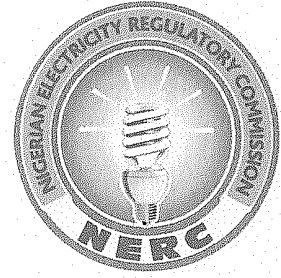


NIGERIAN ELECTRICITY REGULATORY COMMISSION



**FINAL REPORT**

ON

**OPERATIONAL AND TECHNICAL AUDIT OF MARKET AND SYSTEM  
OPERATIONS OF TRANSMISSION COMPANY OF NIGERIA**

**OPERATIONAL AND TECHNICAL AUDIT REPORT**

Submitted to:

**NIGERIAN ELECTRICITY REGULATORY COMMISSION**

By:

**SADA, IDRIS & CO.  
CHARTERED ACCOUNTANTS**

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2<sup>nd</sup> Floor, B Wing FMBN Building  
Central Business District, Abuja.



**Sada, Idris & Co.**

Chartered Accountants and Financial Management Consultants

Member Firm of IECnet Forum of International Expert and Consultants

e-mail: [info@Sadaidris.com](mailto:info@Sadaidris.com)

[sadaidrisc@yahoo.com](mailto:sadaidrisc@yahoo.com)

Offices: Kaduna, Kano, Katsina, Lagos

Tel: 0803 788 2878



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REV	DATE	DESCRIPTION
A		First Draft
B		Second Draft
C		Final

### APPROVALS

Prepared by		
Reviewed by		
Approved by		



## ABBREVIATIONS

DisCo	Distribution Company
EPSRA 2005	Electric Power Sector Reform Act, 2005
GC-14v3	Grid Code 2014 Version 3
GenCo	Generating Company
ISO	Independent System operator
MO	Market Operator
MR-14	Market Rules 2014
MW	Mega-Watt (Active Power)
NBET	Nigerian Bulk Electricity Trader
NCC	National Control Centre
NERC	Nigerian Electricity Regulatory Commission
NESI	Nigerian Electricity Supply Industry
SCADA	Supervisory Control and Data Acquisition
SO	System Operator
TCN	Transmission Company of Nigeria
TSP	Transmission Service Provider
VAR	Volt-ampere-reactive (reactive power)



## **EXECUTIVE SUMMARY**

The main thrust of the TCN (SO/MO) Technical and Operational Audit is on key obligations pertaining to maintaining a secure and reliable electricity supply system, including overall governance arrangement, information sharing amongst users, Generation Scheduling and Dispatch, switching procedures and those obligations for when a secure system cannot be maintained including black start procedures.

### **1.1 System Operator**

There is 12,954.40 MW generation installed capacity and only 5,755 MW is available (Obtained from NCC 2019 Grid System Operations Annual Technical Report) due to weak transmission and Distribution infrastructure. Also, Frequency management problem coupled with low demand from Discos is reducing the hourly generation peak value.

The provision of Operating Reserve on the network to take care of contingencies is a very important aspect of Power System Security and Reliability, but our grid carries no Operating reserve hence the persistent problem of Power failure and National system collapse. The Control Centre operators use their experience to call up Generators to ramp up their output or reduce their output, and Discos are also usually instructed to drop load or pick load in order to control the frequency or voltage magnitude of the network within allowable range. The response time cannot be controlled by NCC as they have no visibility of the network elements. A lot of investment must be made to ensure that the NCC serves as the nerve centre of NESI.

#### **1.1.1 Findings**

Summary of key findings for System Operator are set out below:

- (i) The objectives of the planning chapter are clearly stated under Chapter 2 section 5.1.1 (a-e) of the Grid Code. The planning chapter covers the long-term Demand Forecast, Planning standard and long-term expansion plan.

There was no annual planning report made available to the Audit team

- (ii) The National Control Centre (NCC) in Osogbo is responsible for the grid operations and performance as provided in section 10 of the Grid Code. At the NCC, there

was no real-time dynamic models of the network used for power flow studies, which will aid contingency switching and other controls on the network

There is no active SCADA system at the Control Centre, hence system visibility is very poor, so essentially, we are operating the National Grid blind folded.

- (iii) To ensure System Security and Reliability, the SO must periodically perform a contingency analysis of the networks' dynamic models. This analysis should consider the current state of the network as the starting point and check that no credible contingency will destabilise the system.

From the Auditors assessment of the grid operations, grid code requirements are not materially satisfied which is leading to several system blackouts during the period under audit.

- (iv) The System Operator is required in consultation with the grid users, to specify the Operating Reserve Policy, and submit same to the Regulator (NERC) for approval as provided in Section 15.6 of the Grid Code.

There is no approved Operating Reserve Policy by the Regulator since the inception of the electricity market.

### **1.1.2 Recommendations**

- (i) The System Operator must ensure all relevant reporting required by the Grid Code and Market Rules must be produced and submitted to the relevant units for action. These reports must be transparent and accessible to all participants.
- (ii) As a matter of urgency, investment must be made to ensure 100% coverage of the SCADA system for system operations at NCC, and relevant staff must be trained to ensure proper use of the system.



## 1.2 Market Operator

The market rule number 10 identified the roles and functions of the Market Operator (MO) to be principally market administration and implementation of the market rules.

### 1.2.1 Findings

Summary of key findings are set out below:

- i. The MO is presently locked in a bureaucracy of the organisational structure of the Transmission Company of Nigeria (TCN) thereby hindering effective functioning of the office.
- ii. Market settlements are processed without certified software as stipulated in Market Rule 31.1.
- iii. Specialized accounts required to be maintained in MR 31.2 are not maintained.
- iv. Multi Year Tariff Order (MYTO), an official document guiding energy pricing in Nigeria Electricity Market was not in use. Instead, a yearly NERC order has been the basis for pricing.
- v. From 2015, the management of energy transactions for GENCOs and DISCOs were being handled by Nigerian Bulk Electricity Trading Plc (NBET). NBET therefore assumed responsibilities for invoicing and collections for energy generated and evacuated. This has left the MO with handling revenue and expenditure for service providers only thereby not able to effectively implement the market rule
- vi. Proper records are maintained for invoices, receipts and disbursements for service providers which are now the only financial aspect of the market settlement handled by the MO.
- vii. There are consistently huge balances on the ancillary service account as a result of funding by DISCOs being way higher than actual disbursements on same. There was a total balance of ₦6,583,221,770.08 in the ancillary service account as at 31<sup>st</sup> December, 2019.
- viii. The DISCOs over the years have been remitting fractions of the monthly charge for energy evacuated. This has rendered the MO incapable to settle GENCOs

and service providers in full as and when due in accordance with market settlement reports and market rule.

- ix. As a result of the not so impressive remittances, the DISCOs are heavily indebted for outstanding service providers. The total receivables were 2015 N49.9m, 2016 N52.4m, 2017 N56.6m, 2018 N61.7m, and 2019 N23.7m. The significant drop in the outstanding in 2019 was a direct result of improved remittances. Of the 2019 outstanding, Abuja and Ibadan EDC accounted for 17% and 12.9% respectively while Yola EDC had the least at 2.9%. It is imperative that these balances must be sorted to straighten the accounts.

### **1.2.2 Recommendations**

Key recommendations include:

- i. The Market Rule needs to be reviewed periodically to accommodate current operational requirements for improved transparency, sustainable and efficient market.
- ii. The accounting interface with NBET should be properly defined to comply with the market rules and ensure transparency and accountability.
- iii. Remittances by DISCOs should be properly scrutinized in relation to revenue generated.
- iv. VAT on ancillary service invoices should be reconciled and appropriate remittances made to FIRS.
- v. Invoices and other statements generated as part of the market settlement should be synchronized with NBET operations
- vi. Capacity Charges to DISCOs should be computed based on actual available or operational capacity for all GENCOs instead of contractual capacity as some GENCOs on occasions do have lower available/operational capacity compared to their contractual capacity.
- vii. A comprehensive financial audit of Energy Market should be carried out especially the documentation and transaction flows between participants with a view to establish accurate balances owed and owing among participants.

## **PART 1.**

### **1.0 Introduction**

In a drive to make electricity supply accessible to all Nigerians in a reliable and efficient manner, the Federal Government set in motion a privatisation exercise of the Electricity Supply Industry

The Electric Power Sector Reform Act 2005 (EPSR Act) was approved by the National Assembly in 2005, hence a legal backing for the unbundling of the Generation, Transmission and Distribution sectors.

Currently, the Nigerian Electricity Supply Industry (NESI) is based on a "Market Model", where the Transmission Company (TCN) has been assigned a monopoly of three activities and corresponding license dates as follows:

- Transmission Services (TSP)                      1<sup>st</sup> July 2006
- System Operation (SO)                              10<sup>th</sup> June 2013
- Market Operation (MO)                              10<sup>th</sup> June 2013

The three activities of TCN as shown above are the basis for this Audit.

The EPSR Act establishes that the Commission (NERC) has as principal objectives (among others):

- Create, promote and preserve efficient industry and market structures and to ensure the optimal utilisation of resources for the provision of electricity services
- Ensure that an adequate supply of electricity is available to consumers
- Ensure that prices charged by licensees are sufficient to allow the licensees to finance their activities and to allow for reasonable earnings for efficient operations

The Commission has the responsibility of verifying the licensees' compliance with license conditions, the Market Rules and the Grid Code.

Pursuant to the provisions of EPSR Act and Market Rules, the Commission has appointed SADA, IDRIS & Co to conduct the first and comprehensive Operational audit of the System and Market Operations of TCN.

## 1.1 Scope

The Commission, pursuant to Market Rules 13.1.1(a), has appointed an Independent Consultant to audit the operational activities of TCN as System Operator (SO) and Market Operator (MO).

The purpose of the Audit is to assess the current practices and procedures related to information exchange, economic dispatch, generation and interconnector scheduling, ancillary services, system reliability, registration of participants, metering, settlement, payment, compared to international practices, the Market Rules and the Grid Code.

The bases for the Audit are as follows:

- (i) Compatibility with the Grid Code, Market Rules and other relevant regulations
- (ii) Compliance with accepted international practices in performing similar functions

The Audit is divided into two major tasks as follows:

### **Task 1**

Identification and review of current practices, procedures and processes.

### **Task 2**

Analysis, documentation and compliance with Market Rules, Grid Code and International best practises.

## 1.2 Objectives

The specific objectives for the Audit are:

- (i) Assess current practices on information exchange for the merit order system, day ahead dispatch and real time operation of the system, their adequacy and effectiveness for the System Operator to have sufficient, accurate and timely information

- (ii) Assess current practices on operational reserve and Ancillary services, and their adequacy to protect the reliable and safe operation of the transmission system
- (iii) Assess if TCN as System Operator is dispatching the system within a security constrained merit order, and make recommendations on possible improvements
- (iv) Assess the procedures and calculations of prices of energy and other products traded in the market
- (v) Verify the proper functioning and compliance with Market Rules of the Software used for dispatch, price calculation and settlement
- (vi) Identify differences between current practices in information exchange, merit order, dispatch, generation scheduling, operational reserve and other Ancillary services, and those established in the Grid Code
- (vii) Assess the current organisation in the National Control Centre and its' adequacy to comply with the functions and responsibilities assigned to the System Operator in the General Electricity Law, and recommend appropriate measures to help the System Operator effectively and efficiently carry out its responsibilities
- (viii) Identify the functions currently carried out by the MO/SO and compare with the requirements of the Market Rules and Grid Code. Assess the different procedures followed by the MO/SO
- (ix) Assess the databases managed by the MO/SO. Assess metering system, settlement system and payment system
- (x) Identify problems, sort them according to their importance and make recommendations to solve/improve the situation. Verify if recommendations of any previous audits have been fulfilled
- (xi) Identify cases of non-compliance with the Market Rules, misconduct or breaching of rules by the MO/SO and Market Participants. Verify that in case of breaching of rules by Market Participants the MO/SO have initiated and developed properly ruled procedures and investigations

### **1.3 Audit Grading**

A three-part grading system, as per international best practises, it is adopted for compliance with the relevant documents for Market and System Operations. The grades are:

#### **1. Compliant**

All requirements are met

#### **2. Part Compliant**

Most requirements are met. Those requirements that are not met have an immaterial impact on the reported information.

#### **3. Not Compliant**

Not all requirements are met.

### **1.4 Methodology**

Considering the scope, objectives and the time span (2009 – 2020) for this audit, we have developed a comprehensive methodology and work plan, to ensure all areas are investigated for compliance or otherwise.

A six phased approach is proposed as follows:

#### **1.4.1 General Awareness and Planning**

It is required that all market participants that come under this audit, be informed of the exercise and provide all required information under their custody for ease and transparency of the Audit.

- General agreement on the current documents to be used as reference materials and timelines of changes (Grid Code, Market Rules, Licenses, Procurement of Ancillary Services Policy, Steady state and Dynamic Network models for Generation dispatch)
- Establish/confirm a general data sharing protocol between all market participants
- Establish and maintain a compliance process and Audit Grading

### **1.4.2 Preliminary Analysis**

- Record of all documentations kept with respect to MO/SO functions
- Information sharing/exchange portal and agreed/established protocol
- Records of Bids from GenCos and DisCos for the Audit period
- Operating Reserve and Ancillary services Policy
- Documentation relating to procedures and calculations of prices of energy and other products traded in the electricity market
- Analyse previous and current practices in merit order, dispatch, generation scheduling etc
- Establish the duties assigned to the National Control Centre and current organization – Adequacy assessment

### **1.4.3 Data Collection and Network Models**

- GenCos and DisCos hourly bids (declarations and nominations)
- Load forecast for each bidding period
- Network Dynamic models used for System Dispatch
- Generation dispatch
- Load Flow Studies data
- Calculation of System Energy Price
- Data access to all participants

### **1.4.4 Analysis and Investigation of Discrepancies**

#### Grid Code

- Grid Code provisions on System Control and Stability
- Load forecasting
- Power System Control
- Frequency Control and violations

- Operating Reserve requirement and Reserve Policy Implementation
- Voltage Control and violations
- Market Rules
  - Role of the System Operator
  - Role of the Market Operator
  - Participants Eligibility Requirement
  - Generation Adequacy
  - Submission of Scheduling and Dispatch Data and Contract nomination
  - Settlement and Payment System (Metering, Collection and Validation of Meter Data, Ancillary Services Data)
  - Computation of Charges and Payments
  - Governance, Administration and Enforcement
  - Dispute Resolution

#### **1.4.5 Review and Analysis of all MO/SO activities**

- Data collection on MO/SO activities
- Data Analysis and Compliance checks
- Review and Assessment of Historical Data
- Modelling and Simulation of the Network using the collected Data
- Comparison of developed System model and the SO model
- Data Compilation and Payment reconciliation
- Discrepancies Analysis
- Regulatory Compliance checks and recommendations

#### **1.4.6 Completion and Reporting**

- De-briefing with Market participants
- Discussions of Key findings with MO/SO
- Discussion of Draft report with NERC
- Submission of Final Report



## **PART 2: SYSTEM OPERATOR**

### **2.1 System Operations**

The approval by the National Assembly of the Electric Power Sector Reform Act 2005 and subsequent establishment of the Nigerian Electricity Regulatory Commission (NERC) as the Regulator of the Nigerian Electricity Supply Industry (NESI), an operating license of a Transmission Service Provider was issued to Transmission Company of Nigeria (TCN) on 1<sup>st</sup> July 2006.

A System Operation (SO) and Market Operation (MO) licenses were issued to TCN on 10<sup>th</sup> July 2013. TCN was established and licensed to perform the functions of transmission and system operations of the High Voltage network of the Nigerian Electricity Supply Industry (NESI).

The day-to-day operating procedures and principles governing the development, maintenance and operation of an effective, well-coordinated and economic Transmission System for the electricity sector in Nigeria is contained in the Grid Code.

Part 1, Section 1.3.2 of the Grid Code states:

The Grid Code is designed to:

- (a) Facilitate an efficient production and supply of electricity for all users of the Transmission System and TCN itself, without any act of discrimination between Users or class of Users.
- (b) Facilitate competition in the generation and supply of electricity in the country.

The System Operations audit did focus on the obligations of TCN as a licensee for system operations, pertaining to maintaining a secure and reliable electricity system on the High Voltage network.

Section 1.5 of the Grid Code clearly defines the role of TCN as Transmission Service Provider and a System Operator.

Table 1: Summary of System Operator License obligations and Audit findings

No	Description	Audit Grade	Comment
1	Documentation and process compliance	Not Compliant	No comprehensive internal Audit and compliance program
2	Derogations	Not Compliant	Reporting not done within the required time frame, and documentation not easily accessible
3	Planning	Not Compliant	There were no annual planning reports
4	Transmission System Performance	Not Compliant	Non-functional SCADA system at the NCC
5	Frequency Control and Operating Reserve	Not Compliant	No approved Operating Reserve Policy
6	Power System Control	Not Compliant	Several Network blackouts recorded within the Audit period
7	Scheduling and Dispatch	Part Compliant	Records are kept but not shared in real-time

## 2.2 Planning

The Objectives of the Planning Chapter are clearly stated under Chapter 2, section 5.1.1 (a – e) of the Grid Code. The purpose is for the Transmission System Expansion to cater for the connection of new Load/Generation to the transmission system. The planning and development of the Transmission system shall be in accordance with the Transmission Planning Criteria and relevant standards applicable in Nigeria

The Planning Chapter covers long term Demand Forecast, Planning Standards and Long-Term Expansion Plan.

### **2.2.1 Audit Procedure**

Requests for relevant documents of all Transmission system users were made, and interviews and discussions were held with the relevant departmental officers of the SO, with a view to assess compliance.

Documents given to us were not properly documented, and dates of the documents were not sequential.

The only complete document made available to us is the Fichtner Report (Final) dated December 2017. This report developed the TCN Power System Master Plan for 2020 – 2037.

### **2.2.2 Audit Grading**

Not Compliant

### **2.2.3 Reason for Audit Finding**

The planning chapter provision in Section 6 (Load Forecast) and Section 7 (Expansion Planning) requires a minimum update annually.

There were no annual planning reports available to the Audit team.

All Transmission users' data were also not complete from November 2013 to June 2020.

## **2.3 Transmission System Performance**

The System Operator is responsible for the performance of the grid and reports to the users and Regulator at intervals specified by the Grid code.

The National Control Centre (NCC) at Oshogbo is responsible for the grid operations and performance as provided in Section 10 of the Grid Code. It is stated in 10.1.1 that:

10.1.1 In order to maintain the security and integrity of the Transmission System, it is necessary that the System Operator operates the transmission System and Dispatches it in such a manner as to provide adequate Frequency Control to achieve operation within applicable Frequency limits at all times.

In order to ascertain the operating protocol and usefulness of the NCC, the audit team members visited the NCC for 5 days from 31<sup>st</sup> August to 4<sup>th</sup> September 2020.

The General Manager (System Planning HQ) escorted the audit team to the NCC. A meeting was held in the GM (NCC)'s office and Engr B A Ishola (AGM – NCC) was nominated as a liaison officer for the audit team. A formal request for data from the NCC data base was made to the liaison officer.

Copies of Disco day-ahead nominations (MW), GenCos Hourly Capacity report (MW), Disco Daily nominations and energy off-take spreadsheet and Generation Actual Capacity (MWh) which also shows the daily average for each month were given to the audit team as part of the request for information (RFI) at the NCC. A spreadsheet summary of all Disco hourly nominations and Genco declarations were also given to the audit team.

It was observed that the data is stored on personal computers and can be accessed only by the owners. This clearly indicates that data is not shared in real-time.

There was no real-time dynamic model of the network used for power flow studies, which will aid contingency switching and other controls on the network.

### **2.3.1 Audit Procedure**

Discussions and interviews with the NCC staff were held after analysing the data values given to the audit team. The audit team visited the control room, to assess the current organization of the NCC and its' adequacy to comply with the functions and responsibilities assigned to the System Operator in the Grid code.

It was clear from our observations that during operations in the Control room, there is no active SCADA system in the control room, so essentially, we are operating the National Grid blindfolded. The only reference parameter in the control room is the system frequency, where experienced operators call up generating stations as they deem appropriate to either increase or reduce their output in order to keep the frequency within the stipulated range as provided in the grid code. The Distribution Companies are similarly called up to pick or drop load as required.

The communication between the NCC and the GenCos/DisCos is not on a secured line, rather it is on mobile telephones and data is relayed verbally.

### **2.3.2 Audit Grading**

Not Compliant

### **2.3.3 Reason for Audit Grading**

The SCADA system installed in the NCC is not fit for purpose, the data sent from some of the connected nodes of the network are misleading and are never used by the Control room operators at the time of our visit.

Without a dynamic real-time model of the network in the Control room, it is impossible to see the status of generating units or transmission lines, hence the operators cannot confirm when their operating instruction was carried out.

From the 2019 Grid System Operations Annual Technical Report, it was concluded that "The inability of NCC to monitor power stations has made it difficult to determine accurately the power flowing on the grid, as the measurement relayed from the stations are sometimes biased in their favour. Also, the compliance of stations with NCC instructions are very much suspect".

## **2.4 System Security and Reliability**

The Nigerian Grid is distributed over a wide geographical area, but generation is mostly concentrated in the Southern part of the country, which is leading to network congestion. As Electricity demand and generation to meet the demand vary, the power flow in the branches and the voltages at the nodes of the network fluctuate. The System Operator (SO) must therefore pay attention to the effect of these changes on System Security, by continuously checking and ensuring that no equipment is being operated outside its' safe operating range.

It is expected that the SO periodically performs a contingency analysis of the networks' dynamic model. This analysis should consider the current state of the network as the starting point and check that no credible contingency would destabilise the system.

### **2.4.1 Audit Procedure**

The Audit team requested for a record of the network model and all parameter values used for contingency analysis. Also, we requested for records of the modifications of the network model over the period of the

audit, which will show if new additions are reflected on the model and when they were added.

From the NCC and TCN HQ records, it was deduced that models were kept on Personal computers and there are gaps in the documentation.

The annual assessment report on the Reliability of the transmission System which should be sent to the Regulator for review as required by the Grid Code section 23.5.1, were not complete.

#### **2.4.2 Audit grading**

Not Compliant

#### **2.4.3 Reason for Audit Grading**

Grid Code requirements are not materially satisfied. Several system blackouts have been recorded during the period under audit. The current NCC practice of contingency analysis is off-line and results not uploaded on a central server.

### **2.5 Frequency Control and Operating Reserve**

Section 15 of the Grid code addressed the issue of Frequency Control and Operating reserve. Section 15.1.1 gave the objectives as:

- (a) To specify the System Operator requirements to ensure that adequate Frequency Control capability is provided on the Transmission System to enable operational Frequency Control by the System Operator, so as to achieve the applicable limits, and
- (b) To specify the Operating Reserve and Reliability Must-Run requirements the System Operator has to adhere to in order to achieve the mentioned Frequency Control System Reliability.

Components of Operating Reserve are defined in Section 15.5, while the frequency limits that must be maintained on the Grid are defined in Section 15.3 of the Grid Code. Operating Reserve is used to control the frequency and stability of the grid.

The System Operator is required in consultation with the grid users, to specify the Operating Reserve Policy, and submit same to the Regulator (NERC) for approval as provided in Section 15.6 of the Grid Code

### **2.5.1 Audit Procedure**

The Audit Team requested for all relevant communication with Grid users used to develop the Operating Reserve Policy. As at the time of the Audit, there was no Regulator approved Operating Reserve Policy used by the System Operator and there were no documents shown to us a proof of consultation with grid users.

### **2.5.2 Audit Grading**

Not Compliant

### **2.5.3 Reason for Audit Grading**

There were contracts entered between the System Operator and seven different companies for provision of six different reserves as shown in Table 2.4. All these contracts did not have renewal or expiry dates, however, payment for these services were stopped by December 2016, from the records made available to the Auditors by the Market Operator.

The Operating Reserve Policy must be developed and approved by the Regulator before a service agreement is executed.

Table 2.5 Contracts for Reserve

S/N	COMPANYS	ANCILLARY SERVICES					DATE OF CONTRACT
		SPINING RESERVE	FREQUENC Y CONTROL	REGULATIN G RESERVE	REACTIVE POWER AND VOLTAGE CONTROL	BLACK START	
1	ANCILLARY SERVICES AGREEMENT BTW TCN AND MOBIL PRODUCING NIGERIA UNLIMITED	■	■		■	■	11/04/2014
2	ANCILLARY SERVICES AGREEMENT BTW TCN AND AFAM ELECTRIC POWER PLC	■	■		■	■	21/2/2013
3	ANCILLARY SERVICES AGREEMENT BTW TCN AND JEBBA HYDRO ELECTRIC PLC	■	■		■	■	21/2/2013
4	ANCILLARY SERVICES AGREEMENT BTW TCN AND AZURA POWER WEST AFRICA LIMITED	■	■		■	■	24/6/2014
5	ANCILLARY SERVICES AGREEMENT BTW TCN AND GREGU GENERATION COMPANY LIMITED	■	■	■	■	■	23/08/2016
6	ANCILLARY SERVICES AGREEMENT BTW TCN AND OLORUNSOGO GENERATION COMPANY LIMITED	■	■	■	■	■	23/08/2016
7	ANCILLARY SERVICES AGREEMENT BTW TCN AND OMOTOSHO GENERATION COMPANY LIMITED	■	■	■	■	■	23/08/2016

## 2.6 Scheduling and Dispatch

In order to improve economic efficiency and minimise losses in the system, Generators are scheduled and dispatched to satisfy the provisions of the Grid Code. The objective of Scheduling and Dispatch of generators is given in section 21.1.1 of the Grid Code.

The NCC is responsible for scheduling and dispatching all generators connected to the grid. Generators are provided with running orders for the dispatch Day ahead, such that Generating units will be made available in the correct timescale to enable the System Operator to dispatch them whilst maintaining the required Operating Reserve. The System Operator shall dispatch Generating units according to Market Rules, subject to constraints of safety of personnel, Equipment, System Security, System Stability, Reliability and environmental requirements.





These hourly schedules are subject to actual hourly loads for each scheduled day, a record of the scheduled and actual hourly generation is kept. Similarly, a record of the forecast and actual load is kept.

These records were analysed, and discussions were held with the NCC Liaison Engineer to ensure how they Schedule and Dispatch all Generating units connected to the grid, and how they monitor parameters of concern, like Voltage and Reactive Power at critical nodes of the grid.

### **2.6.2 Audit grading**

Not Compliant

### **2.6.3 Reason for Audit Grading**

Scheduling and Dispatch of Generators is done to minimise the cost of producing electricity, system security and reliability, that is why it is always considered an optimisation problem.

From the current practice of the SO, no sequential documents were accessible to the Audit Team. The dispatch of generators and their corresponding outputs are done out of experience as against using the network model for load flow.

The SCADA system in the Control room monitors only 20% of the 277 stations that make up the grid in real time, according to the 2019 Grid Operations Annual Technical Report. But the reality in the Control room is that none of the values displayed by the SCADA system is useful and never relied upon. This is making it impossible to monitor and determine accurately the Power flow in the grid in real time.

## **PART 3: MARKET OPERATOR**

The objective of the financial operations audit as an integral part of the technical operations audit of the Nigerian Energy Market is to ensure that market rules are followed in addition to established internal control systems in the activities leading to energy market settlements.

### **3.1 Functions of the Market Operator**

The roles and functions of the Market Operator (MO) as outlined in Market Rule 10 basically cover energy market administration and implementation of the market rules.

The structure of Transmission Company of Nigeria (TCN) where the MO is located appears to hinder effective and efficient implementation of the market rules. In the structure, the MO reports to an Executive Director in charge of Independent System Operation who in turn reports to the Managing Director. By this, the MO has not been able to assert any independence and take responsibility for the implementation of the market rules.

Three periods are identified for analysis in line with the practicalities of Market Operations and the Market Rules 2014.

### **3.2 2009 – 2012**

As a precursor to the privatization and to assess the level of change made in the finance and accounts division, a summary review of the accounting operations was carried for the period of 2009 – 2012.

During this period, all financial operations were carried out largely at the Headquarters of Power Holding Company of Nigeria (PHCN) in a centralized finance and accounts division. Power generation and distribution were organized along stations with all revenues coming from distributions stations. These were utilized to defray power generation and distribution cost and overheads.

Revenue accounting, banking and disbursements were examined along with relevant bank statements for selected stations and banks. On average, the centralized finance function of the period was relatively well operated and financial regulations followed especially in funding PHCN operations.

In terms of compliance with the Market Rules, there was nothing required in this period as the Power Sector Privatization was not yet in place.

### **3.3 2013 – 2014**

The power sector reforms and the unbundling of Power Holding Company of Nigeria (PHCN) took effect from October 2013 when the assets of the erstwhile PHCN were restructured for privatization as Electricity Generating Companies (GENCOs) and Electricity Distribution Companies (DISCOs).

To kick start the take-off of a private sector driven power sector, Grid Rules and Market Rules governing the operations of the power sector were developed and deployed for effective monitoring of the expected vibrant and efficient power sector.

The energy market was to a large extent expected to comply with the market rules under the direct supervision of the Market Operator. The MO was therefore the pivot of the energy market driving the much-anticipated market settlement to ensure transparent and promote accountability within the system.

The MO was fully in charge of the until January 2015 when the GENCOs and DISCOs were handed over to private sector investors.

### **3.4 2015 – 2020**

The GENCOs and DISCOs were finally transferred to the private sector investors in February, 2015.

This period effectively signalled the deployment and implementation of the Market Rules that govern the financial operations of the emerging Energy Sector Market in Nigeria.

However, the activities of the MO were curtailed by the emergence of Nigerian Bulk Electricity Trading Plc (NBET) which effectively took over the management and processing of energy and capacity billings and payments to ensure stability and integrity of the market.

### **3.5 Audit Procedure**

The procedure adopted in the audit of compliance of the MO to the Market Rules was primarily based on the examination and analysis of records and reports made available

Among documents examined were:

1. Market Rules 2014
2. Energy and Capacity Reports Summary
3. Energy Balance Sheet
4. Market Settlement Reports
5. Invoices and Remittances Summary
6. Bank statements
7. Annual Budgets

Discussions and interviews were held with Principal Officers in charge of Settlements and Market Operator Finance and Accounts. The MO F&A is responsible for all financial activities of the market operator in relation to compliance with market rules governing market settlement and disbursement of funds to respective participants which include; GENCOs, DISCOS and Service Providers.

The service providers comprise; Nigerian Electricity Regulatory Commission (NERC), System Operator (SO), Transmission Service Provider (TSP), MO and Ancillary Service.

After a review of documents made available, a random sample of periods for which documents were to be examined was selected in 2013 – 2020.

### **3.6 Books of Accounts and Records**

Normal basic book of accounts was maintained pre and post transfer of operations to GENCOs and DISCOs in 2015. Specialized accounts required to effectively operationalize an efficient Energy market were however not maintained. These accounts as listed in in MR 31.2.2 include:

- Market reserve account
- Market escrow account
- Market clearance account.
- Market operator surplus account.

Instead, only one general account was utilized in accounting for all transactions thereby non-compliant with the MR.

The designated accounts were not maintained due to impracticability. Non-compliance was more of a case of convenience due to the fragmented way in which payments are received for DISCOs and disbursements to GENCOs and Service Providers which are based on predetermined sharing ratios. The DISCOs are yet to fully pay energy invoices to pave way for the operationalisation of the accounts as desired.

### **3.6.1 Audit Grading:**

Non-compliant

### **3.6.2 Reasons for Audit Grading**

Lack of regulatory enforcement was the reason for non-compliance between 2013 and 2015 when the GENCOs and DISCOs effectively emerged in the energy market. During the period the MO was entirely in charge of energy market administration as stipulated in the MR.

However, in addition to lack of regulatory enforcement, the system of operation changed with NBET accounting for billings and payments of energy and capacity under separate power purchase agreements and vesting contracts with GENCOs and DISCOs respectively. It is not clear how the accounts will operate as there was no evidence of these accounts at NBET.

## **3.7 Procedures and Calculation of Energy Prices**

The procedures for the calculation of energy prices and service providers charges are largely in compliance with the MR. Documentations for the preparation of monthly energy balance sheet and market settlement reports are verified and authenticated by participants. Discrepancies are usually resolved before the final market settlements are prepared and distributed to all participants with relevant invoices. Despite the relevant accuracy of the procedures, compliance with the MR is partial as energy and capacity are priced at the PPA process agreed by GENCOs with NBET. These prices are at variance with MYTO Tariff.

Detail information for each Genco cannot be provided as most Gencos did not respond to request for information.

Opinion on price variation was reached on the basis of discussions with the Discos who confirmed being charged in accordance with prices agreed in PPAs which was corroborated by NBET.

### **3.7.1 Audit Grading:**

Non-compliant

### **3.7.2 Reason for Non-Compliance**

Pricing energy and capacity at agreed PPA prices is at variance with the MYTO tariffs applied in the preparation of monthly market settlement reports. The seeming independent operation of NBET from the MO is not in tandem with the MR.

## **3.8 Functioning and Compliance of Software**

A Software is required by MR 31.1 for the processing of dispatch, price calculation and market settlement. No certified software was in use for the entire period covered by the audit. Excel spreadsheet in use up to October 2013. An official settlement software was however introduced in November 2013 but abandoned sometimes in 2019 when it ceased to be functional. The reliability and efficiency of the software could not be tested as there was no compliance with the MR.

### **3.8.1 Audit Grading:**

Non-compliant

### **3.8.2 Reason for Audit Grading**

The non-provision and maintenance of a certified software is a clear case of non-compliance which could be traced to management ineptitude and lack of adequate regulatory enforcement.

## **PART 4: FINDINGS**

During the Audit, the Team had several meetings and discussions with Staff of the SO and MO in order to discuss some of the elements we needed further clarifications. It is important to know that we did not see any documented Process for regulatory compliance, both for the Grid Code and the Market Rules.

### **4.1 System Operator (SO)**

- i. The critical aspect of developing any infrastructure is at the planning stage, where all the relevant factors are considered. As provided by the Grid Code in section 7.1.1, the SO, in consultation with the Transmission Service Provider (TSP) shall develop comprehensive Transmission Planning Criteria to guide the expansion planning of the Transmission System.

The long-term expansion planning of the network starts with the long term (20 years) load/demand forecast. The SO analyses the current network using commercial software and provides credible expansion alternatives. A long-term expansion report is developed annually (Grid code section 7.2.7) which the Regulator approves after consultation with all Grid users.

The Audit team did not see any approved long-term expansion document with the SO/TSP. However, a TCN Power System Master plan 2020 -2037 dated December 2017 (Fichtner Report – Final) was given to us, but no approved copy by NERC sited.

- ii. Frequency and Voltage control are critical in ensuring grid security and stability. Section 10 of the Grid Code covers Transmission System Performance characteristics. System Frequency and Voltage magnitude are monitored and maintained within the allowable range, in order to keep the Grid stable.

From the current practices of the NCC, experience is the only factor deployed in order to maintain system frequency and voltage magnitudes within allowable limits. The SCADA system covers only about 20% of the 277 stations of the grid to be monitored in real-time. In the control room, the values displayed by the SCADA monitor are not reliable and are never used for stabilising the network.

- ii. The current practices of information exchange for the generation merit order system, day ahead dispatch and real time operation of the system is not robust enough for the SO to have sufficient, accurate and timely information.



- iv. As of December 2019, the Generation installed capacity is 12,954.40 MW, but only 5,755 MW is available to the grid. The installed capacity is not utilised due to:
- Transmission and Distribution bottlenecks
  - Frequency management coupled with DISCOs low demand
  - Due to Transmission lines congestion, dispatching of some stations is dependent on Grid reliability

It is extremely important to set out a credible Transmission system expansion programme, which shall be implemented on engineering considerations.

- v. The National Control Centre is not fit for purpose in a privatised electricity market. A comprehensive plan must be developed and implemented to equip the NCC control room with a functioning SCADA system, that will enable the Operators oversee the grid performance at ALL nodes in real-time.

#### **4.2 Market Operator (MO)**

- i. Market settlements were being processed without a certified software for the purpose as stipulated in section 31.1 of the market rule. Excel spreadsheet was in use up to October 2013. From November 2013, an official settlement software was introduced but was later out of use sometimes in 2019.
- ii. Only one general account was maintained contrary to section 31.2.2 which stipulated the maintenance of the following accounts:
- Market reserve account
  - Market escrow account
  - Market clearance account.
  - Market operator surplus account.
- iii. As a result of ii, there was no compliance with sections 38.2.1 and 38.3 that requires the market operator to use market clearance account and market reserve account for remitting each participant payments.
- iv. VAT on Ancillary Services Invoices from GENCOs were not paid on the recommendations of the National Control Centre contrary to section 35.7.1 and 35.7.2 of the Market Rule.

- v. Multi Year Tariff Order (MYTO), an official document guiding energy pricing in Nigeria electricity market was not in use. Instead, a yearly NERC order has been the basis for pricing.
- vi. From 2015, the management of energy transactions for GENCOs and DISCOs were being handled by Nigerian Bulk Electricity Trading Plc (NBET). NBET therefore assumed responsibilities for invoicing and collections for energy generated and evacuated. This has left the MO with handling revenue and expenditure for service providers only.
- vii. Disbursements to service providers are usually limited to receipts from invoices raised on DISCOs for services rendered within the context of energy market settlements.
- viii. Electricity power generated and evacuated were being priced in accordance with energy balance sheet/capacity reports as embodied in the market settlement system.
- ix. There were observed a few discrepancies in the energy volume invoiced from energy reports/settlement reports.
- x. It is not clear what GENCOs and DISCOs do with invoices and other statements generated from monthly market settlement reports as the MO no longer have responsibilities for accounting for main energy generated and evacuated.
- xi. DISCOs have over the years consistently remitted lower amounts below monthly invoices thereby resulting into a rather high monthly account receivable.
- xii. Similarly, GENCOs are also usually paid lower amounts for energy generated leading to equally high monthly account payable.
- xiii. Funds received from DISCOs are the main source of income from which GENCOs and Service Providers are paid. Whatever is disbursed on a monthly basis is usually in accordance with approved sharing formula approved by NERC where monthly collections fall short of liabilities.
- xiv. Proper records are maintained for invoices, receipts and disbursements for service providers which are now the only financial aspect of the market settlement handled by the MO.

- xv. There are consistently huge balances on the ancillary service account as a result of funding by DISCOs being way higher than actual disbursements on same. There was a total balance of ₦6,583,221,770.08 in the ancillary service account as at 31<sup>st</sup> December, 2019.
- xvi. Payments by DISCOs were sometimes not in accordance with the payment cycle as stipulated in the market rule. This had worsened the cashflow of the energy market making it rather more difficult for prompt payments to GENCOs and other participants.
- xvii. There are contracts for ancillary services to stabilize energy supply should there be systems failure. The contacts were mainly for Black start and Spinning Reserve. The contracts provided for a monthly fixed payment which were not consistently made.
- xviii. The recording of energy and capacity were quite systematic and flows well into the monthly market settlements. There were however occasional discrepancies in energy volumes (kw/h) reported in energy balance sheet and the actual energy priced and invoiced to the DISCOs.
- xix. For example, the following differences were noted in March, 2015.

Energy Volume Discrepancies in March, 2015 (kw/h)

Discos	Energy Balance Sheet	Settlement Statement	Variance	Percentage %
Abuja	296,793,830	299,753,912	(2,960,082)	-0.010
Benin	215,440,845	217,598,640	(2,157,795)	-0.010
Eko	182,713,460	184,535,756	(1,822,296)	-0.010
Enugu	238,627,150	241,007,105	(2,379,955)	-0.010
Ibadan	292,506,360	295,423,681	(2,917,321)	-0.010
Ikeja	309,958,820	313,050,203	(3,091,383)	-0.010
Jos	93,337,230	94,723,811	(1,386,581)	-0.015
Kaduna	163,367,640	164,996,992	(1,629,352)	-0.010
Kano	96,497,440	97,459,800	(962,360)	-0.010
Port-Harcourt	146,971,310	148,437,132	(1,465,822)	-0.010
Yola	31,197,310	24,352,643	6,844,667	0.219
<b>Total</b>	<b>2,067,411,395</b>	<b>2,081,339,675</b>	<b>(13,928,280)</b>	<b>11.47%</b>

Errors like this, if unchecked pose integrity concern on energy records. The implications are that pricing and collections are likely to be impacted with consequences on revenue and disbursements largely dependent on the Discos.

xx. The DISCOs over the years have been remitting fractions of the monthly charge for energy evacuated.

This has rendered the MO incapable to settle GENCOs and service providers in full as and when due in accordance with market settlement reports and market rule.

xxi. Remittances range between 37% and 44% in 205 – 2018. This however improved significantly to 78% in 2019 as shown in the Table below:

SUMMARY OF DISCOs INVOICES AND REMITTANCES FOR SERVICE PROVIDERS: 2015 - 2019																
S/N	DISCOs	2015														
		2015			2016			2017			2018			2019		
		INV	REM	%	INV	REM	%	INV	REM	%	INV	REM	%	INV	REM	%
Nmillion		Nmillion		Nmillion		Nmillion		Nmillion		Nmillion		Nmillion		Nmillion		
1	ABUJA EDC	9,957	4,663	47	11,363	4,048	36	12,771	3,467	27	13,888	4,500	32	15,113	11,083	73
2	BENIN EDC	9,310	4,802	52	7,593	4,134	54	8,794	4,713	54	9,671	5,086	53	9,330	7,087	76
3	EKO EDC	9,650	7,290	76	7,198	5,553	77	11,403	10,858	95	12,353	8,782	71	13,382	12,020	90
4	ENUGU EDC	11,662	3,650	31	9,252	2,935	32	8,979	2,600	29	8,637	2,550	30	9,093	6,756	74
5	IBADAN EDC	13,313	8,868	67	10,394	4,464	43	12,946	3,977	31	13,264	4,323	33	14,295	11,245	79
6	IKEJA EDC	10,302	3,611	35	10,322	4,980	48	10,919	6,296	58	13,450	8,070	60	15,300	13,346	87
7	JOS EDC	4,916	628	13	4,523	252	6	5,294	805	15	4,793	815	17	5,065	3,579	71
8	KADUNA EDC	7,510	2,559	34	7,191	944	13	7,688	1,420	18	8,216	1,493	18	7,903	5,709	72
9	KANO EDC	4,614	600	13	5,259	750	14	6,837	1,080	16	7,442	1,280	17	7,106	4,922	69
10	P/H EDC	7,248	2,558	35	7,491	1,145	15	7,917	1,809	23	7,456	1,749	23	7,865	5,736	73
11	YOLA EDC	1,417	729	51	2,253	1,238	55	3,185	3,063	96	3,769	2,593	69	4,581	3,890	85
	<b>Total</b>	<b>89,898</b>	<b>39,958</b>	<b>44</b>	<b>82,839</b>	<b>30,443</b>	<b>37</b>	<b>96,733</b>	<b>40,088</b>	<b>41</b>	<b>102,939</b>	<b>41,241</b>	<b>40</b>	<b>109,033</b>	<b>85,373</b>	<b>78</b>

xxii. From the Table it is evident that the DISCOs remittance record has been rather poor between 2015 and 2018. It has been so bad that Jos EDC remitted only N252m (6%) in 2016 representing the poorest remittance so far. Eko, Ibadan, Enugu, Ikeja and Kaduna, Port-Harcourt, Benin and Abuja are the largest DISCOs. It's only Eko EDC that has consistently remitted over 70% each year. Both Eko and Yola achieved 95% and 96% respectively in 2017 while all the companies remitted above 70% in 2019 except for Kano that remitted 69%.

xxiii. As a result of the not so impressive remittances, the DISCOs are heavily indebted for outstanding service providers. The total receivables were; 2015 N49.9m, 2016 N52.4m, 2017 N56.6m, 2018 N61.7m, and 2019 N23.7m. The significant drop in the outstanding in 2019 was a direct result of improved remittances. Of the 2019 outstanding, Abuja and Ibadan EDC accounted for 17% and 12.9% respectively while Yola EDC had the least at 2.9%. It is imperative that these balances have to sorted to straighten the accounts.

Below is a Table of DISCOs for 2015 – 2019.

DISCOs OUTSTANDING FOR SERVICE PROVIDERS: 2015 - 2019											
S/N	DISCOs	2015		2016		2017		2018		2019	
		₦million	%	₦million	%	₦million	%	₦million	%	₦million	%
1	ABUJA EDC	5,293.83	10.6	7,314.49	14.0	9,303.74	16.4	9,388.20	15.2	4,029.69	17.0
2	BENIN EDC	4,508.31	9.0	3,458.72	6.6	4,081.27	7.2	4,585.04	7.4	2,243.24	9.5
3	EKO EDC	2,360.13	4.7	1,645.14	3.1	544.88	1.0	3,570.23	5.8	1,362.42	5.8
4	ENUGU EDC	8,012.01	16.0	6,316.99	12.1	6,379.24	11.3	6,086.95	9.9	2,336.92	9.9
5	IBADAN EDC	4,444.69	8.9	5,930.16	11.3	8,969.04	15.8	8,940.88	14.5	3,050.18	12.9
6	IKEJA EDC	6,690.97	13.4	5,342.04	10.2	4,623.54	8.2	5,379.81	8.7	1,954.58	8.3
7	JOS EDC	4,288.05	8.6	4,271.14	8.2	4,489.39	7.9	3,977.57	6.4	1,486.72	6.3
8	KADUNA EDC	4,950.87	9.9	6,247.05	11.9	6,267.84	11.1	6,722.84	10.9	2,193.59	9.3
9	KANO EDC	4,013.50	8.0	4,509.19	8.6	5,757.42	10.2	6,162.49	10.0	2,184.73	9.2
10	P/H EDC	4,689.49	9.4	6,346.58	12.1	6,108.43	10.8	5,706.92	9.3	2,129.21	9.0
11	YOLA EDC	687.91	1.4	1,015.26	1.9	121.37	0.2	1,175.05	1.9	691.58	2.9
	<b>Total</b>	<b>49,939.76</b>	<b>100.0</b>	<b>52,396.76</b>	<b>100.0</b>	<b>56,646.16</b>	<b>100.0</b>	<b>61,695.98</b>	<b>100.0</b>	<b>23,662.86</b>	<b>100.0</b>

xxiv. A total of ₦248.426billion was outstanding from the DISCOs on account of service providers as at June, 2020. Analysis revealed that 60.3% of the outstanding was owed by Abuja ₦35.36billion (12.7%), Ibadan ₦30.60billion (11.0%), Enugu ₦27.37billion (9.8%), Kaduna ₦26.48billion (9.5%), Port-Harcourt ₦24.27billion (8.7%) and Ikeja ₦23.97billion (8.6%).

Details according to DISCOs is provided in the Table below:

Dues on Service Providers as at 30 June 2020			
S/N	DISCO	Service Providers Charge	
		₦Billion	%
1	ABUJA	35.362	12.7%
2	BENIN	17.388	6.2%
3	EKO	9.438	3.4%
4	ENUGU	27.375	9.8%
5	IBADAN	30.604	11.0%
6	IKEJA	23.975	8.6%
7	JOS	17.491	6.3%
8	KADUNA	26.483	9.5%
9	KANO	22.96	8.2%
10	PORT HARCOURT	24.273	8.7%
11	YOLA	4.764	1.7%
	SUB - TOTAL	240.113	86.2%
	OTHERS	38.314	13.8%
	GRAND TOTAL	278.427	100.0%

The proportionate of the outstanding dues to service providers accruing as revenue is shown in the Table below:

<b>SHARE OF SERVICE PROVIDERS DUES AT JUNE 2020</b>			
<b>S/N</b>	<b>DISCOs</b>	<b>JUNE 2020</b>	
		<b>Nmillion</b>	<b>%</b>
1	<b>ANCILLARY SERV.</b>	374.73	0.1%
2	<b>MO</b>	2,837.86	1.0%
3	<b>NBET</b>	1,701.10	0.6%
4	<b>NERC</b>	24,248.66	8.7%
5	<b>SO</b>	26,033.53	9.4%
6	<b>TSP</b>	223,230.95	80.2%
	<b>TOTAL</b>	<b>278,426.83</b>	<b>100.0%</b>

xxv. It is not clear how and when these obligations will be settled if ever at all. The total dues from DISCOs and payable to GENCOs and service providers as participants in the Nigerian Energy Market will be so enormous when energy transactions handled by NBET is included in the analysis. All these figures have to be put in proper perspectives in line with the realities of the management and administration of the Nigerian Energy Market taking full cognizance of the Market Rule and the need for transparency and accountability.

## **PART 5: RECOMMENDATIONS**

In order to improve the workings of the Nigerian energy Market and make the system operate as efficiently and competitive as desired, the following suggestions are made:

### **5.1 System Operator**

- i. A Regulatory compliance evaluation and monitoring process must be developed and implemented to ensure rigid compliance with the Grid Code, Market Rules and other relevant industry documents for proper, transparent and efficient National Grid by all users.
- ii. The transition of the old NEPA/PHCN staff into the current electricity market structure has made it strange for most staff of TCN to accept and operate within a regulated environment.

There should be proper training and development of all TCN staff with regards to their job descriptions and how they fit in a privatised and regulated business (NESI).

- iii. The NCC must as a matter of urgency be revamped and fully equipped with a state-of-the-art SCADA system that will enhance the visibility of the grid from the control room. The SCADA system must also be scalable such that it can easily adapt to increase of data points when the grid expands.
- iv. The database of the NCC must be on a secured server and open to legal users for real-time information sharing. This should allow users like Discos to send in their daily nominations electronically, as against the current way of using mobile phones.

Real-time dynamic models of the transmission network must be used for operations in the control room in association with the SCADA system

- v. TCN Engineers in the Planning and Operations departments must be trained in Advanced Power Systems Analysis and Protection Systems using commercial software. This will enable TCN to have an in-house capacity to carry out Planning studies such as Generation Adequacy Assessment, Transmission System performance, Generation Scheduling and Dispatch. Investment must be made for central computing facilities for all areas of operation.

- vi. The current state of our network makes it impossible for Power System Optimisation, hence the need to reinforce the Transmission and Distribution system infrastructure in line with long-term development plan of the grid. This will enable the development of a more meaningful operating reserve Policy and market for ancillary services.

## 5.2 Market Operator

- i. The Market Rule needs to be reviewed periodically to accommodate current operational requirements. Such amendments are necessary to enable stakeholders discuss developments in the energy market for improved transparency, sustainable and efficient market.
- ii. There should be a regular compliance monitoring of the provisions of the Market Rule to ensure strict adherence
- iii. The accounting interface with NBET may be properly defined to ensure transparency and accountability
- iv. Reconciliation of the various dues and outstanding in respect of service providers should be carried out
- v. Remittances by DISCOs should be properly scrutinized in relation to revenue generated
- vi. VAT on ancillary service invoices should be reconciled and appropriate remittances made to FIRS
- vii. Possibility of the balances in ancillary accounts maintained with the CBN to attract interest should be exploited
- viii. Invoices and other statements generated as part of the market settlement should be synchronized with NBET operations
- ix. The invoicing system should be reappraised in the market settlement system. This is to allow for separate invoices to be raised for energy and service providers dues



- x. Capacity Charges to DISCOs should be computed based on actual available or operational capacity for all GENCOs instead of contractual capacity as some GENCOs on occasions do have lower available/operational capacity compared to their contractual capacity.
- xi. Monthly Net-off of compensation/penalty due from deviations from the Economic Merit Order Dispatch (EMOD) should be included in sections 28 and 30 of the Market Rules. This should be incorporated on the Final Settlement statement as a line item similar to the invoice line item "Transmission Loss Factor (TLF)" (Compensation/Penalty).
- xii. There should be a complete reconciliation of accounts with GENCOs and DISCOs to ensure that balances arising from the market settlements represent amounts payable and receivable.
- xiii. A comprehensive financial audit of Energy Market should be carried out especially the documentation and transaction flows between participants with a view to establish accurate balances owed and owing among participants.

## **PART 6: CONCLUSIONS**

The Nigerian Electricity Supply Industry (NESI) is still at its' infancy hence close monitoring and supervision must be improved to ensure compliance with the Grid Code, Market Rules and other relevant industry standards.

It is very difficult to call the arrangement we have today as an economically driven electricity market, as it is not efficient, and prices are not determined on the dynamic behaviour of the network, competitive pricing and consideration of other operating parameters like congestion.

There is a need for developing the Network Planning documents so that expansion projects are selected and implemented based on engineering principles. The NCC must be upgraded to serve as a nerve centre of NESI.

The Market Rules over the years have served as a market monitoring system which sets out the operation and pricing system of the Nigerian Energy Market. It has to a large extent ensured an efficient, transparent and predictable market settlement system, while facilitating critical management of financial obligations of energy sellers (GENCOs) and purchasers (DISCOs).

The market rules have through extensive guidelines provided mechanisms for effective dispute resolution among stakeholders in the market.

The current audit of the market rule though long overdue has provided an opportunity to review the workings of the Nigerian Electricity Market and recommendations have been made where necessary to make stakeholders more responsive to their roles within the timelines stipulated.

It is hoped that careful consideration of this report and subsequent review of the market rule will further improve the transparency and accountability of the market and make the system more efficient and sustainable.

## **APPENDIX A**

### **NBET ACTIVITIES IN THE FINANCIAL OPERATIONS OF MARKET OPERATOR'S COMPLIANCE WITH THE MARKET RULE**

The Nigerian Bulk Electricity Trading Plc is an agency established in the privatisation of the Nigerian Energy Market to serve as a critical link in the generation and distribution of electricity in Nigeria. NBET by design acts as managers and administrators in the electricity market loop purchasing energy from the Generating Companies (GENCOs) and sell to Distribution Companies (DISCOs).

NBET was incorporated in 2010 but actively commenced business in 2015 after the formal handing over the erstwhile PHCN managed electricity generating and distribution facilities to private investors in line with the Electric Power Sector Reform Act (EPSRA.)

The operations of NBET heavily impacts the operations of the Market Operator (MO) as detailed in the Market Rule. The Technical and Operational Audit of Compliance to the Market Rule therefore had to examine transactions flows across the energy market participants and the interface with the MO in particular to ensure effective compliance.

After several failed attempts and meetings, NBET finally provided the following information with which samples were extracted to examine level of compliance with the market rule.

1. DISCOs Invoices 2015 – 2020
2. GENCOs Invoices 2015 – 2020
3. GENCOs Power Purchase Agreements (PPA)
4. DISCOs Vesting Contracts
5. GENCOs Revenue Sheet for 2017
6. DISCOs Invoices and Remittances Analysis for 2017
7. GENCOs Payments for 2017

Data analysis and examination were carried out on only 5 DISCOs and I GENCO that responded to requests for supply of information.

The companies are:

- Abuja Electricity Distribution Company (AEDC)
- Eko Electricity Distribution Company (EEDC)
- Ibadan Electricity Distribution Company (IBEDC)
- Ikeja Electricity Distribution Company (IKEDC)
- Kaduna Electricity Distribution Company
- Egbin Power Plc

## **OBSERVATIONS**

The checks carried out indicate the followings:

- i. Energy and capacity figures applied in the computation of DISCOs invoices agreed in material details with the market settlement reports produced by the MO.
- ii. Pricing for energy supply by GENCOs were based on the PPAs as opposed to the MYTO in line with the market rule.  
NBET as well as Gencos/Discos confirmed in discussions that PPA prices are used in billing for energy supplied and evacuated. Detailed invoices were not provided by the parties. An opinion was reached based on the PPAs that were sighted in which NBET was obliged to Gencos on agreed prices therein which are subsequently passed on the Discos in vesting contracts. The prices are usually over and above MYTO Tariff. NBET should provide the relevant details as they were not made available to the audit team.
- iii. Invoicing for DISCOs energy offtakes were at a different price from MYTO as may have been dictated by the GENCOs energy pricing.

- iv. There was no information on service providers fees received thereby making it impossible to cross check with MO records. However, we understand that payment were made on the invoice value from the service provider. This therefore mitigates any discrepancy but a corroborating record from NBET would confirm the entries in compliance with the system requirement.
- v. There was no adequate information to vouch the level of tariff shortfall for the DISCOs and outstanding liabilities to/from both GENCOs and DISCOs.
- vi. Audited financial statements were not made available to properly vouch the flow of transactions and establish the volume of the market and the associated payables and receivables for energy and ancillary services.
- vii. It is suspected that NBET may not have audited its financial statements for some time.
- viii. The difficulties in assessing information and the manner of data provided bring the company's transparency and accountability to question not only as a government owned company but a public limited company that must comply with extant laws and Companies and Allied Matters Act (CAMA).
- ix. From discussions with NBET and the 6 companies that supplied information, it was noted that there are reconciliations of tariff shortfalls and outstanding liabilities which were compiled in conjunction with NERC.

## RECOMMENDATIONS

Arising from above observations, the following recommendations are made:

- i. There's need for the market rule to be updated with the basis for pricing energy for GENCOs and DISCOOs.
- ii. Periodical reconciliations should be carried out on the transactions of NBET and other market participants to always have accurate status of the Nigerian Energy Market.
- iii. There's need for a comprehensive financial and technical audit of NBET to ensure transparency and accountability and to ascertain the level of tariff shortfalls due to each participant in the energy market.
- iv. There's also need to map out appropriate strategies to ensure efficient settlements of GENCOs outstanding and invoices.
- v. Payment guarantees by DISCOs may be re-examined to determine whether these are really essential in the scheme of current operations of the market where remittances have remained pretty low as a result of uneconomic tariff dictated by MYTO. With the Minimum Remittance Order being an improvement in remittances is still low. As such there may be little or no risk of default which the payment guarantee is set to address.
- vi. Charges paid by the DISCOs to the banks and the cash deposit against the guarantee can be freed to increase the minimum remittance and boost available cash resources in the energy market.
- vii. Operations of NBET should be reviewed in line with the objectives of its establishment of stabilising the energy market. This review will enable government determine a new timeline for NBET to wind up and allow the MO to effectively manage the market in accordance with the market rule.
- viii. Overall, there is a need for a comprehensive Revenue Recognition and disclosure policy for all the Operators in the industry to ensure effective Revenue Mobilization and Monitoring, and efficient deployment to all industry participants.

## **APPENDIX B**

### **VISITS TO ELECTRICITY DISTRIBUTION COMPANIES**

The following Discos were visited during the audit.

1. Eko
2. Ikeja
3. Ibadan
4. Kaduna
5. Kano
6. Abuja

Further to the interim report on the financial audit as a component of the Technical and Operational Audit of the Nigerian Energy Market, visits were made to the 6 DISCOs listed above to verify information obtained from TCN and assess general compliance with the Market Rules.

Discussions were held with respective chief finance officers and officers from regulatory, treasury, financial reporting and technical operations. Detailed records and soft copies of reports were made available for examination and deliberations thereon, except for Kano Disco that did not provide documentations for sighting. Suggestions were made for improvements in the operations of the market and areas for review/update of the Market Rule.

Set out below are summaries of the findings for further analysis and incorporation in the final report on the audit where necessary.

- i. NBET is an agency of government created to regulate the relationship between GENCOs and DISCOs after the privation of the Energy Market. NBET specifically started operation in February 2015.
- ii. NBET Invoices the DISCOs for Energy Cost i.e. capacity, energy and other power generating costs. These costs constitute the cost of sales to the DISCOs.
- iii. Two sets of Invoices are issued to the DISCOs; one from NBET and another from TCN. TCN Invoices contain two elements: 1. capacity and energy charges priced on MYTO Tariff Model as stipulated in the Market Rule and 2. Service providers charges due to NERC, NBET, SO, MO, TCN and Ancillary services

- charges. Energy and capacity charges on TCN Invoices are for reconciliations and reporting purposes for NERC.
- iv. There are regular reconciliations with NBET and TCN for invoices, remittances and outstanding liabilities.
  - v. It is suggested that TCN should separate capacity and energy charges from the service providers charges.
  - vi. There's need to incorporate the pricing model of NBET in the Market Rule. The PPA with GENCOs by NBET should be made available to DISCOs for transparency and accountability as the bulk of DISCOs costs of sales is impacted by NBET invoices.
  - vii. The TCN invoices are part of the Market Settlement process. Capacity and Energy charges on TCN invoices are not treated by DISCOs from February 2015.
  - viii. Differences in capacity and energy figures on NBET and TCN invoices are normally reconciled. However, there are issues which are not easily resolved with NBET where higher figures are invoiced above TCN figures as reflected in Market Settlement Reports.
  - ix. Subsidies is actually Tariff shortfall which FG agreed to offset outstanding liabilities to NBET and MO who in turn settles other service providers. No cash transfers!!! Tariff shortfall is what the DISCOs are not able to collect from customers due to low electricity tariff which are considered well below DISCOs costs. Shortfall in tariff is designed to take care of shortfall in remittances.
  - x. Remittances are made to NBET and TCN on a monthly basis and reconciled periodically.
  - xi. Remittances to NBET and TCN are usually discretionary and largely dependent on the finances of each DISCOs. However, remittances improved from 2019/2020 with the introduction of Minimum Remittance Order by NERC which the DISCOs are complying with.



- xii. Minimum Remittance Order notwithstanding, there are still heavy liabilities which will continue to be on the increase as far as the tariff shortfall remain unresolved.
- xiii. The DISCOs want the MO to be independent of TCN which is an active participant in the energy market chain. (Generation–Transmission–Distribution)
- xiv. The DISCOs want improved service from TCN to enable DISCOs evacuate more power for distribution which in turn will increase revenue and remittances.
- xv. The gap between generation and distribution should be met by improved transmission.
- xvi. DISCOs are willing to invest provided adequate investment is made in transmission. It is expected that FG contribute in investing in distribution as it retains 40% equity in DISCOs.
- xvii. There's need to properly agree the quantum of the tariff shortfall and recognise same in the accounts of DISCOs to reduce the heavy liabilities on outstanding payments to NBET and TCN.
- xviii. VAT accounting and remittances to FIRS is a challenge. The Invoices from NBET carry VAT for which DISCOs are demanding relevant receipts to evidence payment in order to net off from VAT liabilities on customers' bills. It is understood that GENCOs pay VAT on Gas which are passed on to NBET. So far NBET has not provided proof of VAT remittance. Whether VAT is paid or not, there's need for its disclosure to DISCOs.
- xix. DISCOs have Vesting Contracts with NBET. These are contracts that ties DISCOs to NBET to accept all energy provided by GENCOs who have separate PPAs with NBET. The vesting contracts were signed in 2013 by the legacy managing directors of the DISCOs who were old PHCN executives and remain imposed on DISCOs after hand over to private investors in 2015.
- xx. The DISCOs would prefer separate PPAs with NBET just as the GENCOs as opposed to the situation where DISCOs are to receive energy from NBET at a price that they are not in a position to negotiate. The price for energy received

is expected to be in accordance with agreements reached with the GENCOs which are not listed in the vesting contracts.

- xxi. The DISCOs are of the view that there are fundamental problems with the vesting contracts as they were imposed and not commercially negotiated. There are therefore suggestions for a review/update of the vesting contracts to align with market needs.
- xxii. There are issues with interests being charged on DISCOs outstanding liabilities particularly to NBET. A situation where tariffs are not being charged at commercial rates does not make good sense to continue to charge interests especially where government has committed to the provision of shortfall in tariff to settle liabilities on energy costs and service providers charges due to NBET and MO respectively.
- xxiii. DISCOs are of the view that once there's comfort in liquidity in the energy market as there are presently for GENCOs, NBET would naturally no longer have a role in the Nigerian Energy Market.
- xxiv. The Market Rule stipulates payment security guarantee be obtained from a bank by DISCOs to cover 3 months invoices. The DISCOs have to collateralise substantial cash at no interest for this purpose. The cost of the payment guarantee constitutes an unproductive drain on the tight finances of the DISCOs. There's urgent need to review this rule or remove it entirely as remittances are now made more regular in compliance with Minimum Remittance Order.
- xxv. Furthermore, with the shortfall in tariff agreed by the government, there's a good case for a review of the payment guarantee clause. It is interesting to note that none of the payment guarantees had been called since inception even when DISCOs were making rather very low remittances.
- xxvi. Finally, the present request by NBET for DISCOs to increase the payment guarantees should be suspended

## APPENDIX C

### VSIT TO EGBIN POWER PLC

The operations of Egbin Power Plc in relation to the financial audit component of the Technical and Operational Audit of the Market Rule was necessitated by the need to understand the roles of GENCOs in the compliance audit of the Market Rule. Also, to examine to what extent has the Market Rule impacted the GENCOs operations as a critical supplier of energy in the Nigerian Energy Market. The interface with the DISCOs through the operations of NBET was also scrutinised.

It was established that the emergence of NBET in the Energy Market in 2015 made the operations of GENCOs relatively stable with remittances for energy supplied enhanced. Payments to GENCOs prior to 2015 was relatively detrimental because remittances by the DISCOs to the market operator was somewhat discretionary and very low on account of low tariff.

Details of the review and discussions at Egbin Power Plc which are to a large extent reflective of other GENCOs are:

- i. There are Power Purchase Agreements (PPA) with NBET. The PPAs allow NBET to purchase energy from the GENCOs which are sold to the DISCOs through Vesting Contracts.
- ii. Other than the PPA with NBET Egbin has Bilateral Agreements with Eko and Ikeja EDCs to supply energy at mutually agreed well outside MYTO Tariff and PPA rates. These are premium energy and regulated by NERC.
- iii. The Invoices issued by GENCOs are at a price stipulated in the PPAs which are higher than the MYTO rates.
- iv. GENCOs maintain that pricing are based on MYTO except that the CBN Template in use allows for adjustments in exchange rates which are additional to the MYTO Tariff.

- v. GENCOs are not averse to giving PPAs to the DISCOs but feel that could be obtained from NBET where there are contractual relationships.
- vi. Regular reconciliations of invoices and remittances in respect of NBET transactions.
- vii. Just like the DISCOs complaining of tariff shortfall, GENCOs are also paid proportionately with balances constituting receivables.
- viii. There is an element of government intervention in sorting invoices underpayment in other words, the shortfalls may be outside the remittances for energy by the DISCOs.
- ix. The GENCOs will appreciate a move toward full settlement of energy invoices and prompt payment.
- x. Despite pricing energy at prices stipulated in the PPAs which are higher than MYTO tariff, GENCOs still feel the prices do not adequately cover costs. A clamour for higher pricing is being made.
- xi. A CBN special window to access foreign exchange at official rates will allow better management of energy costs.
- xii. Government should be actively investors in the quest for improved capacity. A situation where government does not demonstrate willingness to contribute to expansion and renewal programmes will further make energy supply suboptimal.
- xiii. Technical and operational data will be provided along with other financial details electronically to the firm's official email address as provided.