



NIGERIAN ELECTRICITY REGULATORY COMMISSION

GUIDELINES ON THE PROCEDURES FOR TECHNICAL AUDIT OF THE TRANSMISSION SYSTEM AND NETWORK DATA VALIDATION

JULY 2026

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NIGERIAN ELECTRICITY REGULATORY COMMISSION

In the exercise of the powers conferred under sections 34 and 226 of the Electricity Act 2023 ("EA" or the "Act") and all powers related thereto, the Nigerian Electricity Regulatory Commission ("NERC" or the "Commission") hereby issues ***"Guidelines on the Procedures for Technical Audit of the Transmission System and Network Data Validation"***.

Table of Contents

1.	Title	3
2.	Scope/Applicability	3
3.	Background.....	3
4.	Legal Basis	4
5.	Objectives	4
6.	Transmission System Technical Audit Obligations	5
7.	Guidance on Engagement of Consulting Firm.....	6
8.	Implementation of Technical Audit Report.....	6
9.	Regulatory Oversight	7
10.	Effective Date	7

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1. Title

This regulatory instrument may be cited as the "**Guidelines on Procedure for Technical Audit of the Transmission System and Network Data Validation 2026**".

2. Scope/Applicability

These Guidelines apply to the Nigerian Independent System Operator ("NISO"), and Transmission Service Providers ("TSP") operating in the Nigerian Electricity Supply Industry ("NESI") in line with section 66 of the Act.

3. Background

1. The Nigerian electricity transmission network operates at 330kV and 132kV voltage levels and consists predominantly of a radial overhead transmission system. The network comprises of an estimated 9,504.54km of 330kV transmission lines and 8,437.62km of 132kV transmission lines, with a nameplate transformation capacity of 12,574MVA at the 330/132kV level and 20,885MVA at the 132/33kV level¹.
2. There is a significant gap between the name-plate capacity and actual wheeling capability of the transmission network. This shortfall is attributable among other factors, to mismatches between transmission line and substation capacities, inadequate network interface planning and investments in assets that do not materially enhance network performance.
3. The Commission's review of operational and system incident reports indicates that the transmission network continues to experience significant technical and operational deficiencies including -
 - a. Prolonged unavailability of critical transmission lines, power transformers, and high voltage switchgears.
 - b. Protection system failures arising from obsolete protection equipment and inadequate relay coordination.
 - c. High rate of fire incidents and network component failures caused by aged transmission lines and equipment with hot spots, weak support structure, poor insulators, underrated conductors, poor maintenance, and inadequate safety measures.

¹ (TCN System Planning report, 2024).

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4. These deficiencies have adversely affected the reliability, stability and operational efficiency of the transmission network. They have also resulted in recurring Service Level Agreement ("SLA") related liabilities for the Transmission Company of Nigeria Plc. ("TCN") arising from its inability to make critical transmission line/equipment available to deliver allocated capacity to Distribution Companies ("DisCos").
5. In addition, the ongoing efforts to integrate grid-scale Renewable Energy ("RE") and Battery Energy Storage Systems ("BESS") into the national grid require accurate assessment of the technical condition and operational capability of the transmission system to ensure reliable planning and operation.
6. The Commission has also observed inconsistencies between the operational capability of the transmission network components and the nameplate data used for developing the network model, which affects the accuracy of power system studies and investigations.
7. The Commission has developed these Guidelines to establish a transparent, uniform and standardised framework for technical audit of the transmission system and network data validation by NISO.

4. Legal Basis

1. The Commission, pursuant to section 34(1)(e) of the Act, is mandated *"to ensure the safety, security, reliability, and quality of service in the production and delivery of electric power to consumers"*.
2. Section 226 (1) of the Act provides that *"the Commission may make regulations prescribing all matters which by this Act are required or permitted to be prescribed or which, in the opinion of the Commission, are necessary or convenient to be prescribed for carrying out or giving effect to this Act"*.
3. Section 7.2.2 of the Grid Code further provides that *"the TSP in consultation with System Operator shall perform refurbishment audits on the existing transmission system to determine the remaining useful life of the transmission system components. The TSP shall produce a refurbishment plan to replace aging, and damaged equipment. Such plans shall take into consideration the security of the transmission system and the impact of such activities on the users"*.

5. Objectives

These guidelines seek to -

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- A. Establish a standardised procedure for conducting an end-to-end condition survey of operational capability and evaluation of transmission network assets in NESI.
- B. Identify transmission lines and substations for reinforcement or replacement to improve the efficient load evacuation from power plants to load centres.
- C. Assess the adequacy of protection systems and relay coordination in line with established Standard Operating Procedures ("SOP") to improve the reliability and security of grid power operations in NESI.
- D. Update transmission network data to support effective system planning and protection coordination, through the use of network system modelling tool.
- E. Verify compliance of the transmission system with the Act, Grid Code and other applicable technical standards and regulatory requirements.

6. Transmission System Technical Audit Obligations

- A. NISO shall engage a suitably qualified consultant to conduct a comprehensive technical audit of the transmission system covering all 330kV and 132kV transmission lines and substations at least once every 5 (five) years, unless otherwise directed by the Commission.
- B. The Commission may direct NISO notwithstanding clause 6(A) to conduct a special technical audit of specific assets or geographical areas where –
 - i. There have been recurring system failures.
 - ii. Major incidents or accidents have occurred.
 - iii. There is evidence of significant degradation or non-compliance.
 - iv. The Commission otherwise deems necessary.
- C. All licensed TSPs shall provide access to transmission facilities, infrastructural parameters, operational logs and all the necessary support during site inspections by the audit team.
- D. NISO shall file the following reports with the Commission at different stages of the technical audit –

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- i. An inception report outlining the audit's scope, methodology, timeline, and resources. The report shall be submitted to the Commission for review and approval before commencing the audit process.
- ii. Interim report detailing the preliminary findings of the technical audit, including analysis of system performance, asset conditions, operational and maintenance practices, and compliance. The interim report shall be filed with the Commission for review and feedback.
- iii. A comprehensive final report detailing the audit findings, updated network data, transmission asset evaluation report, conclusions, and recommendations. The report shall contain -
 - a. Audit findings covering infrastructure capability assessment metrics, system performance, operational and maintenance practices, updated network data, and compliance with relevant Standards, Codes and Regulations, asset values and updated network data.
 - b. A detailed action plan outlining a list of prioritised performance improvement projects derived through system modelling using validated network data, expected impacts, and implementation timelines.
 - c. Recommendations comprising policy, regulatory, and operational changes required for optimal performance of the grid.

7. Guidance on Engagement of Consulting Firm

NISO shall be guided by the following documents in engaging the consultant to undertake the technical audit of the Transmission System and Network Data Validation. These documents shall serve as the minimum considerations -

- a. Minimum competency requirements – Schedule I
- b. Scope of work - Schedule II
- c. Methodology – Schedule III

8. Implementation of Technical Audit Report

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- A. TSP shall file an updated Performance Improvement Plan ("PIP") based on the findings and established gaps from the technical audit of the transmission system upon receipt of the results of the audit report.
- B. TSP shall file, following the Commission's approval, annual progress reports to the Commission on the implementation of the updated PIP including –
 - i. Status of each recommended action.
 - ii. Expenditure incurred.
 - iii. Performance improvements achieved.
 - iv. Any challenges or delays encountered.
- C. NISO shall utilise the updated network data for power system studies.
- D. The Commission shall update the TCN asset register and valuation based on the outcome of the project.

9. Regulatory Oversight

The Commission may, at its discretion, engage independent experts to validate audit findings or conduct spot checks to verify compliance with regulatory requirements.

10. Effective Date

These Guidelines shall be effective from 20 July 2026.



Musiliu O. Oseni, PhD
Chairman

SCHEDULE 1
Minimum Competency Requirements

1. The following shall apply in the engagement of a consultant.

A. Lead Consulting Firm

- i. Duly registered engineering and consulting firm with COREN or CIPEN demonstrating expertise in power engineering covering transmission system planning, design and construction, power system protection, power system studies, operation and maintenance and grid modernisation.
- ii. 10 years minimum experience in providing engineering consultancy services relating to transmission system planning, technical audits, power system operations and maintenance.
- iii. Evidence demonstrating the firm has undertaken at least 3 (three) comparable assignments involving technical audits, network planning or rehabilitation of high voltage transmission systems.

2. The prospective consultant shall have the following experts.

A. Operations & Maintenance Engineer

- i. Minimum of a bachelor's degree in Electrical/Electronic Engineering with a postgraduate qualification in power systems.
- ii. 15 years minimum experience in operations and maintenance of transmission systems.

B. Power System Planning Engineer

- i. Minimum of a bachelor's degree in Electrical/Electronic, Instrumentation Engineering or Computer Engineering.
- ii. Proficiency in power system analysis software (e.g PSS/E, NEPLAN, DigSilent Power Factory).
- iii. 10 years minimum experience in power system planning and analysis.

C. Electrical Power System Engineers

- i. Minimum of a bachelor's degree in Electrical/Electronic Engineering with a postgraduate degree in power systems.
- ii. 5-10 years minimum experience in power utilities.

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SCHEDULE II

Scope of Work

NISO shall engage a suitably qualified firm to undertake this assignment. Without prejudice to the method adopted by the firm, the following tasks shall be included

Task 1 - Inception of the Assignment and Preparation

- a. Hold initial consultation meetings with NISO, TSP and their regional managers to discuss the various aspects of transmission system network architecture and operational configuration. The outcome of the engagement is to establish the scope of transmission assets to be audited and the responsibilities of the stakeholders.
- b. Collate and review all transmission network data, grid maps, and Single Line Diagram across the transmission regions required to conduct the assignment. NISO and TSP will facilitate engagement with their respective regions and field operational staff for effective data acquisition.

Task 2 - Project Planning and Implementation

- a. Carry out a desk study, physical inspection, and condition survey of 330kV and 132kV transmission lines, 330/132kV and 132/33kV substation equipment in each transmission region.
- b. Review historical daily operational reports for the last five years to track failed equipment, at-risk assets, equipment lifespan, and examine the existing transmission network model.
- c. Conduct performance tests and review of historical operational records and constraints over the last 5(five) years to validate the derated capacity values of transmission lines and substations.
- d. Evaluate all the transmission assets across the regions based on the date of manufacture, commissioning date and operational capability. The asset evaluation shall be based on the depreciation principles and international best practice.
- e. Obtain the existing transmission network model and update the datasets based on the actual performance ratings, and integration of the parameters of newly commissioned transmission lines and substations.

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- f. Conduct steady-state and dynamics power system analysis based on updated system data to identify violations and implications with respect to infrastructure configuration and deficits.
- g. Review the adequacy of the protection system configuration and zoning based on the updated data and the effectiveness of the existing preventive and corrective maintenance procedures.
- h. Inspect all fire detection and suppression systems, grounding and earthing arrangements, and emergency evacuation protocols across the transmission substations within the regions.
- i. Verify compliance of the network infrastructure with the Operating Codes, technical standards and international best practices to establish non-compliance issues with respect to construction, maintenance, and operational standards.
- j. Assess the functionality of SCADA/EMS and systems telecommunication and recommend improvements to enhance grid monitoring and control.
- k. Evaluate the impact of weather on network components and recommend alternative specifications arising from topology or exigencies of the terrain for optimal operational performance.
- l. The consultant shall systematically identify all the weak sections and hot spots on the transmission network in the selected regions for the assignment

Task 3 - Documentation of Interventions Required for Reinvigoration of the Transmission Network.

- a. Develop a schedule of intervention projects to address network component deterioration, failure, longevity, weak sections, under-capacity due to load growth.
- b. Develop a strategic investment plan for grid modernisation in the medium to long term to facilitate the development of a reliable, robust, and resilient grid.
- c. Develop a plan for project implementation and prioritisation. The plan shall comprise technical specifications/ schedules and preliminary drawings.

Task 4: Meeting Coordination and Progress Report

- a. The consultant shall hold periodic progress meetings and submit a report to the client as may be prescribed in the contract. *NA 7.18.11*

SCHEDULE III

Methodology

- A. NISO shall apply the following steps to conduct a technical audit of the transmission system and network data validation -
- i. Engage a highly reputable consulting firm with the requisite knowledge, experience, and track record of conducting similar assignment in other countries or within Nigeria in the past.
 - ii. The engagement of the consulting firm shall be in accordance with the Bureau of Public Procurement (BPP) established protocols.
 - iii. Develop a comprehensive Request for Proposal (RFP) to achieve the objectives in clause 5 (five) of these guidelines.
- B. The following approach shall be adopted in the project implementation -
- i. A regional approach shall be adopted in conducting the technical audit based on the existing delineation of the transmission network.
 - ii. Records of the installed capacity, historical operational performance, and maintenance shall be obtained through templates or an automated platform.
 - iii. A preliminary gap analysis of 330kV and 132kV transmission lines, 330/132kV and 132/33kV transformers, reactors, and capacitor banks shall be conducted in each region.
 - iv. The Original Equipment Manufacturers ("OEM") equipment manuals, technical specifications, and maintenance requirements shall be used to correlate equipment lifespan and operational counts.
 - v. All field data/information collected shall be properly documented in electronic form and maintained for sighting during regulatory reviews.
 - vi. The following project lot arrangement may be adopted for timely implementation, ease of logistics and equity of scope -

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Lot	Transmission Region	No of 330kV/132kV Substations	No of 132kV/33kV Substations
1	Lagos and Osogbo	17	28
2	Abuja, Benin, Enugu and Port Harcourt	19	51
3	Shiroro, Kaduna, Kano and Bauchi	17	37

- C. The following power system studies shall be performed to establish violations in the existing transmission system arising from infrastructure deficit or poor network configuration and propose remedial actions through intervention projects –
- Power flow study
 - Short circuit analysis
 - Switching analysis
 - Contingency analysis
 - Dynamic simulation
- D. The analysis shall be conducted using Power System Simulation for Engineers (PSS/E) software for steady state and dynamic simulations. All results shall be submitted to NISO and transmitted to the Commission.
- E. Examination of the physical condition and the age of lines and equipment through observations, performance tests and data synthesis. The equipment includes: Transformers; Switchgear (circuit breakers ("CB"), disconnecting switches (isolators), earth switches, Protective devices (protection relays, current transformers ("CT"), voltage transformers ("VT"), and Lightning Arresters, Transmission lines (towers/gantries, conductors, and insulators).
- F. Conduct assessment of the maintenance practices through quantitative and qualitative analysis of historical maintenance records and data covering; preventive, corrective and condition-based maintenance. The analysis shall identify gaps between current practices and OEM-recommended maintenance schedules.
- G. Assessment of the adequacy and compliance with the functional requirements of protection systems specified in the Grid Code and NESIS Regulations through performance testing of protection relays;

circuit breakers; current transformers, voltage transformers and lightning arresters;

H. Relay coordination studies shall be conducted to ensure proper fault clearance and system selectivity.

I. Assessment of the system's grounding and earthing arrangements, including: substation grounding grids, tower footing resistance, and functionality studies on the lightning arrester.

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