



SIMPLIFIED LEGAL *And* REGULATORY GUIDE:

**Nigerian Electricity Regulatory Commission
(NERC) Nigerian Electricity Smart Metering
Regulation, 2015**





CONTENTS

[Overview](#)

[Enabling Law](#)

[Objective\(s\)](#)

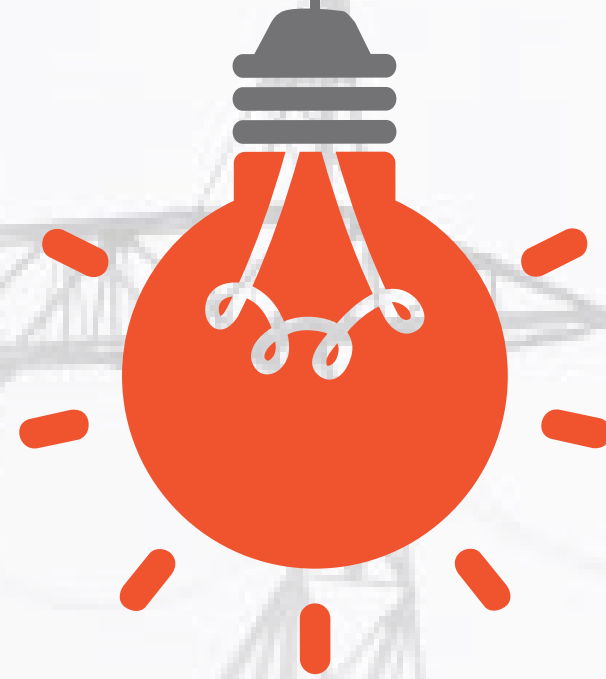
[Key Provisions](#)

[Key Stakeholders](#)

[Pricing and Tariffs](#)

[Incentives and Investment Opportunities](#)

[Sanctions and Penalties](#)



OVERVIEW

**Nigerian Electricity Regulatory Commission
(NERC) Nigerian Electricity Smart Metering
Regulation, 2015**

OVERVIEW



The Nigerian Electricity Smart Metering Regulation was promulgated in 2015 to provide guidelines for the physical, functional, interface, and data requirements for smart metering operations in the electricity industry. The Regulation has eight (8) sections and thirty-six (36) pages. The Regulation notably applies to all licensees in the electricity supply industry who wish to engage in smart metering and should be read in conjunction with the Nigeria Electricity Metering Code Version 02 (as amended).¹ The Glossary of Terms used in the Regulation and referenced in this guide can be found in the main Regulation² and in our [Glossary of Industry Terms](#).



The Electric Power Sector Reform Act (EPSRA)³, 2005 which gives the Nigerian Electricity Regulatory Commission (NERC) powers to develop Standards and make Regulations serves as the legal backing for the promulgation of the Smart Metering Regulation.⁴
[Please refer to EL's guide on the Electricity Act.](#)



OBJECTIVE

Nigerian Electricity Regulatory Commission
(NERC) Nigerian Electricity Smart Metering
Regulation, 2015

OBJECTIVE



<p>The objectives behind the promulgation of the Smart Metering Regulations include:</p>	<ul style="list-style-type: none">• The establishment of directives setting out the minimum physical, functional, interface, and data requirements for smart metering operations in the electricity industry.
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KEY PROVISIONS

**Nigerian Electricity Regulatory Commission
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KEY PROVISIONS



Physical Requirements

Smart Metering Systems are required to be mains powered, operate at a nominal voltage of 230VAC, and consume no more than an average of 4 Watts under normal operating conditions.⁵ Smart Metering Systems are also required to have the capacity to resume operation after a power failure.⁶ Each device forming part of the Smart Metering System will also be required to:⁷

- Display the Device Identifier; and
- Possess a Secure Perimeter.

Both the Home Area Network (HAN) and Wide Area Network (WAN) Interface of a Smart Metering System must be capable of being replaced without also requiring the replacement of the Electricity Meter; and support communications based on Open Standards.⁸

Smart Metering Systems are expected to contain the following minimum physical components:⁹

- A Clock.
- Data Store.
- Electricity Meter.
- Home Area Network (HAN) Interface.
- Wide Area Network (WAN) Interface.
- Load Switch.
- User Interface.
- Back-up battery

Functional Requirements

The Regulation provides that the Clock forming part of the smart metering system must be capable of operating within 10 seconds of Coordinated Universal Time (UTC) +1 at all times.¹⁰ Also, smart metering systems should be capable of establishing communication links through any of its interfaces i.e. either HAN or WAN interface; and ensure that such communication links meet the security requirements established in the Regulation.¹¹ The metering system should also be able to work properly with commands coming through such communication links.



Furthermore, in the establishment of communication links through HAN interfaces, a smart metering system will require technical assistance from at least one microgeneration meter¹² while in establishing communication links through WAN interfaces, Head End Systems (HES) will be required.¹³ Smart Metering Systems are also required to possess the capacity needed to retain all information held in its Data Store when in operation and during loss of power;¹⁴ and be able to display currency units in Naira.¹⁵

Smart Metering Systems regarding display of information, are required to be capable of showcasing up-to-date information on the following:¹⁶

- Payment mode in operation.
- Tariff Register Matrix and Tariff Block Counter Matrix.
- Credit balance.
- Availability of Emergency Credit for activation and upon activation, Emergency Credit balance.
- The suspension of disablement of supply by the Smart Metering System.
- Existing low credit conditions.
- Supply status.
- Existing Time-based Debts or Time-based Debts Recovery rates.
- Existing Payment-based Debts.
- Existing accumulated debts; and
- Existing Fixed Charges

Also, smart metering systems are required to be capable of determining when the Active Power Import exceeds, for a period of thirty seconds or more, the Load Limit Power Threshold;¹⁷ be capable of operating in Credit Mode and Prepayment Mode and of being remotely switched from one mode to the other with the consent of the consumer;¹⁸ be capable of adding credit to or reducing credit from the Credit Balance;¹⁹ be capable of monitoring the Credit Balance



and the activated Emergency Credit Balance;²⁰ and be capable of controlling recovery of debt in certain cases, etc.²¹ The system should be capable of applying all allowable tariff classes like Time-of-use Pricing and Time-of-Use with Block Pricing as configured by the Tariff Type.²²

Smart Metering Systems are also required to be capable of recording necessary data such as billing data; data in the Tariff Time-of-Use Register Matrix, the Tariff Block Counter Matrix and the Total Active Import Register; half hour profile data; Power threshold status; Total Active Energy imported and exported; and Total Reactive Energy imported and exported.²³

A Smart Metering System must be designed in a manner aimed at preventing any failure or compromise of its Integrity capable of compromising the Security Credentials or Personal Data stored on it or compromising the Integrity of any other Device to which it is connected by means of a Communications Link.²⁴ Smart Metering Systems are also expected to have the ability of detecting any unauthorized physical access to its data;²⁵ a requirement which also applies to data contained within its interfaces or communication links.²⁶

The 'Integrity' stated beforehand relates to the following data:²⁷

- Personal Data.
- Security Credentials.
- Random Number Generator.
- Cryptographic Algorithms.
- The Electricity Meter; and
- Firmware and data essential for ensuring its Integrity, held or executing on the SMS.

Interface Requirements

The Regulation provides that Smart Metering Systems must be able to provide the following information upon the establishment of a communication link with a consumer device:²⁸

- Credit Balance.
- Date and time of the last update of the Credit Balance.
- Clock time in UTC+1.
- Total Active Import Register.
- Tariff TOU Register Matrix and Tariff Block Counter Matrix.



- Tariff Switching Table.
- Daily Read Log.
- Emergency Credit Balance.
- Whether or not Emergency Credit is activated.
- Tariff TOU Price Matrix and Tariff Block Price Matrix with an indication of the active Tariff Price.
- Time-based Debts from the Time Debt Registers.
- Time-based Debt Recovery rates from the Debt Recovery Rates.
- Payment-based Debt from the Payment Debt Register.
- Accumulated debt from the Accumulated Debt Register.
- Low Medium Power Threshold and Medium High-Power Threshold.
- Instantaneous Active Power measurement.
- Low Credit Threshold.
- Profile Data Log; and
- Payment Mode.

There are also certain interface requirements expected of smart metering systems upon establishment of a communications link with a Microgeneration meter; which include:²⁹

- The ability to receive requests for information from the Head End Systems via its WAN interface and forward such information to the Microgeneration meter through its HAN interface; and
- Sending information received from the Microgeneration meter through its HAN interface and forwarding such information to the Head End System through its WAN interface

Smart Metering Systems are also required to be able to execute certain commands coming from its user interface which include commands on the activation of emergency credit, addition of credit to the Smart Metering System, and enabling supply if the Load Switch is armed.³⁰

With regard to the WAN interface, the Smart Metering System must be able to execute certain commands coming from this interface which include commands on the activation of emergency credit and addition of credit to the metering system (when the meter is operating in prepayment mode), application of adjustments to the Time Debt Registers and



Credit balance, arming the Load Switch, clearing all entries from the event log, disabling and enabling supply without need for local physical interaction; reading configuration, constant, and operational data; resetting Load Limit Counter to zero, resetting average Root Mean Square (RMS) over and under Voltage Counter, restricting data, synchronizing the Clock with UTC+1 over its WAN Interface, updating its Firmware, updating security credentials, and recording configuration data.³¹

Data Requirements

There is a spectrum of minimum information which a Smart Metering System is expected to be capable of holding in its Data Store. These include Constant data, data serving as device identifiers, data on the operational version of the Firmware of the metering system, Configuration data, average Root Mean Square over and under Voltage Threshold, average Root Mean Square Voltage Measurement Period, data forming a billing calendar, debt recovery rates per payment, debt recovery rates in currency units per unit time, maximum amount of debt recovery rates in currency units per unit time, the threshold in Currency Units for controlling when to Disable the Supply, emergency credit limit and threshold in Currency Units, Load Limit Power

thresholds and Supply State, Low credit threshold, Low medium power threshold, Medium High Power Threshold, Non-Disablement Calendar, Payment Mode (either pre-payment mode or credit mode), Root Mean Square Extreme over and under Voltage Measurement Period, Root Mean Square (RMS) Extreme over and under Voltage thresholds, RMS Voltage Sag Measurement Period and threshold, RMS Voltage Swell Measurement Period and threshold, Fixed Charge, Supply Tamper State, Suspend Debt Disabled, Suspend Debt Emergency, Tariff Block Price Matrix, Tariff Switching Table Tariff Threshold Matrix, Tariff TOU Price Matrix, and tariff type in operation, etc.

In Home Display (IHD)

An IHD is required by virtue of the Regulations to possess the following physical features: a data store, a HAN Interface, and a User Interface.³² Also, an IHD should be mains powered and capable of operating at a nominal voltage of 230VAC, whilst consuming no more than an average of 0.6 Watts of electricity under normal operation. Furthermore, the IHD in question must be designed to enable the information displayed on it to be easily accessed and presented in a form that is clear and easy to understand, including by persons or consumers with specified disabilities.³³



Smart Metering System Standards

The Regulation provides that metering systems must have the capacity to serve as multi-source meters.³⁴ Furthermore, the metering system must possess the following conditions to be suitable for operation:³⁵

- Operating range voltage input: 230 V \pm 15%.
- Basic current (maximum current): 5A (100A).
- Reference frequency: 50 Hz \pm 5%.
- Operating temperature: -40°C to +70°C; and
- Average relative humidity: Up to 95%, non-condensing.

Meters must also be equipped with batteries to maintain minimal time during minimal function, consume no more than 2 Watts on average during normal operation, and be integrated with in-built communication modem(s) for all its communication links established through its interfaces.³⁶

Other requirements include: metering systems must be installed in existing meter locations at consumer premises, its components must support local access and configuration by authorized personnel, must be installed and maintained in a manner that protects public safety, and must be protected from physical tampering or interference, etc.³⁷

Ownership of Smart Metering Systems

Ownership of Smart Metering Systems rests with the Nigerian Electricity Market at the Grid level and must be in accordance with the Nigeria Metering Code.³⁸ Specifically, the Independent System Operator will own, fund, and manage the Smart Metering System which covers the networks up to the Transmission Service Provider (TSP)/DisCo trading points while the DisCos will own, fund and manage the Smart Metering System from the TSP/DisCo trading points to the consumer In-Home Display interface.³⁹

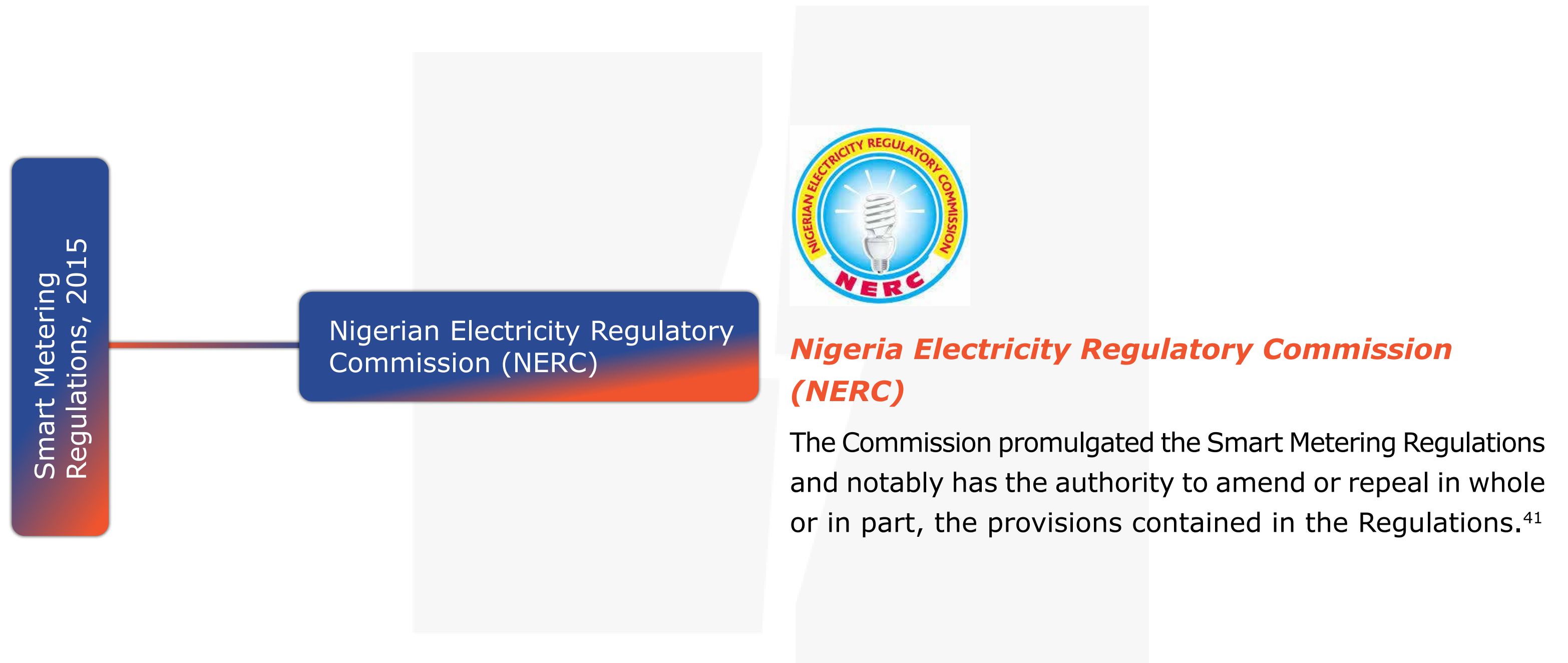
The Regulations also provides standards established by the International Electrotechnical Commission (IEC) as requirements for smart metering systems.⁴⁰



KEY STAKEHOLDERS

Nigerian Electricity Regulatory Commission
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KEY STAKEHOLDERS



The background of the slide features a faint, dark silhouette of a high-voltage power transmission tower, also known as a pylon, which is a lattice structure. It is positioned centrally and extends from the bottom towards the top of the frame, serving as a thematic backdrop for the text.

PRICING **AND TARIFFS**

**Nigerian Electricity Regulatory Commission
(NERC) Regulation on Procedure for
Electricity Tariff Review, 2014**

PRICING AND TARIFFS

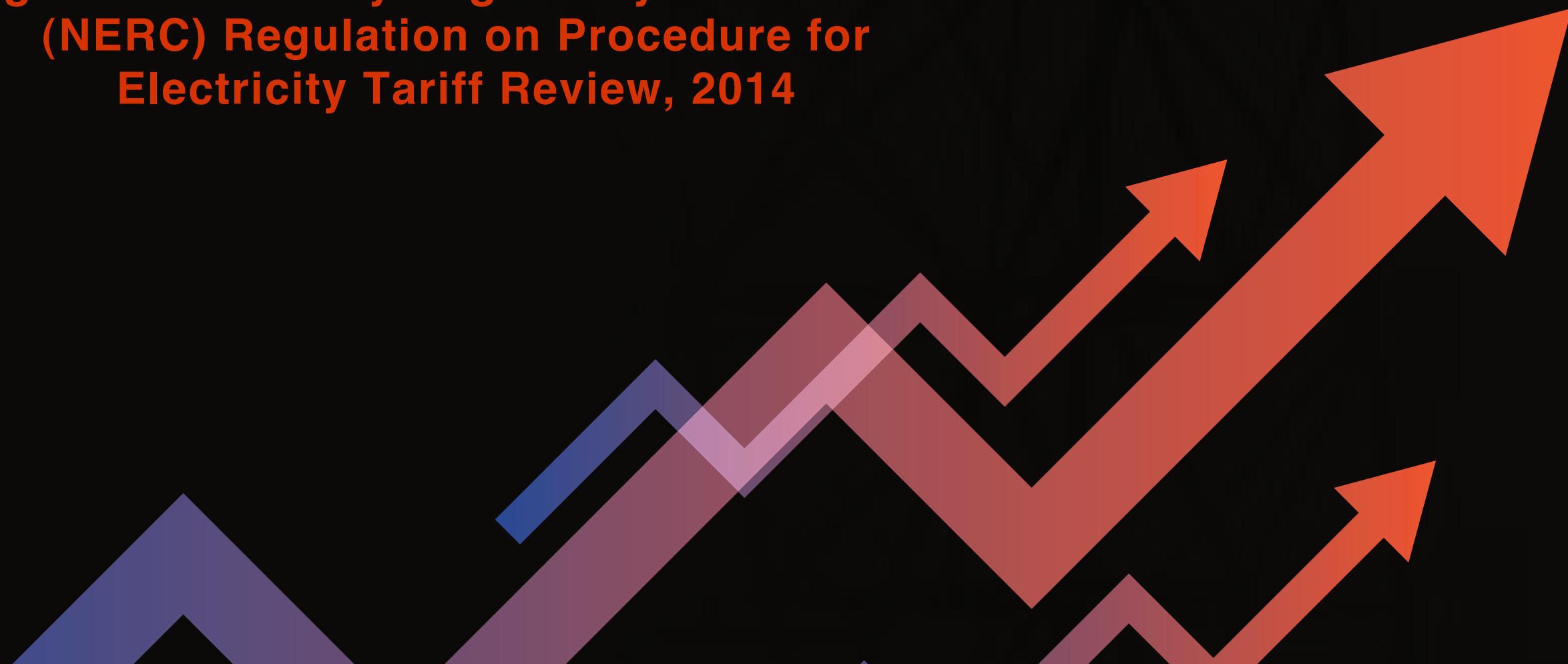


The Regulation provides that Smart Metering Systems must be capable of applying all allowable tariff classes like Time-of-Use Pricing and Time-of-Use with Block Pricing, as configured by 'Tariff Type'.⁴²

Also, as part of the execution of commands arising from its WAN Interface, Smart Metering Systems are expected to properly implement commands to set the payment mode as either Prepayment Mode or Credit Mode and to record the mode of operation in Payment Mode.⁴³ The system must also be able to execute commands to accept new values for Tariff Type, Tariff TOU Price Matrix, Tariff Block Price Matrix, Tariff Switching Table, and Tariff Threshold Matrix.⁴⁴

INCENTIVES AND INVESTMENT OPPORTUNITIES

Nigerian Electricity Regulatory Commission
(NERC) Regulation on Procedure for
Electricity Tariff Review, 2014



INCENTIVES AND INVESTMENT OPPORTUNITIES



The subject matter of the Smart Metering Regulation – Smart Metering Systems – serves as an opportunity for investment in the Nigerian Electricity Supply Industry (NESI). The NESI has in recent times, popularized the use of smart meters in billing consumers, thus opening a way for meter producers and manufacturers to participate in the power sector.



SANCTIONS AND PENALTIES

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SANCTIONS AND PENALTIES



The Regulation does not provide any specific sanctions and penalties for defaulters of its provisions. Such sanctions and penalties can however be found within the Nigeria Electricity Metering Code (Version 02) referenced in the Regulations.

Referenced Statutory Instruments

- Electric Power Sector Reform Act, 2005; and
- Nigeria Electricity Metering Code, 2013

Endnotes

1 Section 1.4 & 2.7 NERC, Metering Code. Available at <https://nerc.gov.ng/index.php/library/documents/Codes-Standards-and-Manuals/Metering-Code/>

2 NERC, Nigerian Electricity Smart Metering Regulation. Available at <https://nerc.gov.ng/index.php/component/remository/Regulations/Nigerian-Electricity-Smart-Metering-Regulation/?Itemid=591>

3 NERC, Electric Power Sector Reform Act (EPSR), 2005. Available at [https://nerc.gov.ng/index.php/component/remository/Regulations/Electric-Power-Sector-Reform-Act-\(EPSR\)-2005/?Itemid=591](https://nerc.gov.ng/index.php/component/remository/Regulations/Electric-Power-Sector-Reform-Act-(EPSR)-2005/?Itemid=591)

4 Section 81 & 96(1), EPSRA

5 Section 2.2

6 Section 2.3

7 Section 2.4

8 Section 2.5 & 2.6

9 Section 2.1

10 Section 3.1

11 Section 3.2

12 Section 3.2.5

13 Section 3.2.6

14 Section 3.3

15 Section 3.4.2

16 Section 3.4.1

17 Section 3.5

18 Section 3.6

19 Section 3.6.2.2

20 Ibid

21 Ibid

22 Section 3.7

23 Section 3.8

24 Section 3.8

25 Section 3.9.2.2

26 Section 3.9.3

27 Section 3.9.2

28 Section 4.1

29 Section 4.2

30 Section 4.3

31 Section 4.4

32 Section 6.2

33 Ibid

34 Section 7.1.2

35 Section 7.1.6

36 Sections 7.1.7, 7.1.8, 7.1.9

37 Section 7.2

38 Section 7.3

39 Ibid

40 Section 7.1.3

41 Section 8

42 Section 3.7

43 Section 4.4.22

44 Section 4.4.23

45 Section 16(3)

DISCLAIMER

This document titled the “Simplified Legal and Regulatory Guide” of the referenced country is not expected to form the basis of, or be construed as standard legal advice; nor should any of its contents and representations be strictly relied upon for any activities. Electricity Lawyer (EL) will not be liable for decisions whatsoever that are made based on the contents of the document.

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