Honourable Minister of Power, Works and Housing on 15th May 2017, the Nigerian Electricity Regulatory Commission (NERC) on 6th November 2017, released the Eligible Customer Regulation. The Regulation among other things, will accord end-users the option to contract directly with Generation Companies (Gencos) for the supply of electric power. The Regulation also seeks to provide standard rules to facilitate competition in the Nigerian Electricity Supply Industry (NESI).

Pursuant to the Regulation, end-users that meet the conditions specified in the Minister's declaration may apply for eligible status under any of the following four (4) categories of Eligible Customers depicted in **Figure 13.**

Figure 13: Snapshot of the Eligible Customer categories



Source: Nigeria Electricity Regulatory Commission

The Regulation accords eligible end-users the flexibility as to which supplier to contract with, provided that adequate infrastructure is available for the System Operator and Market Operator to reliably account for energy quantities. This Eligible Customer contract can be made with more than one supplier.

Some other key provisions in the Regulation include:

1. **Phasing of Implementation** – The Regulation provides that the eligibility framework will be introduced in two (2) phases.
   a. Phase 1 - Implementation of categories 2, 3, 4 and part of category 1 (i.e., those connected to a metered 33kV delivery point).
   b. Phase 2 - Implementation of the second part of category 1 (i.e., those connected to a metered 11kV delivery point)
2. **Site Aggregation** – The Regulation permits a group of end users to combine multiple sites and apply to the Commission for eligibility status, provided that:
   a. Each of the customers is connected to the same Disco network, IEDN or off-grid licensee, and are connected to the same feeder;
   b. The applicant is a single legal entity applying on behalf of the group of end-users and shall be responsible for executing the transaction documents; and
   c. There is a minimum consumption of 500KVA at each site, and all the sites are located within the same geographical network as may be determined by the Commission from time to time.
3. Financial Requirements – End user seeking eligibility will be required to provide a payment security in favor of the Market Operator. The Regulation provides for this security to cater for market administration, Transmission Use of System and Distribution Use of System charges stipulated by the Market Operator.
4. Supplier's Choice and Metering Obligations - The Regulation enables end users to choose between

suppliers, and contract on pricing, quantity and time of supply mechanics. The Regulation however makes it mandatory for end-users seeking to attain eligibility to procure and install the appropriate metering infrastructure at all trading points in compliance with the Metering Code.

The success or failure of the eligibility regime is dependent on a number of factors, some of these key considerations include:

1. **The Release of third-party access rules by the Commission**

   In addition to the Regulation, NERC is expected to issue compliance rules to govern the nature of third-party access to transmission and distribution networks. This is important especially with respect to the determination of fees payable for access. It is important that NERC acts expeditiously as open access to networks is crucial to efficient supply of electrical power to the eligible customers.

2. **Electricity theft**

   As the power sector continues to strive towards attaining competitiveness, it is important that NERC and the Federal Government work together towards tackling the crippling effects of theft in the power sector.

3. **Credit worthiness of eligible customers**

   As indicated above, end users are required to provide a payment security in favour of the Market Operator. There is however the key issue of the ability of the eligible customers to commit to long-term PPAs (which is often required by Suppliers), and provide the requisite payment security to the suppliers.

4. **Establishment and contributions to the Power Consumer Assistance Fund**

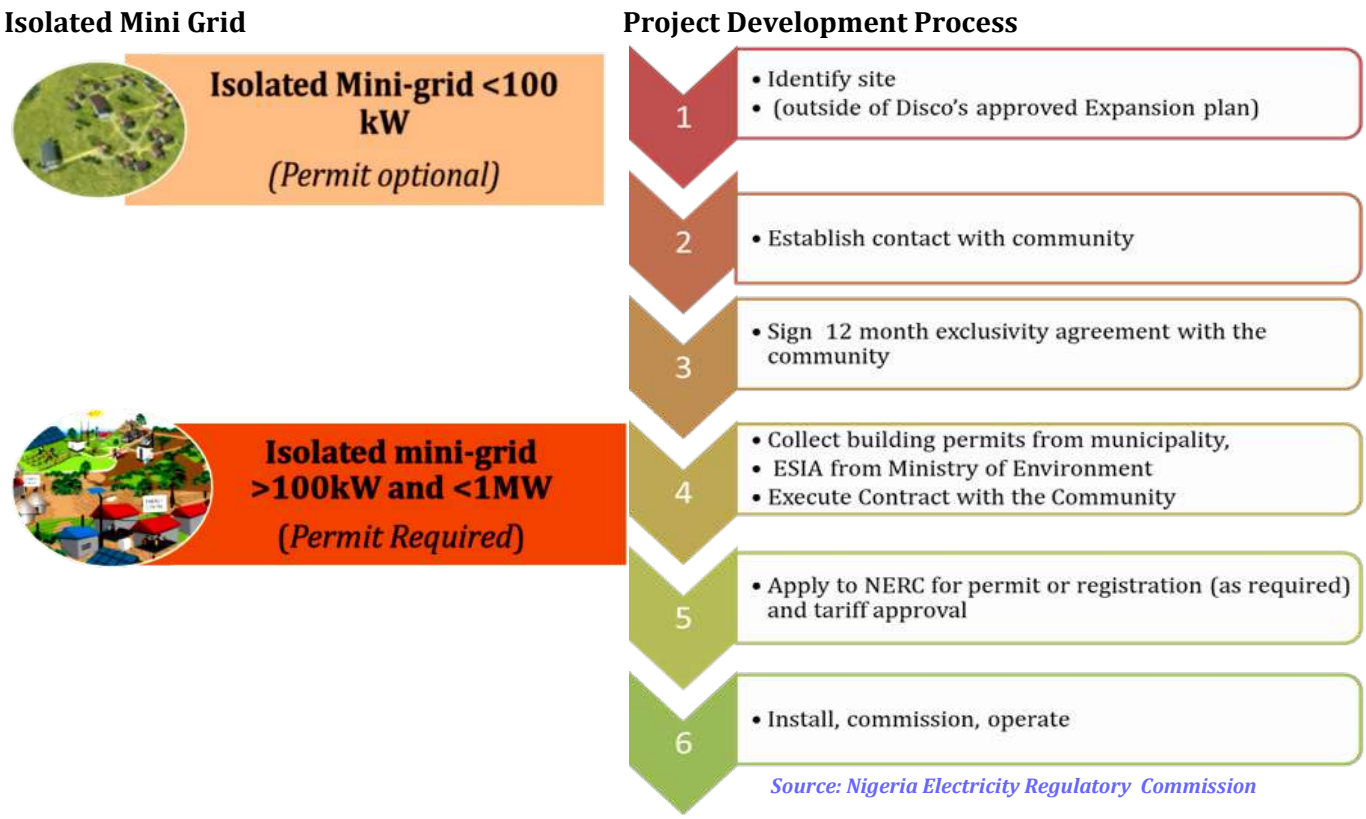
   The Regulation mandates that contributions will be made to the Power Consumer Assistance Fund pursuant to Section 84 of the EPSRA. With the Fund yet to be established, there are major concerns as to how the Regulation will affect the sector, as the primary essence of the Fund is to subsidize underprivileged power consumers. The existence of the Fund will also be very crucial towards helping Discos manage the potential loss of revenue.

II. Issuance of Mini Grid Regulations 2017

The Mini Grid Regulation ("MGR") seeks to incentivize and simplify the process for private sector participation in the mini grid projects in Nigeria, within unserved and underserved parts of Nigeria.

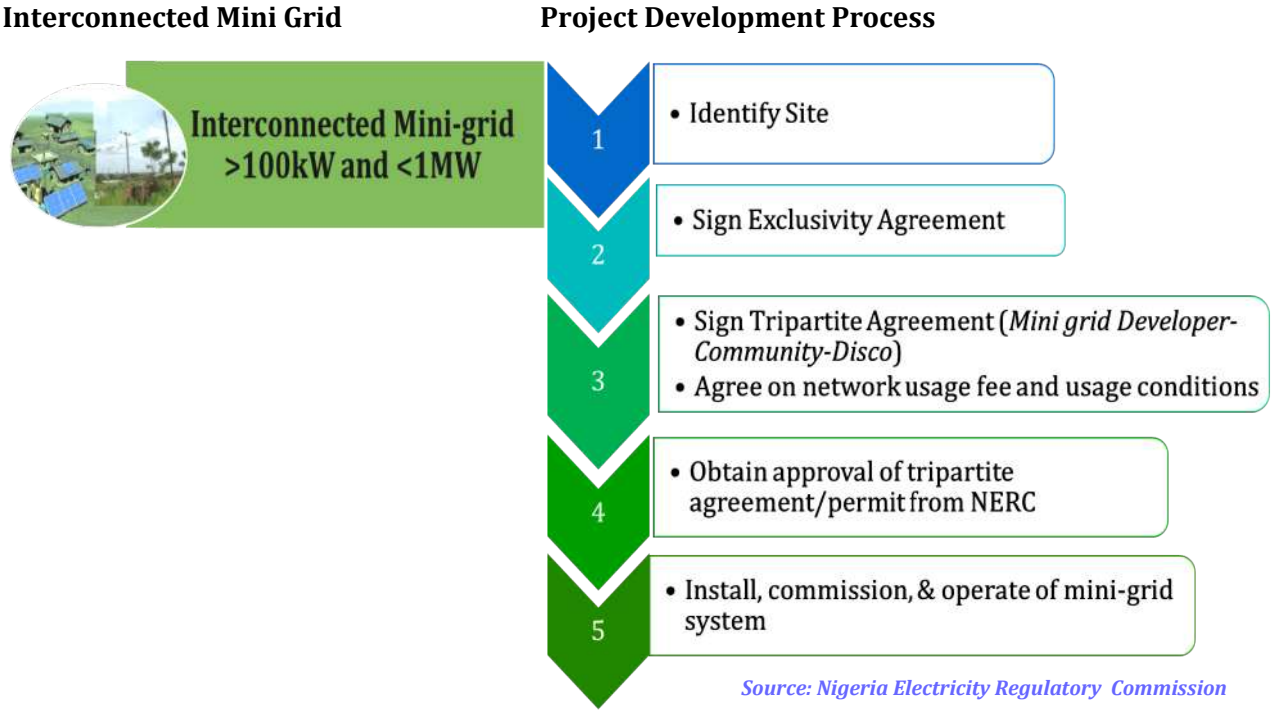
A Mini Grid may either be ***Isolated*** (that is, not connected to a Disco's network) or ***Interconnected*** (that is, the Mini Grid would be connected to a Disco's network);

Figure 14: Project Development Process for Isolated Mini Grids



Source: Nigeria Electricity Regulatory Commission

Figure 15: Project Development Process for Interconnected Mini Grid Projects



Source: Nigeria Electricity Regulatory Commission

Other Key provisions in the Mini Grid Regulations

A. Tariff Payments

Permit Holders are required to calculate the tariff using the methodology provided in the regulations based on the MYTO Methodology designed for Mini Grids. The tariffs are to be subject to technical and non-technical losses of a maximum of 10% each.

The tariff is subject to review based on an application by a Permit Holder or an Inspection of accounts by an authorized person.

Registered Operators can choose between:

a) A tariff based on the MYTO methodology; **or**

b) An Agreed tariff between the Operator and at least 60% of the community.

The agreed tariff may be subject to intervention by NERC where the Operator's rate of return exceeds typical non-recourse commercial local currency debt by 6%.

B. Network Usage Charge

The Network Usage Charge is a charge agreed between the Mini Grid Operator and the Disco subject to NERC's approval. Where the parties are unable to agree on the value of the Network Usage Charge, the Regulation provides guidelines to aid parties in reaching a fair and mutually acceptable charge.

C. Compensation Mechanics

Where a Disco extends its network to an Isolated Mini Grid. The Operator has the option of either converting to an Interconnected Mini Grid or transferring its assets for compensation:

a) **Extension prior to Initial Period of 5 years** – remaining depreciated value (including development and construction costs) as defined by the Commission plus revenue generated commencing 12 months prior to connection of the Mini Grid to a Distribution Network.

b) **Extension after Initial Period of 5 years**- remaining depreciated value as defined by the Commission plus revenue generated commencing 12 months prior to connection of the Mini Grid to a Distribution Network.

Where tariff definition by NERC has changed, the Operator may initiate an inspection of accounts to determine the depreciated value. In the interim, the Operator will be paid the value of the asset based on NERC's definition and difference will be paid after the inspection.

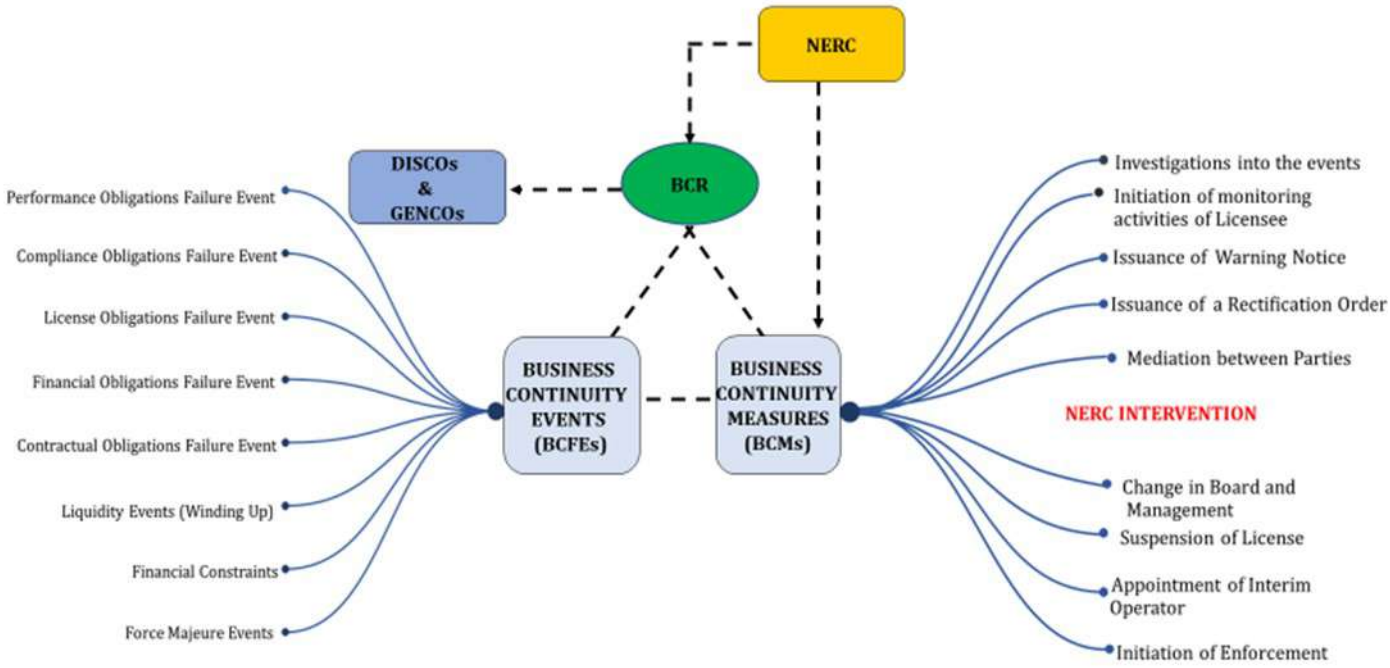
Where the Parties fail to agree on compensation, NERC shall act as an Arbiter. This also applies to a Registered Mini Grid Operator who applies for a permit. However, no compensation is provided to Registered Mini grids, as the registered Mini Grid needs to decommission and relocate within 2 months after commencement of grid supply.

For Interconnected Mini Grids where the Tripartite Agreement is not renewed, the Disco may reintegrate the Mini Grid into its network subject to proof of endorsement by the community, and notification to NERC.

III. Issuance of Notice of the Development of Business Continuity Regulations for the NESI

By a notice issued on 7th June 2017, NERC announced plans on the development of Business Continuity Regulations (BCR) which is to serve as a mechanism for NERC to regularly monitor the operational and financial viability of the operators; and where necessary, enforce discipline in the market to prevent market collapse. **Figure 16** provides a schematic of the BCR framework which highlights the failure events and NERC's enforcement powers under the Regulation.

Figure 16: Snapshot of the key provisions of the Business Continuity Regulations



IV. NERC Regulation on Feed in Tariffs

Feed in Tariffs (FITs) are designed to enable eligible renewable energy project developers to sell their power to the grid at considerably higher prices than the tariffs obtainable for other power generation sources such as thermal generation. Inducements implied in FITs include (a) guaranteed market; (b) priority grid connection and off-take; (c) facilitated land acquisition process; (d) concessionary tariff rates and (e) simplified licensing/permit process.

The tariff structure for renewables in Nigeria is outlined in the Regulation on Feed in Tariff for Renewable Energy Sourced Electricity in Nigeria (REFIT Regulations) passed in December 2015. The highlights of the REFIT Regulation are considered as follows:

a) The REFIT Regulations set a target generation output cap from renewable sources at 2000MW by 2020. The Distribution companies (Discos) and Nigerian Bulk Electricity Trading Plc (NBET) are obligated to purchase 1,000MW each on a "must buy" basis, thereby providing priority grid access to generators;

b) Eligible renewable energy sources under the REFIT Regulations are wind, small hydro, biomass and solar;

c) Eligible renewable projects under the REFIT Regulations are restricted to projects with a capacity between 1-30MW. Off-grid Renewable projects are excluded from the ambit of the REFIT Regulations;

d) Power Purchase Agreements (PPAs) under the REFIT are structured to be for 20 years and payments are for energy delivered only;

e) Costs of shallow connections (i.e. installation of facilities required to deliver power at the connection point, excluding any grid upgrade beyond the common point of coupling) are to be borne by the project developers; however, off-takers can fund interconnections and recover the costs from developers. Costs of deep connections (i.e. reinforcement, extension, or reconfiguration of the existing transmission network beyond the point of connection at higher voltage levels connecting the generating unit) are to be borne by the Transmission Service Provider or Disco.

The FITs may be reviewed every three years. However, the prevailing tariff at the time a PPA is signed with a developer shall be fixed for the term of such PPA and the tariff review would only be applicable to new projects.

This may however be an issue for project developers given that investor preference is for aspects of the tariff to react to certain indices such as inflation and foreign exchange movements for costs denominated in foreign exchange.

V. Nigerian Electricity Management Services Authority (NEMSA) Act

NEMSA was established as a technical regulatory authority pursuant to the Nigerian Electricity Management Services Authority Act 2015. to take over the functions of the Electrical Inspectorate Services Department, under the Federal Ministry of Power. NEMSA is mandated to carry out inspectorate services for the NESI and ensures all major electrical materials and equipment used in Nigeria is of the right quality and standards.

NEMSA is empowered to[42]:

a) enforce all quality standards for major electrical materials and equipment used in Nigeria;

b) ensure power systems and networks projects are properly executed;

c) specify technical standards for electrical plants, safety requirements for construction, operation and maintenance of electric power plants, transmission system, distribution networks and electric lines;

d) provide comprehensive technical support services, test transformers and major electrical equipment and materials;

e) process and issue competency certificates and electrical installation licenses to qualified electrical personnel and contractors working in the NESI; and

f) advice the government and other relevant agencies on all technical matters relating to generation, transmission, and distribution of electricity, and promote measures for advancing the skill of persons engaged in the NESI.

VI. Draft National Gas Policy

On 28th June 2017, the Federal Government approved a new National Gas Policy (the Policy) which articulates the Federal Government's visions, goals, strategies, and implementation plan for the introduction of an appropriate institutional, legal, regulatory, and commercial framework for the gas sector. The Gas Policy is intended to remove the barriers affecting investment and development of the gas sector.

In relation to the power sector, the policy seeks to ensure that there is sufficient gas supply to the power sector in view of the understanding that significant demand for gas will emanate from the power sector flowing from the many gas to power projects.

Source: http://www.jpenergy.org/wp-content/uploads/2014/04/shutterstock_138247598.jpg

VII. Draft NERC Smart Metering Regulation

The Commission on the 24th of February 2017 in exercise of the powers to develop Standards and make Regulations conferred by the EPSRA released Smart Metering Regulations. The Regulation is a technical regulation that provides the minimum physical, functional, interface and data requirements for a Smart Metering System in the NESI based on International and European standards, to be applicable to all licensees that wish to deploy the Smart Metering System.

Source: http://thenewsnigeria.com.ng/2017/02/man-arraigned-for-adjusting-pre-paid-metre/

The Regulation also stipulates the acceptable standards and specifications for Smart Metering equipment, communication protocols and security.

VIII. Lifting of the Suspension on the Bulk Procurement Regulations

The Nigerian Electricity Regulatory Commission on the 26th of May 2016 announced that it would be lifting the suspension on the Bulk Procurement Regulations in its entirety from the 1st of July 2016. Pursuant to the Regulation, unsolicited bids, proposals for the provision of generation capacity outside the application of the Regulation, and entry into any contract involving the purchase of electrical output of any generation facility to which the Regulation applies, are not permitted, unless approved by the Commission for good cause.

The Commission further issued a clarification notice defining 'good cause" to include among other things Renewable Energy/Alternative Power, Environmental-related Projects, Projects that contribute to the stability of the grid, Government-funded projects etc.

IX. The Electrify Africa Act and the NESI

The Electrify Africa Act 2015 was passed by the United States Congress with bi-partisan support and was signed into law by President Barack Obama on the 9th of February 2016. The Electrify Africa Act seeks to encourage the efforts of countries in sub-Saharan Africa to improve access to affordable and reliable electricity. Specifically, the Electrify Africa Act seeks to promote first time access to power services for at least 50 million residents of sub-Saharan Africa by 2020 in both urban and rural areas.

The Electrify Africa Act seeks to prioritize efforts and assistance for power projects by mandating the US Government Agencies and Corporations including the United States Agency for International Development (USAID), the U.S. Trade and Development Agency (USTDA), Overseas Private Investment Corporation (OPIC) and the Millennium Challenge Corporation (MCC) to prioritize and expedite institutional efforts and assistance to facilitate the involvement of such institutions in power projects and markets both on and off grid.

In July 2014, the Federal Government of Nigeria and the US Government entered into a Memorandum of Understanding regarding Power Africa. The Power Africa initiative is a partnership among the U.S. Government, African governments, bilateral and multilateral development partners, and the private sector aimed at adding more than 30,000 megawatts (MW) of cleaner, more efficient electricity generation capacity. Under the terms of the MOU, the US Government through the USAID and USTDA pledged the sum of US$31millon to support the privatization of Nigeria's electricity sector, reform of the gas sector, and development of renewable electricity generation. This support is primarily through the provision of technical assistance.

The Electrify Africa Act seeks to institutionalize the Power Africa initiative and ensure that future U.S. Administrations are bound to continue the projects regardless of political leanings. This will help consolidate the gains made by the Power Africa partners in Nigeria and the African continent.

SECTION E :NIGERIAN ON GRID POWER SECTOR IN REVIEW (2015-2017) CHALLENGES AND RECOMMENDATIONS

This section is divided into Project Specific Matters and General On-grid Challenges and Recommendations. Note that the information under "General On-grid Challenges" also applies to the projects highlighted under the Project Specific Matters.

IPP PROJECTS UPDATE

I. SELECT IPP PROJECTS

a) Project Azura-Edo IPP

The 450MW Azura-Edo power project being developed by Azura Power Holdings reached financial close on 28 December 2015.[43] The Project is reportedly set to achieve commercial operations on 4th May 2018, being 6 months earlier than previously scheduled.[44] Having weathered through several storms pre-financial closing, we are not aware of any current project specific issue affecting commercial operations of the Azura Edo IPP.

It is however important for Government to provide its continuous support for the full implementation of this project till it begins commercial operations including ensuring that NBET's financial obligations to the project are met; as the project has become a template for other IPPs. More so, making a final success story out of this project will also incentivize other investors to participate in the Nigerian power sector.

b) Oma Project

The 1080mw Oma green field gas fired project is being developed by Geometric Power, and General Electric; and is set to be achieved in 3 phases. We note that 500MW would be achieved during the first phase of the project; 750MW during the second phase of the project; and 1000MW during the third phase of the project. Financing is currently being procured for the first 2 phases of the Project.

We note that it was initially projected that the Oma Project would reach financial close by Q1 2017, but this is yet to be a reality. Some stakeholders perceive that the ongoing issues in the on-grid space, and the protracted negotiations of the Power Purchase Agreement, have stalled the project.

"It is however important for Government to provide its continuous support for the full implementation of this project till it begins commercial operations including ensuring that NBET's financial obligations to the project are met; as the project has become a template for other IPPs. "

Project Azura-Edo IPP *Source: http://armharith.com.ng/portfolio/azura-edo/*

Qua Iboe Power Project *Source: https://constructioninsightmagazine.com/govt-approves-1-1-bn-ppa-qua-iboe-power-project/*

c) Qua Iboe Power Project

The Qua Iboe Akwa Ibom Power Plant project (jointly owned by the NNPC, Black Rhino Group and Dangote Group) is intended to add 540MW to the national grid. The Federal Government recently approved the terms of a Power Purchase Agreement between NBET and Qua Iboe Power Plant Limited; and the PCOA between NBET, Ministry of Finance, and the project investors in October 2017. The Gas Sales Agreement for the project are also in place. The project is intended to reach financial close within the second quarter of 2018[45], and the plant is scheduled to commence commercial operations by 2021. Given the recent developments in the project, it is projected that parties will move swiftly with the project schedule.

d) Mambilla Hydro Project

The Mambilla Hydro Project, which was initiated in 1972, is expected to contribute up to 3,050MW to the national grid. The Federal Executive Council (FEC) on the 30th August 2017 approved the contract for the engineering work of the Mambilla Hydro Electric Power Plant in Taraba State in the sum of $5. 792bn. The project is expected to be completed within 72 months (approximately 6 years).

The Minister of Power, Works and Housing recently executed a joint venture contract with the project developers indicating that the government would put forward 15% of the costs of the project[46] with the China Export Import, EXIM, Bank providing 85 per cent of the cost[47].

The recent approach of Government is a huge step in the right direction, and should not be relented on. Most recently, the Minister has also expressed the government's intention to concession the project.

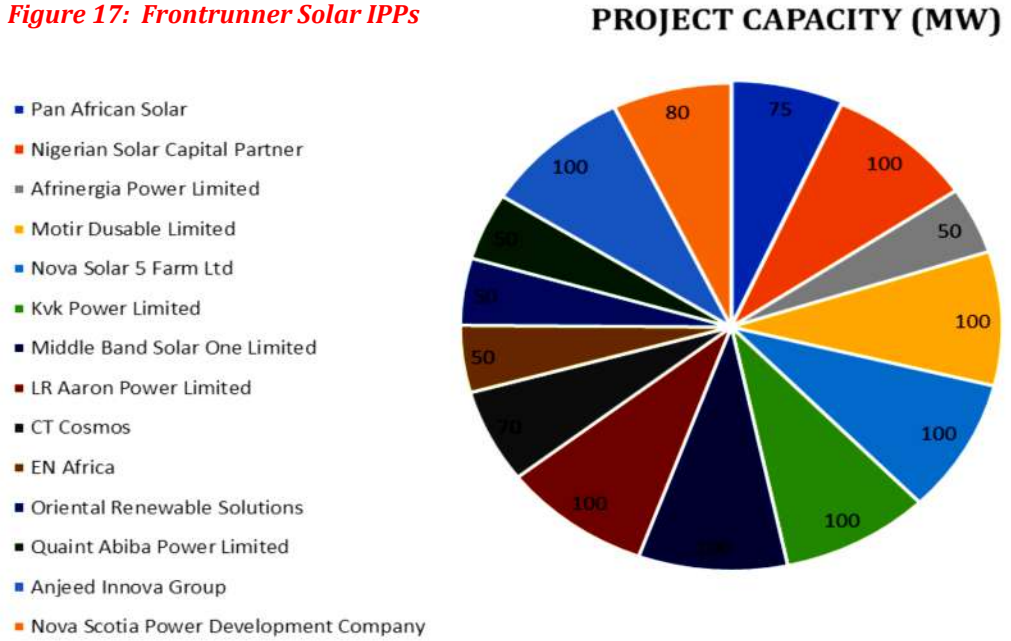
Mambilla Hydro Power Project *Source: http://www.offgridnigeria.com/page/3/*

e) Solar IPPs

In July 2016, 14 solar developers with a total capacity of 1125MW executed Power Purchase Agreements with NBET. Set out in **Figure 17** below is a chart of the Solar PPA's executed with NBET.

In September 2016, it was reported that 11 out of the 14 solar developers had complied with the obligation to post a $20,000 per MW development security letter of credit, which provides security for the IPPs obligation to achieve the financial closure[48].

Figure 17: Frontrunner Solar IPPs



The PPAs have been agreed based on tariff of 11.5 cents per kWh. The tariff structure for solar generation within and outside the REFIT Regulations is currently higher than the rate paid in South Africa (0.14 cents/kwh) and Zambia (6 cents/kwh)

As at September 2016, 10 out of the 14 solar developers had posted a $20,000 per megawatt development security letter of credit as security for the developer's obligation to achieve the financial close by the target closing date (which is 6 months after the execution of the PPAs or the long stop closing date as defined in those agreements[49]). The development security is to be refunded to the project developers when the target closing date is met after which the solar developers will begin construction of the plant[50].

"With respect to IPP development in Nigeria, the PSRP notes that only one IPP (Azura) has reached financial close since the creation of NBET in July 2010. This is a huge disincentive for the sector. The PSRP, therefore, advocates for a streamlined process for the implementation of on grid power project such as an alternative project development process; development of simplified templates for the development of power projects and encouragement of competitive procurement processes. "

We note that none of the solar developers have been able to obtain Partial Risk Guarantees ("PRG") which the government is required to provide under the respective PPA's[51]. This may affect the progress of the solar projects as the PRG would be crucial to the commencement of those projects.

It was expected that financial closure for these projects would have been attained in the 3rd quarter of 2017, however there have been some issues which have stalled the projected timelines[52]. We note that implementation of some of the solar PPA's have been stalled due protracted negotiations of the PCOA. In April 2017, the federal government signed the PCOA of only 2 out of the 14 solar PPA (Afrinergia which would be constructing a 50MW solar farm in Nasarawa State and CT Cosmos which has a 70MW solar power project in Plateau State).[53]

More so the current state of insolvency of the Discos and their inability to meet their financial obligations to NBET and other market participants do not give investors a clear horizon of the financial viability of the Industry. Given the current state of affairs in the industry, none of the solar IPP's have been able to obtain the Partial Risk Guarantees for their projects. This delay has forced some of the solar power developers to initiate conversations with NBET with regards to restructuring of funding plans (allowing equity as opposed to debt) to facilitate financial close[54].

With respect to IPP development in Nigeria, the PSRP notes that only one IPP (Azura) has reached financial close since the creation of NBET in July 2010. This is a huge disincentive for the sector. The PSRP, therefore, advocates for a streamlined process for the implementation of on grid power project such as an alternative project development process; development of simplified templates for the development of power projects and encouragement of competitive procurement processes.

Furthermore, given that the key off taker for the above IPPs is NBET, it is essential for government to take active steps towards recapitalising NBET, and improving DISCO efficiency, to ensure that payment obligations are met across the value chain. This is to avoid the crystallisation of the PCOA/PRG, if and when already procured.

II. NIPP Projects Update

After a protracted delay in the conclusion of the privatization process of the 10 NIPPs since March 2014, the Federal Government resumed contractual negotiations with the preferred bidders of the power plants in July 2016. The Federal Government has decided to conclude the sale of 3 out of the 10-power plants perceived to be closer to conclusion. This will serve as a template for the remaining 7 projects. We note that Egbema and Gbarain Plants were also subsequently included in the list of plants to achieve closing in the short term.

Lack of funding have been the major deterrent factor for the sale of these NIPP Plants. We note that some preferred bidders have recently proposed a payment structure of 30% equity, and 70% debt, to settle the cost of the plants.[55] Other issues that have stalled the finalisation of the NIPP Projects have been gas issues, industry insolvency, macroeconomic issues, transmission evacuation issues, and other bankability issues with the contractual framework. These issues need to be promptly resolved, to facilitate financial close for the front runner NIPPs. Furthermore, we note that the proceeds of sale of the NIPPs is to be used to fund the investments enshrined in the PSRP.[56]

The PSRP contemplates that by 20th March 2018, NDPHC would have concluded the sale of the Calabar, Benin, Geregu and Omotosho power plants. Some issues however still need to be addressed prior to the financial close of these assets. For example, there is a need to resolve the pending litigation on the Alaoji Power Plant[57] filed by Ethiope Energy Limited.[58] There have been protracted negotiations between the investors and the government on the provisions of the PCOA. The bankability of the other project documents such as the GSA and the PPA as well as the credit worthiness of NBET are also crucial to the successful sale of these assets.

Geregu Power Plant

Source: http://www.nigeriaelectricityhub.com/2017/12/14/forte-oil-others-invest-94-million-in-geregu-power-plant/

Omotosho Power Plant *Source: http://sweetcrudereports.com/2017/11/10/blackout-fears-four-power-plants-shut-two-days/*

GENERAL ON-GRID CHALLENGES AND RECOMMENDATIONS

a) Enforcement of regulations

Whilst NERC has issued a plethora of regulation for the operations of the Industry by participants, the issue of enforcement will increasingly become critical to strengthening NERC's position and the industry.

Some of the areas that would require improved enforcement include:

i. Contract enforceability between Industry participants (i.e. DISCOs, GENCOs, Gas Suppliers, NBET and TCN):

ii. Financial discipline and accountability between participants particularly DISCOs, GENCOs, NBET and TCN;

iii. Compliance with and maintenance of regulatory standards and procedures by Market participants including off-grid and embedded generators.

iv. Ensuring that electricity consumers are served to regulatory standards and infractions by erring DISCOs are penalized.

v. Ensuring that customers who do not pay for power (including Government Ministries and Agencies) are also penalized appropriately.

b) Ongoing Court cases

The changes in tariffs have resulted in the institution of cases against NERC, namely:

i. Enugu Disco. & 2 Others V. NERC FHC/ABJ/CS/387/2016 ("the Enugu Disco Case")

ii. Abuja Disco & 4 Others V. NERC & NBET Suit No: FHC/ABJ/CS/386/2016 (the Abuja Disco Case)

iii. Toluwani Adebiyi V. NERC: Suit No: FHC/L/CS/768/15 (the "Toluwani Case")

The institution of the above cases has adversely affected the growth of the sector in various ways. However, the consequences that the sector could suffer where the courts rule against NERC are far greater, some of which may result in the following:

i. **Potential Disruption of the NESI by changes to the role of NBET**: In the event that NBET is required to novate its rights and obligations under the NESI agreement, the role of NBET as a bulk trader licensed to purchase electrical power from Gencos for onward resale to the Discos and eligible customers will cease. Discos will then be mandated to procure power directly from GENCOs. The Nigerian electricity market is not ready for this stage of market evolution as a number of Discos are not financially credible and there is a potential risk of this additional financial obligation affecting repayment obligations down the electricity sector value chain.

ii. **Other potential impacts/effects of the Disco cases include**:

- Market instability as this affected further disbursement under the CBN-NEMSF;
- Affects investor confidence;
- Encourages consumer and customer resistance; and
- Worsens the liquidity issues in the sector; and
- Increases the perception of the regulator as weak and vulnerable.

c) Liquidity Issues

i. Market Shortfall

The shortfall in the power sector has continued to grow since the handover of the PHCN Gencos and Discos to private investors in November 2013 due to lack of cost reflective tariffs, amongst other issues. Reports have shown that the shortfall in the power sector since 2015 amounts to about N931 Billion, which includes market shortfalls (amount owed by Discos to the rest of the market) of about NGN 473 billion (US$1.5 billion) and tariff shortfalls (amount owed by consumers, including MDAs, in aggregate to the power sector) estimated at NGN 458 billion (US$1.4 billion).

The estimated shortfalls as of Q3 of 2017 has risen to up to N1 trillion naira, partly due to the rise in foreign exchange rates and devaluation of the Naira.

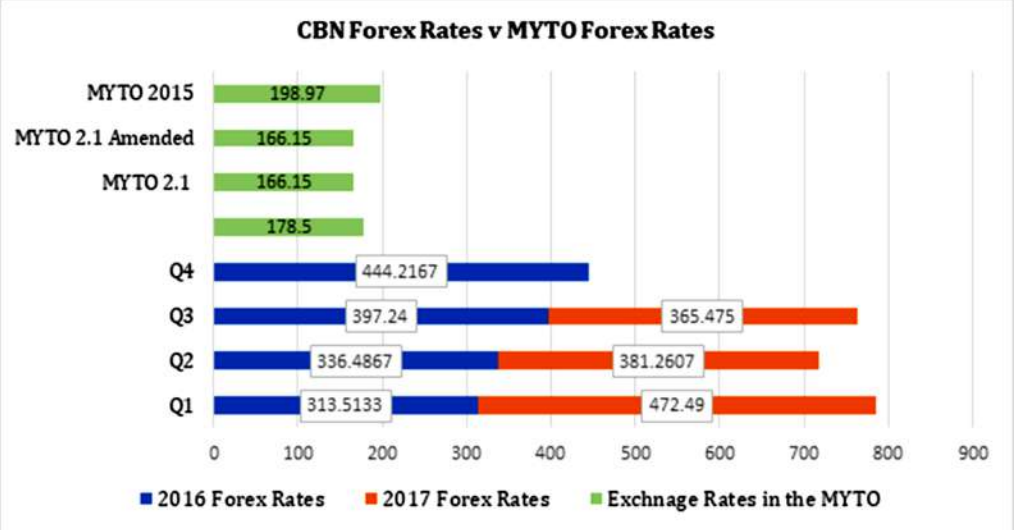
Source: https://guardian.ng/news/naira-further-regains-strength-at-n425-to-a-dollar-in-parallel-market/

ii. Forex Issues

Currency mismatch across the value chain – Revenue for the entire power sector value chain is derived from customers, and is invoiced and paid in Naira. However, payments by GENCOs to gas suppliers are invoiced, and sometimes paid in dollars.

"Whilst NERC has issued a plethora of regulation for the operations of the Industry by participants, the issue of enforcement will increasingly become critical to strengthening NERC's position and the industry."

Figure 18: Comparison of Forex Rates and MYTO Forex Rates



As indicated in **Figure 18** above, foreign exchange is indexed in the MYTO at N198/$1 against about N305-N306 interbank/N367 parallel market rates. The MYTO therefore assumes that the cost for Dollar-based CAPEX requirements of the Discos and Gencos is funded at the rate as imputed in the MYTO. In reality however, funding of CAPEX is usually procured at whatever the current value or rate of the Dollar is. This usually results in a funding gap which the Discos and Gencos have to bear. Furthermore, in view of the fact that the MYTO is not dynamic enough to match up to current realities, the

"a huge portion of the shortfall is due to collection losses, and inadequate involvement of the regulator in the enforcement of obligations across the value chain; amongst others. If the foregoing issues are not resolved, a further increment in the tariffs will result in increased shortfalls."

Discos and Gencos experience substantial shortfalls in their revenue vis-à-vis CAPEX and OPEX requirements.

To buttress the above, between February 2015 and December 2016, the market shortfall (amount owed by the Discos to the rest of the market) is estimated at NGN 473 Billion (US $1.5 Billion). This has had a substantial impact on the ability of Discos and Gencos to adequately meet debt service obligations under their respective acquisition finance structures. Furthermore, the market shortfall has resulted in difficulty of other NESI participants to fulfil their payment obligations under respective NESI Agreements. NBET for instance is currently only able to pay 28% of invoices made under the PPAs with GENCOs.

iii. **Increased Loan Costs —** The cost of dollar at the point of acquisition during the privatization exercise was N168 per dollar on average. However, due to the devaluation of the naira, the tariff revenue received in naira (which has risen u to N360/$ as of December 2017) from the end users can no longer effectively service the foreign currency denominated acquisition loans.[59]

iv) **Funding Gaps** - Also, several market participants had huge funding gaps, due to the devaluation of the Naira, as against the dollar. For instance, Eko Electricity Distribution Company had a funding gap of N900 billion. This is largely due to the heavy losses occasioned by the naira devaluation which has put a strain on the Disco's ability to repay the foreign currency denominated elements of their costs. International lenders are skeptical about extending credit to the power industry in the country.[60]

The Federal Government through the PSRP has proposed some policy interventions to manage the market deficits and forex issues, some of which include the establishment and implementation of a Forex policy for the Power Sector, completion of the disbursement of the CBN-NEMSF, and the implementation of a payment mechanism to offset subsisting and future MDA Debts.

In addition to the above, the Federal Government may also consider recapitalizing the NBET to improve its credit worthiness; work with NERC towards expediting the passage of electricity theft legislation to help boost the collection efficiency of the Discos. The sum of **N22,794,359,314** has been earmarked for NBET under the proposed 2018 budget, it is hoped that these funds will go a long way in boosting NBET's financial status.

Furthermore, we note that there have been several clamours on the need to have a cost-reflective tariff in the sector. Whilst a cost reflective tariff is important, certain critical issues need to be dealt with prior to increase in tariff. These include the development of policies geared towards improvement of efficiency and performance of market participants across the value chain. This is because a huge portion of the shortfall is due to collection losses, and inadequate involvement of the regulator in the enforcement of obligations across the value chain; amongst others. If the foregoing issues are not resolved, a further increment in the tariffs will result in increased shortfalls.

e) Gas Issues

Gas is the dominant feedstock for power generation in Nigeria; 85% of the current power generation is generated by thermal plants.[61] To this end, any issues affecting gas supply will no doubt have a ripple effect on the entire sector. Some of these gas issues are highlighted below:

i. **Gas Pricing**: One of the major reasons ascribed to the incessant flaring is the insufficiency of the gas pricing in the domestic market compared to the cost of commercializing gas that should have otherwise been flared. IOCs prefer to export gas due to favorable gas pricing regime in the export market, and then flare the excess gas. Thus, there is a need to attain some level of parity in the domestic and export prices of gas to increase domestic utilization of the gas via the power sector.

"Between January and February 2016, Nigeria flared about 42.7 billion Standard Cubic Feet, BCF, of gas which translates to 3000-megawatts of power"

The National Gas Policy, approved on 28th June 2017 by the Federal Executive Council, contemplates that a revised National Domestic Gas Supply & Pricing Regulation will clarify the gas pricing framework. It is hoped that the gas pricing framework would incentivize gas producers to increase gas production. Adequate implementation mechanisms need to be in place to ensure that the Regulation is implemented within set timelines.

ii. **Gas Flaring**: The gas flare rate in the country for the month of December 2016 was stated to be at 9.87%[62]. As at August 2017, the flare rate in Nigeria had risen to 12%[63]. However, with the discovery of 38 new gas flare sites bringing the existing number of gas flare sites in Nigeria to 178, the actual flare rate is believed to be significantly higher than the estimated 12% flare rate. Between January and February 2016, Nigeria flared about 42.7 billion Standard Cubic Feet, BCF, of gas which translates to 3000-megawatts of power[64].

Source: https://www.vanguardngr.com/2017/08/ranking-lagos-oil-gas-producer-improve-2020/

"Lack of investment, poor planning, as well as delays in the delivery of planned gas infrastructure have resulted in a shortage of gas-processing and pipeline infrastructure which are critical to the operations of thermal power plants in the country."

The Gas Policy in a bid to address the issue of gas flaring mandates that oil and gas companies as a domestic supply obligation allocate a specific amount of gas to the power sector. In a bid to end gas flaring in the Niger Delta, the Federal Government has set up the Nigerian Gas Flare Commercialization Programme (NGFCP) with a mandate to provide a commercial approach towards eliminating routine gas flares by 202. The Programme is also expected to drive positive social, environmental and economic impacts in the Niger Delta through the mobilization of private sector capital towards gas flare capture projects.

iii. **Gas Infrastructure**: The dearth of gas infrastructure has also been identified as one of the pitfalls of the power sector. Lack of investment, poor planning, as well as delays in the delivery of planned gas infrastructure have resulted in a shortage of gas-processing and pipeline infrastructure which are critical to the operations of thermal power plants in the country. The capacity of the gas pipeline infrastructure is insufficient to reliably meet the gas demands of the existing power plants operating at the full installed capacity.

The PSRP advocates for the government to manage the delivery of key gas pipeline infrastructure (including the Ob-Ob pipeline) to ensure that gas is readily available where it is needed. Additionally, the National Gas Policy indicates the intention of the government to implement a Gas Infrastructure Blueprint which would map out the planned gas infrastructure needed to connect the gas networks in the western and eastern parts of the country as well as build new transport pipelines. Once implemented, power plants would have easier access to gas infrastructure.

iv. **Gas Pipeline Vandalism**: In 2015, due to the vandalization of the Escavos-Lagos gas pipeline, the government lost about N2.04 billion ($12 million) over the space of 4 days, with power supply dropping by 1,505 megawatts. We note that downstream pipeline sabotage has decreased from 94 pipeline vandalized points in March 2017, to 82 in April 2017, representing a 12.77% reduction relative to the previous month.[65] Although this shows a decrease in vandalization activities, the impact of gas vandalism remains grave.

"According to the National Bureau of Statistics, the total invoice for the year 2016 amounting to N331.02bn was issued by the Gencos to the Discos while a payment of N88.03bn was made with a balance N242.97bn recorded at the end of 2016"

To address the gas pipeline vandalization concerns, the PSRP advocates for the Ministry of Petroleum Resources to develop a clear plan on gas vandalism prevention strategy (this is supposed to have been achieved in April 2017). Furthermore, we recommend that the government should further encourage innovative modes of gas transportation, which include the use of virtual pipelines (using trucks, FPSOs, regassification units etc.) rather than physical pipelines. Government should also intensify security measures to protect physical pipelines, which may include the use of surveillance jets and satellites. This is important to ensure that acts of vandalism are minimized, and if possible, totally eradicated.

v. Non-Payment of Gas Invoices from Gencos to Gas Suppliers

According to the National Bureau of Statistics, the total invoice for the year 2016 amounting to N331.02bn was issued by the Gencos to the Discos while a payment of N88.03bn was made with a balance N242.97bn recorded at the end of 2016[66]. This deficit would no doubt impact on the ability of the Gencos to make relevant payments to the gas suppliers.

Due to uncertainty, gas suppliers would be wary of supplying gas to the power developers.

To address this issue, the PSRP indicates that the CBN has provided a NGN701 billion (US$2.2 billion) payment assurance facility to assist NBET in meeting its payment obligations with respect to the settlement of generation invoices and easing the liquidity challenges in the sector. The payment facility is a NGN 701.9 billion CBN loan to NBET, guaranteed by the Ministry of Finance, to support NBET payments to Gencos and in turn, to gas suppliers, thus ensuring that Gencos and Gas suppliers are paid notwithstanding any shortfalls from the DISCOs. Currently the Gencos and Gas Suppliers get 80% of their invoices paid under the payment assurance facility.

f) Transmission issues

i. Inadequate Transmission Infrastructure

The transmission segment of the power sector value chain has severally been perceived as the weakest link in the sector. This is because, amongst other reasons, the transmission infrastructure only has capacity to wheel 50-60% of its installed capacity[67]. The existing transmission network comprises mostly 300kV circuits and substations. There are approximately 32 work centers spread across the country; although most are concentrated in the south[68]. There is a dire need to strengthen, and expand the geographical coverage of the transmission network. This is because there is attendant risk of a total breakdown of the transmission infrastructure, as generation capacity increases. In the last 10 months up to November 2017, the TCN has been able to add 1,000MW to its wheeling capacity to reach a total of 7000 MW which is likely to be insufficient given the projections for 2018 in the MYTO 2015. Typically, transmission capacity by best practices should be twice the generation capacity.

Figure 19: System Collapses (2010-Q3 2017)

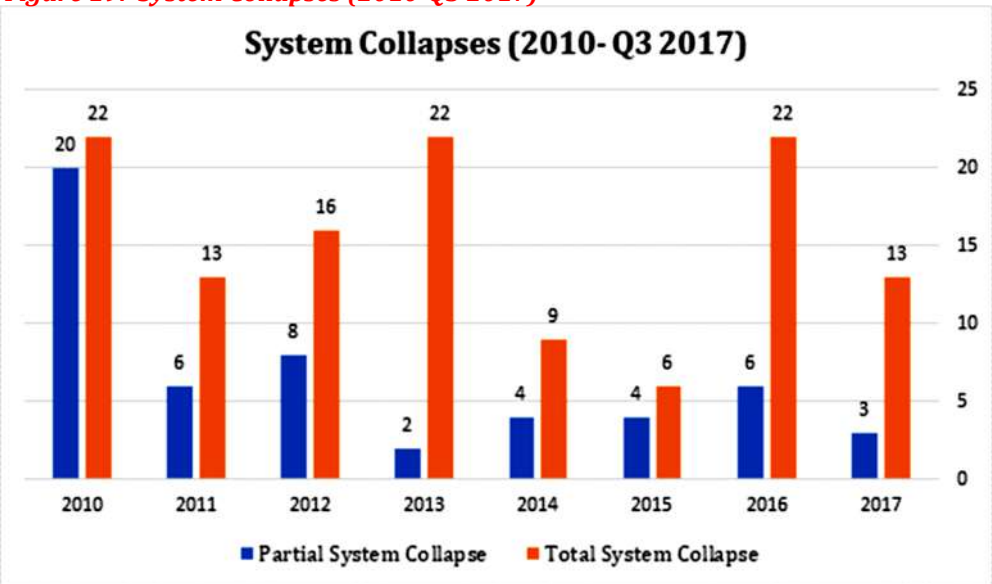


Figure 19 provides a snapshot of the system collapses that have occurred between 2016 and 2017.

We note that the NDPHC has recently embarked on 120 transmission projects, which includes the development of transmission stations and substations. Although this is beneficial to the expansion of the national grid, Government needs to intensify efforts to provide alternative sources of power supply, off the national grid. Furthermore, embedded power projects should be encouraged, and distribution companies should be provided with adequate support to expand their embedded generation capacity. This will lessen the pressure on the national grid, whilst TCN is implementing plans to strengthen its network.

ii. Load Rejection issues

Closely related to the infrastructure issues above, is the load rejection issues in the sector. In recent times, several megawatts of electricity are lost to load rejection by Distribution companies, leading to enormous funding challenges for the TCN; given that the DISCOs do not pay for the power that is not accepted. TCN claimed that between September 18th to 24th 2017, a total of about 16,729MW of power was wasted due to load rejection by the DISCOs.

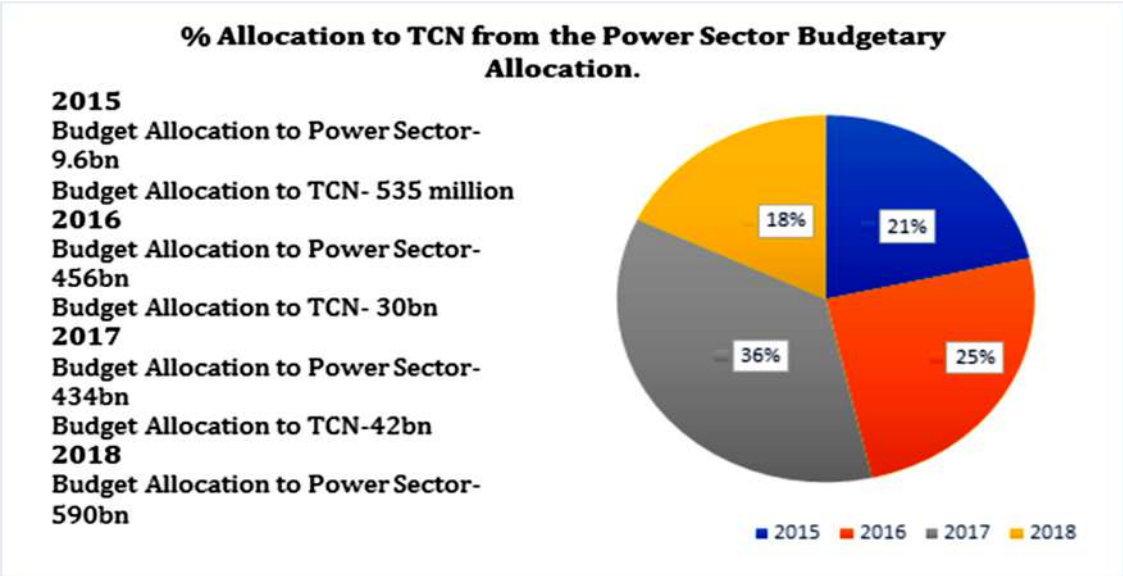
DISCOs in reaction to TCN's allegation have said that the System Operator wrongly projected the drop in demand during off-peak periods as load rejection. The DISCOs further claimed that the other times they have rejected power from TCN, has been due to TCN's inadequate infrastructure.

Aside from the need for TCN to strengthen its transmission infrastructure (noted above), it is important for TCN (System Operator), GENCOs and DISCOs to collaborate, with a view to adequately managing load demands. NERC, as the regulator of the sector, should coordinate with the relevant parties, to ensure proper management of load demands.

iii. TCN Funding issues

TCN requires about $7.5billion to fund its five-year expansion programme which is aimed at expanding the transmission capacity to 11,500MW (from the current ~5,500MW) by 2019. Over the years, TCN has been funded through the Federal Government budgetary allocations. **Figure 20** below is a chart of TCN's budgetary allocations between 2015 and 2017.

Figure 20 : TCN Budgetary Allocations



From the chart, there is a remarkable increase in the allocation to TCN in the budget, year on year. Whilst this may appear beneficial to TCN, it is still insufficient.

Under the PSRP, the sum of $486million has been earmarked for TCN priority projects. The sum earmarked to TCN in the PSRP, along with the proposed budgetary allocation in the 2018 budget are a huge step in the right direction. However, this is not sufficient to meet TCN's projected funding needs against the year 2019. We note that TCN also plans to fund its revenue requirements through procuring concessionary loans and grants from International Finance Agencies, and other private sector participation initiatives. One of the issues is that TCN gets insufficient funding from the market participants. Discos in particular should be able to pay for the services they receive from the TCN.

"Whilst the intention of government is clear, it is important that a more holistic and sustaining approach is adopted in relation to the management of TCN, to boost investor confidence. It is recommended that the Transmission Company of Nigeria should be unbundled, and subsequently privatized"

Source: http://venturesafrica.com/why-privatization-has-not-improved-power-supply-in-nigeria/

It is recommended that TCN should pay close attention to the possibility of funding its revenue requirements through PPP arrangements (though this will still be subject to the Discos ability to pay a cost reflective transmission tariff). Furthermore, Government needs to set out plans for high level consultations amongst key government parties (including the Ministry of Power, Ministry of Finance, NERC, Infrastructure Concession Regulatory Commission, and the Bureau of Public Procurement, amongst others) with a view to setting out proactive plans to fund and assist in developing TCN projects.

More recently, the TCN has taken steps towards attaining its target of 14,000 MW under the Transmission Expansion and Rehabilitation Programme (TERP) which has attracted funds from international lenders to the tune of about N383 Billion ($1.064 million). **Figure 21** highlights the contributing lenders and the value of their respective contributions .

Figure 21: Funds from International Lenders to the TCN

iii. Management of TCN

In February 2017, Mr. Usman Gur Mohammed was appointed the Managing Director of the Transmission Company of Nigeria. The Minister noted that the appointment was in a bid to improve TCN operations.

Whilst the intention of government is clear, it is important that a more holistic and sustaining approach is adopted in relation to the management of TCN, to boost investor confidence. It is recommended that the Transmission Company of Nigeria should be unbundled, and subsequently privatized. This could possibly start with the breaking down of the Transmission Network into regions for better management, and efficiency whilst ensuring interconnection between the regional networks to maintain flexibility.

g) Distribution Issues

i. Inadequate Transmission Infrastructure

As noted in the Disco Score Card above, majority of the DISCOs are collecting between 40% and 58% of their bills. The highest collection rate is by Eko DISCO at 69.14%; whilst the lowest collection rate is by Kaduna DISCO at 30.54%.

The DISCO collection issues are attributed to electricity theft; recalcitrant refusal of certain customers (e.g. the MDAs) to pay for electricity; performance and collection inefficiency by some DISCOs; and unethical dealings between certain DISCO staff and end users.

The PSRP requires that the BPE and NERC should conduct detailed reviews of the distribution companies' state of affairs, including their business plans; to provide comfort on design, implementation, and funding for ATC&C loss reduction plans for each DISCO. The DISCOs would be contractually obligated to deliver on their respective performance targets, failure of which would trigger business continuity measures under the proposed Business Continuity Regulations.

We recommend that the DISCOs should consider the use of technology to improve their collection efficiency levels. DISCOs should also set performance parameters and reward mechanisms for their staff, to encourage their performance. DISCOs should also improve on their customer relations and response levels, to breed happier customers who will be willing to pay for electricity.

ii. Electricity theft

Electricity theft remains a major concern for the players in the Nigeria Electricity Supply Industry due to the impact it has on the revenues of the DISCOs which in turn affects their ability to pay down the entire value chain. For example, Port-Harcourt DISCO loses about N238 Billion monthly to electricity theft. Although electricity theft is included as an offence under the Miscellaneous Offences Act9; and sparsely referenced under Section 84 (3) of the EPSRA, there is need for robust provisions on electricity theft, with adequate penalties.

More recently, NERC has taken a progressive step with the issuance of an Order on Authorized Access, Meter Tampering and Bypass released on 7th December 2017. The Order prescribes reconnection fees for customers that gain unauthorized access to electricity by tampering or meter bypass. Such customers will be disconnected and be required

Source: https://energypedia.info/wiki/Metering_and_Billing_Systems

We note that there is currently a draft of the Electricity Theft Regulations. It is important for the Regulations to contain adequate provisions enabling state governments to enact and enforce their own electricity theft laws, in accordance with the applicable laws. The foregoing will help to curb the growing collection losses, and will deter offenders.

More recently, NERC has taken a progressive step with the issuance of an Order on Authorized Access, Meter Tampering and Bypass released on 7th December 2017. The Order prescribes reconnection fees for customers that gain unauthorized access to electricity by tampering or meter bypass. Such customers will be disconnected and be required to pay fines ranging from N50,000 to 100,000 for first time incidents and N75,000 to N150,000 for subsequent incidents. By virtue of the order, Maximum Demand users will be liable to pay a reconnection fee of up to 300% of the last authorized recorded monthly consumption for first time incidents and up to 150% for subsequent incidents.

iii. Metering Challenges

Closely related to the issue of collection alluded to above is the huge gap between the percentage of Discos' customers that have been metered and the percentage of customers that are yet to be metered. As at 31st July 2017, the number of metered customers stood at about 3,451,611 representing about 46% of the total customer population of 7,476,856 on the billing platform of the Discos. This is not so much of an improvement from the 53% metered of the 5,113,135 - customer population as reported by the Presidential Task Force on Power (PTFP) in 2012. These numbers obviously do not reflect the realities of the number of customers actually connected (legally and illegally) to the grid.

In a bid to solve this challenge, the Commission in 2013 introduced the Credited Advance Payment for Metering Implementation (CAPMI), a willing-customer financing scheme whereby electricity consumers yet to be metered by the Discos could finance the procurement of their meter and repay the costs over time through deductions from their monthly bills. Following a 3-year period fraught with implementation challenges, the Commission discontinued the CAPMI scheme in September 2016.

On the 4th of October 2017, the Commission released a consultation paper for a regulation to end estimated billing of customers in the NESI, further to which the Commission sought to re-introduce what some have deemed a "***Modified CAPMI***". The Commission proposed two leasing options, as follows:

- The first option involves the licensing of Meter Services Providers (MSP) by the Commission who would, on a competitive basis, provide for the financing, procurement, installation, maintenance, and replacement of electronic prepaid meters for end-users of electricity.
- Under the second option, the customer is the lessee of the MSP with monthly lease fee payable through the vending platform for energy.

Under the PSRP, the sum of $500 million dollars has been earmarked as potential funding from the World Bank Group to reduce losses in distribution, with specific emphasis on the deployment of a metering scheme. This scheme will include the installation of prepaid meters for MDAs to ensure regular payment for power consumed.

On 31st October 2017, the National Council on Power (NACOP) in line with the steps already being taken by NERC approved the restoration of the CAPMI Scheme. NACOP further recommended that NERC issue regulations towards ensuring the successful re-introduction of the CAPMI. Some of these regulations are expected to cover the following:

(i) Ensure that customers who participate in the scheme should be reimbursed by way of cash or by energy;

(ii) Ensure that third-parties should be able to provide, install, and manage customer meters, provided that such third parties are certified by NEMSA, and approved by DISCOs, based on appropriate metering standards;

(iii) NERC to provide a framework for compensating the third-party meter providers either in cash or shares in the DISCOs;

(iv) As much as possible, meters should be manufactured and assembled in Nigeria, and where it is necessary to import materials for their manufacturing, there should be exemptions from customs duties.

More recently, following the recommendations provided by the NACOP, NERC, on 22nd November 2017, issued a noticed in line with items (i) and (ii) directing all participating Discos to bring such transactions to a close by installing the procured meters at customer premises no later than December 31, 2017. Customers who are not provided with the meters upon the expiration of the deadline are required to provide NERC with copies of payments made and other supporting documents, to enable NERC to take the requisite actions against the erring Discos.

Under the PSRP, the sum of $500 million dollars has been earmarked as potential funding from the World Bank Group to reduce losses in distribution, with specific emphasis on the deployment of a metering scheme. This scheme will include the installation of prepaid meters for MDAs to ensure regular payment for power consumed. The PSRP also requires that DISCOs enumerate and identify their customers, to ensure that adequate metering is planned for and implemented. We recommend that there needs to be certainty in the regulatory framework for metering, and an alignment of goals. It is important for NERC to issue regulations to outline the applicable position regarding metering, to give certainty, and to clear all ambiguities.

iv. Infrastructure Deficit and DISCO Finance Issues

The Discos constantly deal with issues like overloaded transformers and feeders, obsolete equipment, limited network, lack of automation, etc. The inadequacy of the Disco's infrastructure has contributed to incidents of stranded power on the national grid. Hence, the DISCOs require substantial financing to fix the infrastructure gap. Despite the foregoing need, DISCOs are currently overleveraged with the local bank, over-exposed to the power sector, thus lacking the capacity to provide further funding support to the DISCOs.

We note that NDPHC is working on several distribution projects across Nigeria, with a view to expanding the distribution network. As at May 2017, NDPHC had spent $1.5million in distribution projects.

It is recommended that Government should provide funding support to DISCOs to solve the issue of infrastructure deficit. It is important to note, however, that beneath the capex funding issues lies the issue with the Discos' acquisition financing. Most core investors in the DISCOs have been unable to fully meet their obligations to their lenders, and this may have a ripple effect on the DISCOs. We recommend that the Government, through the CBN should engage with the respective banks, with a view to ensuring that acquisition loans are restructured on more practicable terms.

Source: https://www.vanguardngr.com

v. MDA Debts

A huge proportion of DISCO receivables are from government's departments and agencies (MDA), including State and Local Governments; however, these debts were not factored in as collection losses under MYTO 2015. Prior recovery efforts by the DISCOs yielded little fruits, impacting DISCO cash flows and ability to meet debt service obligations. Recently, the Federal Government approved the payment of N25.994bn (out of the claims of N90Billion as of September 2017) being debts owed by Ministries, Departments, and Agencies to DISCOS.[69]

It will also be important for MDAs to devise a sustainable method to pay their bills, going forward. An option (as proposed under the PSRP) would be for the Discos to give pre-paid meters to all MDAs; that way, MDAs would have to pay for power before use, and this eliminates the possibility of debts. Secondly bills should be deducted from source for MDAs, State and local governments and recalcitrant debtors should be cut off without any penalty to the Discos.

SECTION F – RENEWABLE ENERGY

A. Renewable Energy in Nigeria

Renewable energy is energy that comes from resources which are naturally replenished on a human timescale. Renewable energy is now viewed by many people around the world as a viable cost-effective alternative to the conventional means of power generation for developing countries like Nigeria. Despite the availability of renewables which can be exploited to efficiently incorporate renewables into Nigeria's energy mix, renewable energy penetration in Nigeria is still at its infancy.

The renewable options available in Nigeria are solar, wind, small hydro and biogas. In May 2016, the Minister of Power, Works & Housing, Babatunde Fashola, revealed the Road Map for Steady, Incremental and Uninterrupted Power Supply. The Roadmap confirms the drive to increase generation capacity by the use of renewable energy sources into the country's energy mix. Examples of planned projects under the Roadmap include the 3,050MW Mambilla hydroelectric power project in Taraba State and the 10MW Vergnet SA wind power farm project located in Katsina State.

The Minister of Power had also announced that an energy mix document would be released by the Government with the aim of reducing the cost of electricity and seeking further diversification of its power generation sources. The focus of the yet to be released document would be to spur investment in Renewables to encourage rapid economic development.[70]

B. Potential for Solar Generation in Nigeria

Among the renewable options, solar presents an efficient avenue to improve generation capacity in the country. Nigeria receives an average solar radiation of about 7.0kWh/m2 (25.2MJ/m2 per-day) in the far north and about 3.5kWh/m2 per day (12.6MJ/m2 per day) in the costal latitudes. The estimate of potential solar energy in Nigeria, with 5% device conversion efficiency is 5.0×1014 KJ of useful energy annually. This is equivalent to about 258.62million barrels of oil produced annually and about 4.2×105 GWh of electricity production annually, in the country.[71] In under-served and unserved areas of Nigeria, SMEs rely heavily on diesel generators for their day to day operations.

The cost of electricity for businesses in such areas is about NGN 69/kWh (USD 0.35/kWh). Installed self-generation capacity in Nigeria is about 729 MVA, and generators have a life-cycle of about 5 years. This translates in a theoretical market potential of about 1,6 GWp of installed solar PV capacity, with an installation rate of about 320 MWp per year. With these investment opportunities, the potential market size, if 50 percent of the SMEs (within the targeted sectors) decide to retrofit their diesel generators with a solar PV system, is NGN 10 billion (USD 50 million).[72]

Source: http://www.nigeriaelectricityhub.com/2017/02/07/

C. Legal framework for renewable electricity generation in Nigeria

There have been a number of laws and policies made by the Government relating to renewables. The **Figure 22** sets out the existing laws and policies:

Figure 22: Existing Renewable Energy Laws and Policies

S/N	Name of Policy/ Legislation	Issuing Authority	Policy Directives
1.	**National Electric Power Policy ('NEPP') 2001**	Electric Power Implementation Committee ('EPIC')	**Approved** by the Government and outlines the framework for power reform agenda. It targets 10% renewable energy mix in the country by 2020.
2.	**Nigerian National Energy Policy 2003**	EPIC	**Approved** by the Government and emphasizes the importance of renewables. However, no concrete targets for renewables were set.
3.	**Renewable Energy Master Plan ('REMP') 2005**	Energy Commission of Nigeria ('ECN')	**Not yet approved**. Encourages the integration of renewables. REMP targets 13% renewable energy mix in the country in 2015, 23% in 2025 and 36% by 2030.
4.	**Electric Power Sector Reform Act ('EPSRA') 2005**	Federal Legislature	**Passed as an Act of the National Assembly**. Establishes the Rural Electrification Agency ('REA') to ensure the development of a rural electrification plan and advocates the use of renewables.
5.	**Renewable Energy Policy Guidelines ('REPG') 2006**	Ministry of Power ('MOP')	Advocates for the development of off-grid independent renewables systems and establishes the Renewable Electricity Trust Fund ('REF') to accelerate renewable projects.
6.	**The Renewable Electricity Action Programme ('REAP') 2006**	MOP	Sets out a roadmap for implementing the REPG and REF.
7.	**The National Biofuel Policy and Incentive 2007**	Nigerian National Petroleum Company	**Approved** by the Government. Advocates the development of a national fuel ethanol industry and the gradual reduction of the nation's dependence on gas.
8.	**The Roadmap for the Power Sector 2013**	Presidential Task Force on Power	Highlights legal issues in the EPSRA, such as the silence of the EPSRA on renewable energy licensing despite the abundance of renewables in Nigeria. It recommends that the policies on the development of renewables for the power sector need to be clarified.
9.	**National Renewable Energy and Energy Efficiency Policy ('NREEEP') 2015**	Ministry of Power	**Approved** by the Government with the aim of improving power generation through renewables by 2020 and consolidates the objectives of the documents listed in Nos 1-8 above.
10.	**Rural Electrification Strategy and Implementation Plan ('RESIP') 2016**	Ministry of Power	**Approved** by the Government and sets out Government's strategy to accomplish the goals established in the EPSRA and the Rural Electrification Policy.

These policies and laws highlight the Government's drive to ensure that renewables are utilized in the country's energy mix.

D. Tariff Structure for Renewables in Nigeria

The tariff framework for renewables in Nigeria can be considered under 2 categories: those subject to the REFIT tariff framework and the tariff framework for renewables outside the ambit of the REFIT.

(a) REFIT Tariff Framework

As indicated in Section C above, the REFIT applies to renewable energy sources such as wind, small hydro, biomass and solar. The REFIT aims to scale up RE power supply the grid by 1000MW in 2018 and 2000MW by the end of 2020. NBET is expected to procure 50% of this capacity with the Discos procuring the other 50%. Eligible renewable projects under the REFIT Regulations are restricted to on grid projects with a capacity between 1-30MW.

Figure 23: Eligible Projects under the REFIT Regulations

S/N	Renewable	Minimum Capacity (mw)	Maximum Capacity (mw)	Capital Cost ($/kw)	O&M Cost ($/kwh)
1.	Wind	1	10	1760	19.98
2.	Small Hydro	1	30	3100	23.25
3.	Biomass	1	10	2900	54.49
4.	Solar PV	1	5	1500	30.06

These FITs may be reviewed every three years. However, the prevailing tariff at the time a PPA is signed with a renewables developer shall be fixed for the term of such PPA and the tariff review would only be applicable to new projects.

Source: https://gizmodo.com/denmarks-wind-energy-output-just-exceeded-national-dema-1717066802

(b) Renewable Tariffs Outside the REFIT Regulations:

With respect to on grid renewable projects, the eligible on grid projects under the REFIT Regulations are restricted to projects with a capacity between 1-30MW (depending on the renewable source being utilized). Thus, solar generation projects over the 5 Mw threshold would not come under the REFIT Regulations. It should be noted that unsolicited bids for renewable projects negotiated with NBET, are excluded from the REFIT.

The ambit of the REFIT also does not extend to off grid renewable projects[73] and as such, tariffs for such off-grid projects would be agreed between the renewable project developer and the buyer, subject to the approval of NERC.

E. Challenges with the deployment/Utilization of Renewable Energy in Nigeria

The prospects for renewable power generation are quite high in Nigeria. However, certain factors would have to be addressed to attract investment to improve on-grid and off grid renewable power projects:

(a) **Lack of adequate technical expertise on local developers**: There is need for local project developers to enhance their technical knowledge of the relevant technologies in the renewables sphere. Most local renewable developers have been constrained to implementing small scale projects and more often than not, the local developers have to partner with foreign entities (at substantial costs) to undertake medium or large scale renewable energy project. To ensure the country's energy mix fully utilizes renewables, it is essential for local competence to be developed to design, build, operate and maintain larger renewable energy installations.

(b) **Policy Certainty & Good Regulatory Framework**: Investments in renewables rely heavily on policy-driven price subsidies or favourable regulations to compete with conventional energy sources. The ECN, FMOE and the Federal Ministry of Power all have renewable energy policies and programmes which are somewhat conflicting. There is a need to harmonize the numerous policy objectives and the develop clearer policy statements and regulatory environment (on both federal and state level) for renewable power solutions and for such policies to be converted to law that mitigates investment risks and thereby improve investor confidence. Without clearly enacted laws or approved master plans it is difficult to see how far these policies can have an impact in the renewable energy sector.

(c) **Fiscal System**: Although the Nigerian government provides tax relief and incentives for the manufacture of solar energy powered equipment and gadgets (as a pioneer status industry), there is need for the government to extend such reliefs and incentives to other renewables such as biomass and wind renewables so as to attract more diversification in the renewables sector. In India, the government provided capital cost support for setting up renewable projects which in turn resulted in an investment of about $14billion in the renewables sector.[74]

(d) **Financing & Liquidity Issues**: Establishing medium or large scale renewable energy installations is capital intensive with long pay back periods, and acquiring finance for these projects, especially early stage finance for project development can be a challenge. For on- grid power generation projects, the liquidity issues currently plaguing the sector does have its attendant impact on the attractiveness of on-grid renewable investments. NBET has not shown itself to be a credit worthy off-taker and the Discos from the way the market is structured are not able to pay for the power supplied by the Gencos which has resulted in a substantial amount of debt across the value chain. This no doubt could dissuade investors given the high potential for off-taker default on payment obligations.

(e) **Improving the Transmission infrastructure**: While the Federal government seems to be concentrating efforts at improving generation capacity, it is important that correlative efforts are also put in place to improve the capacity of the national grid to accept and transmit power generated from the renewable generators. The current capacity of the grid is currently 7000mw. For on-grid renewable project developers, the issues around the strengthening and reliability of the grid for evacuation of the power generated would be a key issue.

"Investments in renewables rely heavily on policy-driven price subsidies or favourable regulations to compete with conventional energy sources. "

SECTION G: POWER SECTOR OUTLOOK

We have set out below our outlook on where we see potential for projects and investments in the power sector in the next 12-24 months. Given the challenges in the on-grid power sector, the lingering challenge of energy access and the length of time required to deal with the challenges even in spite of governments efforts via regulation and the PSRP, it is our view that the Nigerian Power Sector is very likely to witness more growth and investment in off grid power generation whilst the on-grid challenges are being resolved.

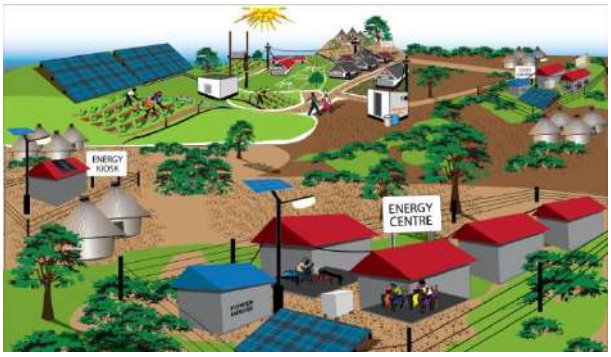
This projected growth is already attracting required funding into the off-grid space. Most recently, the World Bank Group on 5th December 2017 disclosed that a sum of $350 million has been made available to Nigeria to aid the development of off grid power projects in rural areas. The loan is expected to support the efforts of the private sector in developing Nigeria's off grid sector, with $100 million of the total sum dedicated to the development of mini grids. The U.S Africa Development Foundation (USADF) and All On announced on 7th December 2017 a $3 million partnership with the goal of expanding access to energy for underserved and unserved markets in Nigeria. USADF's contribution to the fund will be in form of grant funding to selected companies while All On is expected to provide an equal amount of impact capital in the form of convertible loans and/or equity.

A. Mini Grids

The Mini Grid Regulations have the potential to liberate the Nigerian power sector and improve energy access in rural and urban areas that are either unserved or underserved by the grid. With over 20 Mini Grids in Nigeria as of 2015, serving over 2,000 customers spread across rural areas in Nigeria, Mini Grid penetration is expected grow with over 28% penetration experienced between 2005 and 2015. The Nigerian Energy Support Programme ("NESP") through the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH ("GIZ") NESP who in collaboration with NERC developed the MGR has also supported the development of 5 mini grid projects in 5 states (Sokoto, Niger, Plateau, Cross River, Ogun).[75]

The success of GVE Projects Limited, a mini grid developer, which has developed 6 mini grids projects across Nigeria is also evidence of the opportunities that are available from the deployment of Mini Grids.

The Nigerian Bank of Industry (BoI) has also installed a 24KW mini-solar electricity grid in Onono-Anam, Anambra state.[76]



Source: Nigeria Electricity Regulatory Commission

The outlook for mini grids in the country is no doubt very positive as the MGR has simplified the process for the development of Mini Grids across the country thereby encouraging communities and private entities to invest in the deployment of mini grids. A lot however needs to be done to facilitate access to capital for mini grid projects as well as subsidies to enable more viable projects and affordable tariffs. The REA in this respect seeks to support access to finance through the Rural Electrification Fund, which will provide capital subsidies to cover the capital costs of mini-grid developers.

B. Rural Electrification

The Rural Electrification Strategy and Implementation Plan (RESIP) which was approved in July 2016 sets forth the FGN's strategy to accomplish the goals established in the EPSRA and the Rural Electrification Policy. The main thrust of the RESIP is to promote a full menu of rural electrification options on–grid and off-grid (mini-grid & stand-alone) from thermal & renewable sources as well as facilitate the entry of new market participants and continued development of local rural electrification (RE) ventures whose activities may include the production, installation, operation, maintenance, and distribution/sales of equipment, systems, and services related to power supply in rural areas.

With respect to Mini Grids, REA has embarked on eight (8) pilot projects in the six (6) geo-political zones in the country. One of such projects is the 16KW solar mini-grid project at Ngodo, Umudum in Isuochi in Abia State.[77]

We envisage that once the Rural Electrification Fund comes on board, renewable project developers would be able to have access to the Fund to finance relevant capital cost for the deployment of off grid solutions.

C. Standalone Solutions

Like mini-grids, Stand Alone Solutions (SASs) are also on the rise in Nigeria. This can be seen in the growing number of foreign and local Nigerian Renewable energy companies with specific focus on the Nigerian market for SME solar solutions and solar home systems.

The partnership between MTN and Lumos Global resulted in the launch of the MTN Lumos SASs in Nigeria. The MTN Lumos SASs raised $90 million in 2016 and attracted an additional $40 million this year in foreign investment, making it one of the largest ever investments in the off-grid industry in Nigeria.

Source: https://www.naijatechguide.com/2017/03/lumos-smart-solar-system-specs-price.html

The SASs are particularly useful in sub-urban and rural areas lacking access to the national electricity grid, and where the costs of setting up a mini-grid is not worth the market size such as rural areas with low levels of demand and disperse populations. In such instance, the mini grid may not be a viable option and the SASs can provide sufficient electricity to satisfy the needs of households and small commercial enterprises (e.g., for lighting, radio, TV, fan).

The SASs are being deployed to end users using either a pay as you go payment structure (such as that offered by Lumos Nigeria & Azuri Paygo SHS) that allows customers access solar power under an affordable payment plan via mobile phone or the rent to own structure that allows consumers install affordable solar panels and pay on a daily or monthly basis for only the power they consume (such as provided by Arnergy Energy).

The deficiency of power supply to the rural areas creates a massive investment opportunity for the provision of SASs for small businesses, cottage industries and households as many of such end users see SASs as a viable solution to self-sustaining power supply.

D. Embedded Generation

Given the deficit in power supply across the country, a number of states (Lagos, Kaduna and Edo States) are considering embedded generation projects to boost energy supply within their states. With respect to embedded generation, apart from the Geometric Aba project (which is still not operational) there are currently no precedents for properly developed and project financed embedded generation projects. This is despite the fact that there are currently eight (8) embedded generation projects licensed by NERC. We however envisage that some of the states mentioned above will blaze the trial. It is also likely that with the directive and regulations on eligible users in place, we are likely to see embedded generation projects structured around eligible users as well.

Whilst embedded generation will no doubt provide more efficient and increased generation supply to the distribution companies or their areas of coverage, a lot still needs to be done to achieve properly structured and financed embedded generation projects of a size that would make the required impact. Issues such as the Discos financial credibility or having credit worthy off-takers or guarantors who would give investors and funders the required comfort, funding of capital expenditure required to strengthen existing or build new distribution networks and how it would be recouped via the tariff, having adequate information on the customers to be covered, efficient collections to ensure that energy generated can be paid for and dealing decisively with energy theft in the areas covered by collections and issues around energy theft and enforcement will need to be considered.

"The deficiency of power supply to the rural areas creates a massive investment opportunity for the provision of SASs for small businesses, cottage industries and households as many of such end users see SASs as a viable solution to self-sustaining power supply."

Furthermore, the role of the Discos will be critical to ensuring successfully structured projects that would make the required impact. There needs to be collaboration with the Discos who need to see these projects as a win-win rather than an encroachment on their market share.

E. Off Grid Renewable Solutions and Commercial and Industrial Clusters

The performance and growth of medium and small-scale industries is crucial for a developing economy like Nigeria. Nigeria's industrial development has however been hampered by the epileptic power supply with many industries having to fold up as a result of the huge costs associated with running diesel generators. We are likely to see a number of projects being developed around commercial and industrial clusters that have proven ability to pay for electricity to be supplied. The directive and regulations on eligible users is also likely to enable some of these projects.

Innovative renewable solutions could also provide a viable alternative to the grid and we are likely to see a number of projects (particularly solar) in areas where there is potential for higher radiation levels. The upfront costs of solar and innovative pre-financing solutions would be critical for growth in this area.

In realization of this impediment to economic growth, the Bank of Industry in January 2017 launched the 1 billion Naira Solar Energy Fund to support the provision of sustainable and reliable energy for medium and small medium enterprises. [78] Solar developers are able to access the Fund subject to relevant conditions (including that the project would be for the purposes of micro businesses or small/medium scale business).[79]

F. Off Grid Renewable Solutions and Agricultural Development

Previously, efforts in the agricultural sector were focused on intensive land clearing, fertilizer distribution and other inputs, at highly subsidized costs with very little or no attention paid to energy demand in the Agricultural sector. Attention is now being focused on the installation and usage of renewable energy sources in the agricultural sector in Nigeria as a means of addressing the issue of energy access which is pertinent to sustaining food security. Nigeria produces so much food crops but most of them are lost during harvest and others are lost as a result of poor handling and poor storage facilities. In realization of this, the Nigeria Incentive Based Risk Sharing System for Agricultural Lending (NIRSAL), a wholly owned subsidiary of the Central Bank of Nigeria, have concluded plans to carry out about N60 billion worth projects across the country to provide renewable energy and de-risk the agricultural value chain in Nigeria.[80]

We envisage that a number of projects will be developed and financed to meet the energy needs of agricultural communities and clusters.

Notwithstanding that the agriculture sector is a significant user of energy, it also has the potential to be a major contributor to Nigeria's energy supply mix in meeting its energy deficit. Biomass energy is produced from plants and other agricultural products and same can be utilized as feedstock for power generation. Thus, there is a potential for investment in biomass renewables arising out of an efficient agricultural output.

Source: https://ng.boell.org/2015/09/28/living-grid-nigeria

SECTION H: POWER GENERATION OPTIONS

S/N	POWER GENERATION OPTIONS
1.	**Captive Generation** The NERC Captive Power Generation Regulation reinforces the definition in the EPSRA and goes to define captive power generation to mean generation of electricity exceeding 1 MW for the purpose of consumption by the generator and which is consumed by the generator itself and not sold to a 3rd party. The Captive Power Generation Regulations also define a captive power plant to mean a power plant of over 1 Mw in capacity set up by the generator for its own.
	Pros: • Eliminates technical losses as the power produced is consumed directly by the generator. • Least hurdles in terms of financing and regulatory risks. • Ensures optimal use of power generated as there are no issues with technical and commercial losses. • Industrial customers can generate the power needed for their operations. **Cons:** • The price of grid power is cheaper. • Lack of special incentives to encourage captive generation which is understandable because captive generational is not developmental. • A permit holder must apply for and receive prior written consent from NERC before supplying power not exceeding 1 Mw to an off-taker. A permit holder who intends to supply power exceeding 1 Mw to off-taker must apply for a generation license.
2.	**Embedded Generation** This is the generation of electricity that is directly connected to and evacuated through a distribution system which is connected to a transmission network operated by a System Operations Licensee. To supply power, the Embedded Generator is required to apply to the Commission and to fulfil conditions of the Market Rules relevant to procurement of more electric power above the amount allocated by the Bulk Trader.
	Pros: • Introduces competition in the market. • Backup or bonus to on-grid power projects. • More power supply, more cash flows and more capital flows and more customers for the Discos. • Reduces technical and collection losses because of proximity to the distribution system. • Helps in deepening the electricity market and ensures more bankable deals • Creates more options for industrial consumers. **Cons:** • Distribution licensee's power purchasing ability is also constrained by the Market Rules as it is required to apply to NERC and fulfil conditions in the market rules relevant to procurement of more electric power above the amount allocated by the Bulk Trader. • Embedded generation projects may be less bankable because distribution licensees currently lack liquidity to commit to a Power Purchase Agreement. • Connection to the distribution system of a distribution company is dependent on the maximum embedded generation capacity allowable by the distribution license.

S/N	POWER GENERATION OPTIONS
3.	**Mini Grid Generation:** This is an electricity supply system with its own power Generation Capacity, supplying electricity to more than one customer and which can operate in isolation from or be connected to a Distribution Licensee's network.
	Pros: • A permit is optional for Mini Grids with distributed power of less than 100kW. • Simplified application processes with the inclusion of standardized template contracts, forms and guidelines as annexures to the Regulation. • Increased development in the sector with respect to Disco franchise areas currently not being exploited by the Discos. • Promotes the use of renewable energy (primarily small-scale hydro and solar). • Suitable for users in a community or cluster with smaller energy needs. • Should incentivize Discos to reduce losses in their franchise areas. • Tariff regulated though Operators are allowed to charge a cost reflective tariff. **Cons:** • There is a likelihood of the Disco's sabotaging the growth of mini grids as a mini grid operator is required to obtain Disco confirmation to ensure that the mini grid activities will not interfere with the Disco expansion plans. • May not be suitable for heavy energy users. • More suited for rural/underserved areas rather than urban areas because urban areas are more likely to be taken over by Discos. • Electricity supply limited to 1MW.
4.	**IPP Off-Grid**: This is a privately funded power generation plant whereby power is not evacuated unto the national grid but instead requires an off-taker which could be a commercial consumer or residential customers within a cluster.
	Pros: • Potential market for power supply for housing estates, industrial estates/clusters and telecom installations. • Reliable way of meeting the electricity needs of industrial customers. • Adds new generation capacity to meet the rapidly increasing demand for electricity. • Industrial consumers can have the option of choosing the most suitable suppliers for them. **Cons:** • Constraints with accessing gas for gas fired plants • A downside however is that if excess power is produced, it cannot be sold to NBET or evacuated unto the grid without an IPP On-Grid license. • Additional cost as IPP would need to invest in distribution infrastructure.

S/N	POWER GENERATION OPTIONS
5.	**IPP On-Grid**: This is a privately funded power generation plant where the power generated is evacuated on to the national grid. It is suitable for large scale power projects, but may be subject to capacity needs and system constraints.
	Pros: • Suitable for large scale power projects. • The introduction of competitive bids following the introduction of the NERC Generation Procurement Regulations guarantee the off-take of power produced. • Adds new generation capacity to meet the rapidly increasing demand for electricity. **Cons:** • High cost of financing. • The IPP may require partial risk guarantees. • Power Generation on-grid is subject to capacity needs and system constraints. • Liquidity risks on the part of the Bulk Trader to buy contracted capacity. • Constraints with accessing gas for thermal projects.
6.	**Embedded Independent Electricity Distribution Network (IEDN):** This is an IEDN connected to a distribution network that is connected to the transmission system operated by the system operation licensee. Embedded IEDN Operator is essentially to support the existing Distribution Company in the supply of power to end users within a geographical area.
	Pros: • Maximize access to electricity services particularly for the successor distribution companies. • Reduction of distribution congestion to the benefit of consumers. • Incentivizes investments in the distribution networks. • Island arrangements i.e. ring fencing a section of willing paying customers of a Disco could be commercially viable. • Cheaper than the Isolated Off-Grid (Rural &Urban) IEDN as the successor distribution company connected to the embedded IEDN shall be responsible for the procurement, certification, installation and maintenance and vending of all meters in the embedded IEDN. **Cons:** • This license shall be issued only when there is no existing distribution system within the geographical area to be served by the proposed IEDN Operator or where the area is poorly serviced. • Tariff would have to make commercial sense to an Embedded IEDN Operator given capital outlay required and the liquidity issues currently being faced by Discos.

S/N	POWER GENERATION OPTIONS
7.	**Isolated Off-Grid Rural IEDN**: This is an IEDN in a rural area which is not connected to a distribution network that is connected to the transmission system operated by the system operation licensee. A rural area is any area of the country not existing within 10km from the boundaries of an urban area or city and which has less than 20000 inhabitants or population density is less than 200 per square kilometre and which is at least 20km from the nearest existing 11KV line.
	Pros: • In line with the rural electrification plan which seeks to promote development of off grid electrification and ensure that the inhabitants of the rural areas have access to access to electricity. • The IEDN Operator can apply to the Rural Electrification Agency for financial support in developing his project. **Cons:** • There will have to be an existing generator with the network who will supply power to the IEDN Operator for distribution to its customers. Where there is no existing generator, IEDN Operator will need to invest in generation infrastructure and also secure gas for the generators. This will increase the cost of financing which may not make it worthwhile for the Operator. • Strong likelihood of substantial collection losses as the inhabitants in rural areas are often low-income earners and the Rural Electrification Fund is not to be used as subsidies for consumption in these areas.
8.	**Isolated Off-grid Urban IEDN:** This is an IEDN in an urban area which is not connected to a distribution network that is connected to the transmission system operated by the system operation licensee.
	Pros: • Maximize access to electricity services. • Reduction of distribution congestion to the benefit of consumers. • Promotes competition in the market particularly in areas which are poorly serviced. • Investor has considerable control of tariff (subject to the approval of NERC) and revenue collection provided that customers are willing to pay for the service. **Cons:** • This license shall be issued only when there is no existing distribution system within the geographical area to be served by the proposed IEDN Operator or where the area is poorly serviced. • High cost in connecting customers as the IEDN Operator shall be responsible for the procurement, certification, installation and maintenance and vending of all meters in its network. • IEDN License is subject to additional regulatory hurdles as NERC has to be satisfied that the area to be covered is poorly serviced. Therefore, maintaining a balance between ensuring increased access to reliable and stable electricity and ensuring that the Disco's market share is not eroded.

GLOSSORY OF TERMS	
ATC&C Losses	Aggregate, Technical, Commercial & Collection Losses
BCR	Business Continuity Regulations
CBN NEMSF	Central Bank of the Nigerian Electricity Market Stabilization Facility
Discos	Distribution Companies
ECN	Energy Commission of Nigeria
EPIC	Electric Power Implementation Committee
EPSRA	Electric Power Sector Reform Act 2005
ERGP	Economic Recovery and Growth Plan
FGN	Federal Government of Nigeria
GENCOS	Electricity Generation Company
IEDN	Embedded Independent Electricity Distribution
IOCs	International Oil Companies
IPP	Independent Power Producer
IRP	Interim Rules Period
MW	Megawatts
MYTO	Multi Year Tariff Order
NBET	Nigerian Bulk Electricity Trading Plc
NDPHC	The Niger-Delta Power Holding Company of Nigeria
NEMSA	Nigerian Electricity Management Services Authority
NERC	Nigerian Electricity Regulatory Commission
NESI	Nigerian Electricity Supply Industry
NIPP	National Integrated Power Project
NREEEP	National Renewable Energy and Energy Efficiency Policy 2015
OPIC	Overseas Private Investment Corporation
PCOA	Put Call Option Agreement
PHCN	Power Holding Company of Nigeria
PPA	Power Purchasing Agreement
PRGs	World Bank Partial Risk Guarantees
PSRP	Nigeria Power Sector Recovery Program
REA	Rural Electrification Agency
REAP	The Renewable Electricity Action Programme
REFIT Regulations	Regulation on Feed in Tariff for Renewable Energy Sourced Electricity in Nigeria in December 2015
REMP	The Renewable Energy Master Plan of 2005
REPG	The Renewable Energy Policy Guidelines 2006

GLOSSORY OF TERMS	
RESIP	Rural Electrification Strategy and Implementation Plan
SO	System Operator
TCN	Transmission Company Nigeria
TEM	Transitional Electricity Market
USAID	US Agency for International Development
USTDA	US Trade and Development Agency

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