



PROSPECTS OF TECHNICAL STANDARDS IN NIGERIA'S ELECTRICITY INDUSTRY

Presented to Nigerian Institute of Electrical and Electronics Engineers (NIEEE)

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□ Introduction

- Prospects of Technical Standards in Nigeria Electricity Supply Industry (NESI), other allied industries and premises.
- □ NEMSA's responsibility for Ensuring compliance to

Technical Standards and Regulations.

□ Facilitation measures taken by NEMSA towards effective

Enforcement of Technical Standards

□ Conclusion





The Nigerian Electricity Management Services Agency (NEMSA) was established by the NEMSA Act, 2015, to carry out the functions of Enforcement of **Technical Standards** and Regulations, Technical Inspection, Testing and Certification of all categories of Electrical Installations, Electricity Meters and instruments etc., to ensure the efficient production and delivery of safe, reliable and sustainable electricity power supply and guarantee safety of lives and property in the Nigerian Electricity Supply Industry (NESI), other allied industries and premises.





Technical Standards are technical requirements, rules and guidelines for planning, designing and executing reliable, safe and stable networks and system to ensure quality and reliability of delivery of power supply to citizenry.

National and International Technical Standards are created using all relevant technical parties/stakeholders for ensuring standardization. These National and International Technical Standards, Regulations and Codes include, but are not limited to:

- Nigerian Industrial Standards (NIS)
- The applicable International Electrotechnical Commission (IEC) standards;
- > The Nigerian Electricity Health and Safety Code,
- The Nigerian Electricity Supply and Installation Standards (NESIS) Regulation,
- > The Nigerian Electricity Smart Metering Regulations,
- > The Grid Code,
- The Distribution Code,
- The Nigeria Metering Code Version 02 (NMC V 02),
- > The Mini-Grid Regulations,
- The Electrical Installations Regulations S.I.5 and Electricity Supply Regulations S.I.6,





CONSEQUENCES OF LACK OF ENFORCEMENT OF TECHNICAL STANDARDS IN NESI AND ALLIED INDUSTRIES

Lack of adherence to Technical Standards and specifications in NESI and allied industries has several consequences, prominent amongst which are the following;

- 1. Rampant use of substandard electrical materials
- 2. Improper planning and execution of electricity projects
- 3. Inadequate safety provisions during construction and subsequent utilization of the network
- 4. Occurrences of electrical accidents, sometimes fatal.





<u>Compliance to Technical Standards would ensure and guarantee the followings;</u>

Technical

- Adherence to industry international best practices
- Stable Network; minimal maintenance
- Improve grid stability
- Safe and reliable Network
- Reduced Electrical accidents and Electrocutions
- Encouraged network expansion

Commercial

- One-time project execution with economic savings; Reduce wastage from repeat or substandard projects
- Reduced aggregate Technical, Commercial and Collection losses
- Certified electricity meters assure billing integrity
- Economic savings from reduced breakdown maintenance
- Improved revenue





BAD ELECTRICAL INSTALLATION



THIS 33KV DOUBLE CIRCUIT FALLS SHORT OF STANDARD CONSTRUCTION PRACTICE AND CANNOT STAND THE TEST OF TIME. THE HIGH TENSION POLE HAS BEEN EXTENDED WITH UN-GALVANIZED CHANNEL (SUBSTANDARD MATERIALS) ALREADY RUSTED, BENT AND WAITING TO COLLAPSE AS INDICATED IN THE PHOTOGRAPH. THIS NETWORK IS DEFECTIVE IN DESIGN AND CONSTRUCTION, AND SHOULD BE DISCOURAGED. SPECIAL POLES OF 40FT (12METERS HIGH) OR 33KV STEEL TOWER, GALVANIZED POLE OF APPROPRIATE HEIGHT SHOULD HAVE BEEN USED FOR THIS TYPE OF CONSTRUCTION TO GUARANTEE THE STABILITY AND DURABILITY OF THE NETWORK AS WELL AS SAFETY OF LIVES AND PROPERTY.





BAD ELECTRICAL INSTALLATION



THE CONSTRUCTION OF THIS 33KV OVERHEAD LINE THAT PASSES UNDER THE RAILWAY TRACK BRIDGE IS A DEATH TRAP. THE BRIDGE WILL BE ENERGIZED WHEN THE 33KV LINE COMES IN CONTACT WITH IT AND IS IMMINENT DUE TO THE PROXIMITY OF THE O-H LINE TO THE BRIDGE. IT ALSO POSES RISK/DANGER TO THE PASSERBY. UNDERGROUND CABLING SHOULD HAVE BEEN USED FOR THE CROSSING





BAD ELECTRICITY METER INSTALLATION



Consequences

- i. Short circuit/bridging of phases by meters accessories is possible
- ii. Wrong Connection/swapping during maintenance
- iii. Difficult to identify meters assigned to individual customers
- iv. Difficult for repairs/ maintenance





- The importance of safety in all we do cannot be overemphasized.
 Therefore, compliance to Technical Standards and specifications reduces the risks of loss of life, loss of revenue and property.
- Safety is impacted by adherence to standards and regulations. Nonadherence to construction standards, whether in buildings or electrical installations, is a sure road to disaster, endangering lives and property.





It aids the elimination of substandard electrical materials and equipment such as transformers. The standard typical transformers in Nigeria are;

Power and Distribution Transformers

- Standard power transformer capacities for (Injection substation) shall be: 2.5 MVA, 5 MVA, 7.5 MVA, 10 MVA, 15 MVA and up to 30 MVA suitable for 33000/11000V at the secondary side of the transformer, at a nominal frequency of 50 Hz; and
- Distribution transformers shall be:

25 KVA, 50 KVA, 100 KVA, 200 KVA, 300 KVA, 500 KVA, 1000 KVA, 1500 KVA and 2500 KVA suitable for 33 kV or 11 kV operations with 400V at secondary side of the transformer, at a nominal frequency of 50 Hz.





TYPICAL EXAMPLES OF TECHNICAL STANDARDS AND SPECIFICATIONS FOR ELECTRICAL MATERIALS AND EQUIPMENT IN OUR DISTRIBUTION NETWORKS





Vector group requirements

Distribution Transformers

| 11/0.400kV | Dyn11 |
|------------|-------|
| 33/0.400kV | Dyn11 |

Power Transformers

33/11kV Dyn1

Basic Insulation Level requirements

| 11kV | BIL 28kV | |
|-------|---------------|--|
| 221/1 | RTI 72/001/1/ | |
| 33kV | BTI 72/90k\ | |





Compliance with the use of minimum 150mm² ACSR conductor for 33KV overhead lines comes with the following advantages;

- Higher mechanical strength that will reduce incidence of sudden detachment/snapping and falling of conductors most often responsible for Electrical accidents, electrocutions and loss of property;
- Higher mechanical tension that allows for a tauter stringing and tension of the overhead line;
- A lower coefficient of thermal expansion of the steel core under current loading and hence less sagging;
- Higher current carrying capacity of 150mm2 conductor that will enable better utilization of available power as against the lower sizes of conductors

Standard Sizes of conductors

| | Approved size mm ² | |
|----------------------|-------------------------------|-------------|
| Type of construction | H.D. Al | ACSR |
| Combined 11kV/LV | 100 and 150 | |
| 11kV | 100 and 150 | 100 and 150 |
| 33kV single circuit | | 150 and 200 |
| 33kV double circuit | | 150 and 200 |





Compliance to Technical Standards ensures that Electric concrete poles used in the NESI are of the right quality/strength that will ensure stability of the network.

Markings:

Each pole bear legible engraved identification marks to be located 3m from the butt, with NEMSA certificate number, date of manufacture and manufacturing company's initials clearly indicated as;

| Concrete pole | Length (m) | Planting depth (m) |
|---------------------|---------------|--------------------------|
| LT | 8.54 | 1.2 |
| HT | 10.36 | 1.8 |
| SP | 12.20 | 2.1 |
| Factor of safety | 2 | .5 |

| Treated wooden pole | Length (m) | Planting depth (m) |
|---------------------------|---------------|-----------------------|
| LT | 8.54 | 1.2 |
| НТ | 10.36 | 1.8 |
| SP | 12.20 | 2.1 |
| Factor of safety | | 3.5 |





It ensures that Electricity meters and Instruments deployed are of right type, class and accuracy for proper accountability of the energy produced, delivered, supplied and utilized as well as safe for use Suppliers/Distributor of electricity meters shall ensure that all electricity meter are tested and certified by NEMSA before deployment for use. The technical requirements and accuracy for the following classes of electricity meters as provided by NMC V 02 and other extant regulations shall be:

- (a) \pm 0.2% for class 0.2 S static watt-hour meters.
- (b) \pm 0.5% for class 0.5 S static watt-hour meters.
- (c) \pm 0.5% for class 0.5 watt-hour meters.
- (d) \pm 1.0% for class 1.0 watt-hour meters.
- (e) \pm 2.0% for class 2.0 watt-hour meters.





- ✤ Generally;
 - Adherence to Technical Standards provides reliable, safe and stable network for safe and sustainable power supply and ensuring adoption of best practices in the industry.
 - Compliance to Technical Standards reduces cost of repeating jobs thereby saving revenue that may be lost due to poor quality jobs.





- Inspection, Testing & certification of electrical installations projects including Generation, Transmission, Distribution and Renewable Energy across the Federation for safety and fitness before connection or put to use
- Monitoring of existing electricity distribution networks to ensure safety and continuous fitness to deliver power to consumers.
- Investigation of reported electrical accidents across the federation to fore-stall future occurrence of similar accident.
- Inspection of electrical concrete pole manufacturing facilities to ensure that the right equipment/materials are used, and the end products conform to standard and regulations before they are deployed for use in NESI.
- Inspection of electrical installations in factories, public places and hazardous locations to ensure safety of the public/ personnel working in such environment.
- **Certification of electrical contractors** to ensure only competent personnel are engaged in the construction and electrical installations in NESI and other allied industries/workplace/premises.
- The data collated through these activities are analyzed and the Data from the analysis are used for the safety ranking of power sector operators, Electricity Information Management System (EIMS) as well as for power sector policy making/updates.





- Published Nigerian Electrical Installations and Construction Guidelines Manual for the Distribution Subsector. The manual aims to achieved standardization and unification of the distribution networks and systems.
- Enforcement notice on: Approved Vector Groups for Power and Distribution Transformers.
- Enforcement of the use of minimum 150mm² ACSR conductor for 33KV overhead lines.
- Enforcement of the banning of the use of untreated wooden poles and wooden cross-arms in the distribution networks.
- Enforcement notice on the banning of the use of substandard electrical materials/equipment in the distribution network such as ungalvanized channel/angle iron, tie-straps, undersized conductor/cables, under rated feeder pillar (e.g use of 400/600A feeder pillar for 500KVA transformers instead of 800A, use of 300/400A feeder for 300KVA transformer instead of 600A) etc.





- Restriction of the use of 33kV primary feeder lines for distribution and point loads transformers.
- Notice of enforcement of strict compliance with specified 400 volts and 230 volts low voltage ratings for electrical materials, equipment, appliances, fittings, etc. to be deployed/used in Nigeria in line with specifications of extant regulations.
- Enforcement notice on banning the engagement/use of uncertified electrical installation contractors for the execution of electrical installations and electricity power projects and processing application for electricity supply to consumers' premises (form 74) by the electricity distribution companies





NEMSA collaborate with Standards Organization of Nigeria (SON) to check the influx of fake and substandard electrical materials and equipment entering the country. Through the inspectorate activities of NEMSA, these sub-standard Electrical materials and equipment are identified and removed from the system and SON alerted for necessary action.

Thank You for listening



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