# STATUTORY INSTRUMENT

Supplement to the Sierra Leone Extraordinary Gazette Vol. CXLX, No. 91
dated 13th day of December, 2019

# ELECTRICITY QUALITY OF SUPPLY REGULATIONS, 2019

## ARRANGEMENT OF RULES

**STATUTORY INSTRUMENT NO. 14 OF 2019**

*Published 13th day of December, 2019*

# SIERRA LEONE ELECTRICITY AND WATER REGULATORY COMMISSION ACT, 2011 (ACT NO. 13 OF 2011)

ELECTRICITY QUALITY OF SUPPLY REGULATIONS, 2019 **Short title**

In exercise of the powers conferred upon it by section 66 of the Sierra Leone Electricity and Water Regulatory Commission Act, 2011, the Commission makes the following Regulations –

## PART I – PRELIMINARY

**1.** In these Regulations, unless the context otherwise requires – **Interpretation**

"Act" means the Sierra Leone Electricity and Water Regulatory Commission Act, 2011;

"affiliate" in relation to the licensee means any holding company of the licensee or any subsidiary of the licensee or any subsidiary of a holding company of the licensee, in each case within the meaning of the Companies Act, of 2009;

"high voltage" means a voltage between 69 kV and 230 kV;

"holding company" means a holding company within the meaning of the Companies Act, of 2009;

"key performance indicators" or "KPIs" mean a set of measurements and calculations, delineated in these Regulations, which describe or characterise the state of the generation, transmission

and distribution network, the quality of service rendered by a licensee and the continuity of service;

"licensee" means a person licenced by the Commission to undertake the generation, transmission and distribution of electricity;

"licensee's distribution and supply system" means all electric lines of the licensee within the licensee's authorised area, except lines forming part of the transmission system and the distribution system of other distribution licensee's and any other electric lines which the licensee may, with the approval of the Commission, specify as being part of the licensee's distribution system, and includes any electric plant, meters, transformers and switchgear of the licensee and which is used for conveying electricity to premises;

"low voltage" means a voltage up to 1 kV;

"medium voltage" means a voltage between 1 kV and 69 kV;

"person" means an individual, a company, partnership or any association of individuals, whether incorporated or not;

"relevant asset" means any asset for the time being forming part of the licensee's generation and/or transmission system and any legal or beneficial interest in land upon which any of the foregoing is situated;

"technical and operational codes" mean the codes governing the technical operations of utilities including the electricity distribution supply code, the grid code, the metering code and any

other technical codes as approved by the Commission; and

"transmission system" means the system which is owned and operated by the transmission licensee and which consists, wholly or mainly, of high voltage electric lines and electric plant and which is used for conveying electricity from a generation plant to another or from one substation to another, including all high voltage electric lines which are used to convey electricity to the premises of bulk supply consumers, but shall not include any such lines which form part of any distribution system.

**Application**

**2.** (1) These Regulations shall apply to electricity generation, transmission and distribution licensees.

(2) Where there is a conflict between these Regulations and any other statutory instrument made under the Act, these regulations shall prevail.

**Minimum service standards**

**3.** (1) A licensee shall meet the following –

(a) the required standards of performance outlined in the licence; and

(b) the minimum standards prescribed in these regulations or any other regulations made under the Act

(2) The minimum service standards shall specify the licensees' commitments to consumers and other licensees and consumers with respect to –

(a) reliability of supply; and

(b) quality of supply.

## PART II – SERVICE PROVIDERS

**Service providers**

**4.** A licensee shall submit documents containing the following information to the Commission for its approval –

(a) the terms and conditions for the connection between installations of the licensee and those of other licensees and consumers;

(b) the terms of business relations with other licensees;

(c) the required service standards.

**Performance indicators**

**5.** (1) A licensee shall keep and maintain a record of measurements and calculations necessary and sufficient to characterize the key performance indicators set out in Schedules 1, 2 and 3, in such form as the Commission may from time to time prescribe.

(2) The Commission may, from time to time set targets for the achievement of key performance indicators by a licensee as well as incentives or penalties for achieving or failing to achieve such targets.

**Emergency response plans**

**6.** (1) A licensee shall submit to the Commission a draft emergency supply plan for its approval.

(2) Where the Commission does not approve the draft the licensee shall revise and re-submit the draft again for approval.

(3) A licensee shall submit an approved emergency supply plan to the Commission at least every three years.

**Reliability of supply**

**7.** (1) A licensee shall make all reasonable efforts to provide continuous supply of electricity to meet demands and prevent interruption of its services to consumers and other licensees.

(2) When an interruption occurs, the licensee shall seek to re-establish service within the shortest possible time.

(3) Where a licensee is to interrupt the supply of electricity to a consumer's premises in order to undertake planned maintenance to its equipment, the licensee shall notify the consumer of such interruption at least three days before the day of the planned interruption.

(4) A licensee may interrupt electricity supply to a locality or consumers for the purpose of carrying out planned maintenance, including repair and installation of new equipment provided that the licensee

(a) submits the annual maintenance plan to the Commission for approval;

(b) distributes the approved plan to other licensees users of its service;

(c) abides by the approved maintenance plan;

(d) in the event of an emergency inform its consumers and other licensees of planned interruption which shall include the following –

(i) the time that the interruption will occur or is planned to occur;

(ii) the area that will be affected;

(iii) the reason for the planned interruption; and

(iv) the time at which it is anticipated that the supply will be restored.

(5) In the event of an unplanned interruption, the licensee shall use an appropriate medium to inform its consumers of –

(a) the reason for the unplanned interruption; and

(b) the likely duration of the restoration of the service.

(6) In the case of an emergency, the licensee shall –

(a) take appropriate measures to rectify the situation; and

(b) issue instructions to its employees covering procedures to be followed in accordance with its Emergency Response Plan.

(7) Where shortages occur due to causes beyond the immediate control of a Licensee, the licensee shall prepare a load shedding plan under which it shall fairly share available electricity to all consumers.

(8) In planning its load shedding plan under regulation (7), the licensee shall take account of any special needs and grant preference to those services that are the most essential to the public welfare.

**Records of planned and unplanned interruptions**

**8.** (1) Except for momentary interruptions lasting not more than 5 minutes and which do not cause a major disruption of service, each licensee shall keep a complete record of all planned and unplanned interruptions.

(2) The record referred to under sub-regulation (1) shall where applicable contain the following –

(a) the cause of interruption;

(b) the date and duration of the interruption;

(c) the approximate number of consumers affected;

(d) the remedy and steps taken to prevent recurrence in cases of emergency interruptions; and

(e) any other information that the Commission may require.

## PART III – QUARTERLY REPORTS AND OTHER RELATED PROVISIONS

**Quarterly reports**

**9.** A licensee shall submit quarterly reports to the Commission which shall contain the records referred to in regulation 10 and any other information that the Commission may require.

**Use of indices**

**10.** The Commission shall use the industry's indices set out in Schedule 3 to measure the extent of interruptions of supply of electricity.

**Quality of supply**

**11.** (1) For synchronization purposes, a generation licensee shall of ensure that the generating units are designed to provide continuous operation when the frequency changes from 50 Hz +3% to 50 Hz –5% or between 47.50 Hz and 51.50 Hz.

(2) The Commission shall determine compliance by requesting the Transmission System Operator to submit periodic records of the number, magnitude and duration of frequency excursion events.

(3) A licensee shall maintain the voltage of the power delivered to consumers and other licensees within the following voltage band of reasonableness –

(a) all voltages plus or minus a 10% deviation from 240 volts, at all points in the network for a distribution licensee;

(b) all voltages plus or minus a 10% deviation from the rated voltage of the transmission line; this shall apply to lines rated higher than 69KV for a transmission licensee.

(4) To ensure that sub-regulation (3) is complied with, the Commission may request information on the number, magnitude and duration of voltage excursions from the transmission system operator and his information shall relate specifically to the number of transformer stations where the voltage level exceeded the allowable range.

(5) A licensee shall maintain the frequency of power delivered within the prescribed frequency as follows-

(a) all frequencies plus or minus a 1% deviation from 50 hertz as measured at the meter, at all points in the network for a distribution licensee;

(b) all frequencies plus or minus a 1% deviation from 50 hertz as measured at the meter, at all points in the network for a transmission licensee.

(6) The Commission shall monitor the quality of supply delivered by the distribution licensee with respect to the security of the system and effectiveness of the maintenance practices employed by the licensee and shall focus on reducing the nuisance associated with the frequency of outages as well as the duration of the outages.

(7) A licensee shall where relevant comply with –

(a) standards on voltage sags, voltage dips, voltage swells, voltage imbalance, harmonics, flickers;

(b) other power quality disturbances; and

(c) the compatibility levels of the power quality disturbances as set out in Schedule 4.

**Record of major interruptions**

**12.** (1) A licensee shall keep a complete record of -

(a) all major interruptions, indicating the following

(i) the cause;

(ii) the date ;

(iii) time;

(iv) duration;

(v) number of consumers affected;

(vi) the remedial steps taken; and

(vii) steps taken to prevent recurrence.

(b) all voltage and frequency deviations exceeding the band of reasonableness, indicating the following –

(i) the date;

(ii) the time;

(iii) number of consumers affected.

(2) For the purpose of paragraph (a) of sub-regulation (1) major interruption means an interruption affecting the entire system or any of its major divisions that last more than 15 minutes.

(3) For the purpose of paragraph (b) of sub-regulation (i) band of reasonableness means a range of voltage and frequency that constitutes acceptable power quality.

**Measuring voltage and frequency**

**13.** (1) A licensee shall measure the voltage and frequency at a statistically valid and representative sample of end points on the network monthly to provide a characterization of levels for each circuit under various levels of demand.

(2) A licensee shall keep a complete record of the measurements referred to in sub-regulation (1) and shall submit a copy of the record to the Commission on a quarterly basis or at any time stipulated by the Commission.

**Calculating performance indicators**

**14.** The data required to calculate and verify the key performance indicators shall be as follows –

(a) key performance indicators for generation shall be as set out in Schedule 1;

(b) key performance indicators for transmission shall be as set out in Schedule 2;

(c) key performance indicators for distribution shall be as set out in Schedule 3.

**Annual report**

**15.** A licensee shall submit to the Commission an annual report containing the following information –

(a) the aggregate version of the major interruption and voltage and frequency deviations records referred to under regulation 12;

(b) the measurement of each key performance indicator referred to under regulation 14;

(c) any other information required by the Commission.

**Reporting guidelines**

**16.** A licensee shall submit a report to the Commission on the quality of supply in the form as set out in Schedule 5.

**Confidentiality**

**17.** A Licensee to whom confidential information is provided shall –

(a) not divulge or give access to that confidential information to any person except as permitted or obliged under these regulations or any other law; and

(b) only use or reproduce the confidential information the purposes for which it was provided under these regulations or any other law, or for a purpose consented to by the person making the disclosure.

# SCHEDULE 1

## Regulations 7(1), 16(c)

## Key Performance Indicators – Generation

The Commission has approved the following Key Performance Indicators for the generation of electrical power and the utilities involved in the generation of electrical power. The Key Performance Indicators are measured on a quarterly basis and reported by each generation utility.

Table 1: Summary of Key Performance Indicators for Generation

| **Generation KPI** | | **Unit** | **Level** | **Frequency** |
|---|---|---|---|---|
| G1 | Station Reliability Index (SRI) | % | Per Administrative Region and per Technology | Annual |
| G2 | Station Availability Index (SAI) | % | Per Administrative Region and per Technology | |

**G1. Station Reliability Index (SRI)**

The Station Reliability Index (SRI) tracks the reliability of each power plant. This should normally range between 0% and 100%. The occurrence of negative values will indicate that the power plant under consideration has more redundant generators than operational ones.

$$SRI = \frac{UA \times HA}{UU \times HU}$$

where:

- UA is Units Available;
- HA is reporting period (hours);
- UU is units not available; and
- HU is down time of unavailable units (hours).

**G2. Station Availability Index (SAI)**

The Station Availability Index (SAI) monitors operation based on the plant availability as follows:

$$SAI = \frac{H \times AC}{K \times 8760\ Hours}$$

where:

- H = Number of Hours of Annual Availability
- AC = Available Capacity (MW)
- K = Total Installed Capacity in MW.

## SCHEDULE 2

**Regulations 7(1), 16(b)**

# Key Performance Indicators – Transmission

The Commission has approved the following Key Performance Indicators for the transmission of electrical power and the utilities involved in the transmission of electrical power. The Key Performance Indicators are measured on an annual basis and reported by each transmission utility.

Table 2: Summary of Key Performance Indicators for Transmission

| **Transmission KPI** | | **Unit** | **Level** | **Frequency** |
|---|---|---|---|---|
| T1 | SAIDI-T | Minutes/year | Voltage level: ≥69kV, <69kV<br>Type: Planned, Unplanned, Generation, Force Majeure | Annual |
| T2 | SAIFI-T | Interruptions/year | | |
| T3 | MAIFI-T | Interruptions/year | | |
| T4 | Outages per 100km | Outages/year/100km | | |
| T5 | Voltage Dips | Number per year | Total; Affecting load | |
| T6 | Frequency Dips | Number per year | | |
| T7 | Transmission Losses | % | System | |
| T8 | Energy Not Served | MW | System | |
| T9 | AIT | Minutes/year | System | |
| T10 | AIF | Interruptions/year | System | |
| T11 | SR Duration | Minutes/year | System | |
| T12 | SR Frequency | Interruptions/year | System | |

**T1. System Average Interruption Duration Index, Transmission (SAIDI-T)**

The System Average Interruption Duration Index is a measure of the duration of supply interruptions affecting Consumers during a given time period. SAIDI is measured in units of time, often minutes or hours, measured over the course of a year.

$$SAIDI = \sum_i \frac{(f_i \times t_i)}{F}$$

Where:

- f is the number of Consumers affected by the interruption (i), at all voltage levels;
- t is the duration of the interruption in minutes; and
- F is the average number of Consumers connected to transmission at the time of the interruption.

**T2. System Average Interruption Frequency Index, Transmission (SAIFI-T)**

The System Average Interruption Frequency Index is a measure of the average number of supply interruptions per Consumer during a given year. SAIFI is measured in units of interruptions per Consumer, measured over the course of a year.

$$SAIFI = \sum_i \frac{f_i}{F}$$

Where:

- f is the number of Consumers affected by the interruption at all voltage levels; and
- F is the average number of Consumers connected to transmission at the time of the interruption.

**T3. Momentary Average Interruption Frequency Index (MAIFI-T)**

The Momentary Average Interruption Frequency Index is the average number of momentary interruptions that a Consumer would experience during a given period (typically a year). Electric power utilities may define momentary interruptions differently, with some considering a momentary interruption to be an outage of less than one minute in duration while others may consider a momentary interruption to be an outage of less than five minutes in duration.

$$MAIFI = \frac{NI}{N_T}$$

Where:

- NI is the total number of Consumer interruptions less than the defined time; and
- $N_T$ is the total number of Consumers served.

**T4. Outages per 100 km**

Outages per 100 km is the average number of outages per 100 km of transmission line.

$$Outages\ per\ 100km = \frac{N_i}{\left(\frac{L_T}{100}\right)}$$

Where:

- $N_i$ is the total number of outages in the transmission network; and
- $L_T$ is the total length, in km, of the transmission network.

**T5. Voltage Dips**

Voltage Dips is a measure of the deviation of voltage from the normal expected range (in normal condition, voltage in a transmission line may fluctuate ± 5%). Voltage Dips measures the number of times that the transmission voltage exceeds the permissible limits for a period exceeding 30 minutes.

$$Voltage\ Dips = \sum_i V_i$$

Where:

- $V_i$ is a voltage dip incident exceeding 30 minutes.

**T6. Frequency Dips**

Frequency Dips is a measure of the deviation of frequency from the normal expected range (in normal condition, frequency in the transmission line may fluctuate ± 1%). Frequency Dips measures the number of times that the transmission frequency exceeds the permissible limits for a period exceeding five minutes.

$$Frequency\ Dips = \sum_i f_i$$

Where:

- $V_i$ is a voltage dip incident exceeding five minutes.

**T7. Transmission Losses**

Transmission losses are technical losses as a percentage of energy received. Technical losses on the transmission network represent the difference between the total electricity received from the generation plants and the total energy supplied to all transmission Consumers. Transmission losses are measured as a percentage, measured over the course of a year.

$$Transmission\ Losses\ (\%) = \frac{E_T - E_D}{E_T}$$

Where:

- $E_T$ is the electricity supplied from generators to the delivery point of the transmission company; and
- $E_D$ is the total electricity supplied by the transmission company to the connection points of distributors and major consumers.

**T8. Energy Not Supplied (ENS)**

Energy Not Supplied (ENS) is the total amount of energy that would have been supplied to the interrupted Consumers if there would not have been any interruptions.

$$ENS = \sum_{i=1}^{n} P_i \times T$$

Where:

- $P_i$ is the MW lost in the $i^{th}$ circuit connected to the incoming circuit breaker of the relevant substation;
- n is the total number of reported circuits; and
- T is the duration in hours.

If T is less than or equal to 1, then $P_i$ will be equal to the MW delivered at the time of the initiation of the outage. If T is greater than 1, then for every additional hour, $P_i$ will be equal to the average MW (to be taken on a half-hourly basis) recorded during the corresponding hour of the same day of the preceding week immediately prior to the outage. For any fraction of an hour, $P_i$ will be equal to MW recorded at the start of the corresponding hour.

**T9. Average Interruption Time (AIT)**

Average Interruption Time (AIT) is a measure for the amount of time that the supply is interrupted.

$$AIT = \frac{60 \times ENS}{P_T}$$

Where:

- ENS is total energy not supplied for the time period; and
- $P_T$ is the average power supplied by the total system for the reporting period (in MW).

**T10. Average Interruption Frequency (AIF)**

Average Interruption Frequency (AIF) is a measure for the number of times per reporting period that the supply is interrupted.

$$AIF = \frac{\sum_i P_i}{P_T}$$

Where:

- $P_i$ is the MW lost in the $i^{th}$ circuit connected to the incoming circuit breaker of the relevant substation; and
- $P_T$ is the average power supplied by the total system for the reporting period (in MW).

**T11. System Reliability – Duration of Interruption (SRDuration)**

System Reliability – Duration of Interruption (SRDuration) is a measure of the reliability of the transmission system. It is the average number of outage hours in the system per network interconnection point. Loss of supply incidents shall be reported individually with details of location, time, duration of incident and maximum demand lost.

$$SRDuration = \frac{\sum_i OIC_i}{N_{IC}}$$

Where:

- $OIC_i$ is the amount of time, in hours, of each outage at an interconnection point in the transmission network; and
- $N_{IC}$ is the total number of interconnection points in the transmission network.

**T12. System Reliability – Frequency (SRFrequency)**

System Reliability – Frequency (SRFrequency) is a measure of the reliability of the transmission system. It is the average number of outages per circuit in the transmission system. Loss of supply incidents shall be reported individually with details of location, time, duration of incident and maximum demand lost.

$$SRFrequency = \frac{\sum_i OC_i}{N_C}$$

Where:

- $OC_i$ is the number of outages at an outgoing circuit in the transmission network; and
- $N_C$ is the total number of circuits in the transmission network.

**Transmission System Availability Index**

(a) **The System Planned Unavailability Index ($U_p$)**, giving the overall planned availability percentage for the transmission system

$$U_p = \frac{\sum(C_{po} \times T)}{\sum C \times 720}$$

where

- $C_{po}$: Circuit experiencing a planned outage
- T: duration of the outage
- $\sum C$: total number of circuits

(b) **The System Unplanned Unavailability Index ($U_i$)**, giving the overall unplanned availability percentage for the transmission system:

$$U_i = \frac{\sum(C_o \times T)}{\sum C \times 720}$$

where

- $C_o$: Circuit experiencing an unplanned outage
- T: duration of the outage
- $\sum C$: total number of circuits

(c) **The Transmission System Availability Index or Global Availability Index ($I_g$)**, giving the overall percentage availability of the transmission system:

$$I_g = \frac{\sum 100 - (C_t \times T)}{\sum C \times 720}$$

where

- $C_t$: Total circuit experiencing an interruption
- T: duration of the outage
- $\sum C$: total number of circuits

The Commission shall determine the maximum required $U_p$, $U_i$ and $I_g$ indexes based on the following Industry standard:

- $U_p$ value should vary between 2% and 8%.
- $U_i$ value should vary between 0.1% and 1%.
- $I_g$ value should be greater than 90%

# SCHEDULE 3

## Regulations 7(1), 12, 16(c)

## Key Performance Indicators – Distribution

The Commission has approved the following Key Performance Indicators for the distribution of electrical power and the utilities involved in the distribution of electrical power. The Key Performance Indicators are measured on an annual basis and reported by each distribution utility.

Table 3: Summary of Key Performance Indicators for Distribution

| **Distribution KPI** | | **Unit** | **Level** | **Frequency** |
|---|---|---|---|---|
| D1 | SAIDI | Minutes/year | Type: Planned, unplanned, generation / transmission, force majeure | Annual |
| D2 | SAIFI | Interruptions/year | | |
| D3 | CAIDI | Minutes/year | | |
| D4 | CAIFI | Interruptions/year | | |
| D5 | MV Fault | % | MV network | |
| D6 | LV Fault | % | LV network | |
| D7 | Technical Losses | % | System | |
| D8 | Non-Technical Losses | % | System | |

*The computations for SAIDI, SAIFI, CAIDI and CAIFI will exclude load shedding and exceptional events

**D1. System Average Interruption Duration Index (SAIDI)**

The System Average Interruption Duration Index is a measure of the duration of supply interruptions affecting Consumers during a given time period. SAIDI is measured in units of time, often minutes or hours, measured over the course of a year.

$$SAIDI = \sum_i \frac{(f_i \times t_i)}{F}$$

Where:

- f is the number of Consumers affected by the interruption (i), at all voltage levels;
- t is the duration of the interruption in minutes; and
- F is the average number of Consumers connected to distribution at the time of the interruption.

**D2. System Average Interruption Frequency Index (SAIFI)**

The System Average Interruption Fault Index is a measure of the average number of supply interruptions per Consumer during a given year. SAIFI is measured in units of interruptions per Consumer, measured over the course of a year.

$$SAIFI = \sum_i \frac{f_i}{F}$$

Where:

- f is the number of Consumers affected by the interruption at all voltage levels; and
- F is the average number of Consumers connected to distribution at the time of the interruption.

**D3. Consumer Average Interruption Duration Index (CAIDI)**

The Consumer Average Interruption Duration Index is a measure for the amount of time to restore service to each individual Consumer.

$$CAIDI = \sum_i \frac{SAIDI}{SAIFI} = \sum_i \frac{(f_i \times t_i)}{f_i}$$

Where:

- f is the number of Consumers affected by the interruption (i), at all voltage levels; and
- t is the duration of the interruption in minutes.

**D4. Consumer Average Interruption Frequency Index (CAIFI)**

The Consumer Average Interruption Frequency Index is the average number of interruptions experienced per Consumer affected by at least one interruption.

$$CAIFI = \frac{NI}{NC_i}$$

Where:

- NI is the total number of Consumer interruptions; and
- $NC_i$ is the total number of distinct Consumers interrupted.

**D5. MV Faults Clearance Index (MV Fault)**

The MV Faults Clearance Index it the ratio of the number of medium voltage (MV) faults cleared within 8 hours to the total number of MV faults reported.

$$MVFault = \frac{FC_T}{TF}$$

Where:

- $FC_T$ is the number of MV faults cleared within 8 hours; and
- TF is the total number of MV faults reported.

**D6. LV Faults Clearance Index (LV Fault)**

The LV Faults Clearance Index is the ratio of the number of low voltage (LV) faults cleared within 8 hours to the total number of LV faults reported.

$$LVFault = \frac{FC_T}{TF}$$

Where:

- $FC_T$ is the number of LV faults cleared within 8 hours; and
- TF is the total number of LV faults reported.

**D7. Technical Losses**

Technical losses are reported as the percentage of energy received. Technical losses on the distribution network represent the difference between the total electricity received from transmission lines and the total energy supplied to all distribution Consumers.

$$Technical\ Losses\ (\%) = \frac{E_D - E_C}{E_D}$$

Where:

- $E_D$ is the electricity supplied from the transmission company to the connection point of the distribution company; and
- $E_C$ is the total electricity supplied to end-use Consumers (measured at the local substations prior to delivery to Consumers).

**D8. Non-Technical Losses**

Non-technical losses are reported as the percentage of energy received. Non-technical losses on the distribution network represent the difference between the total electricity delivered to the Consumer connection point and the electricity billed to Consumers.

$$Non\text{-}Technical\ Losses\ (\%) = \frac{E_C - E_B}{E_D}$$

Where:

- $E_B$ is total electricity billed to Consumers;
- $E_C$ is the total electricity supplied to end-use Consumers (measured at the local substations prior to delivery); and
- $E_D$ is the electricity supplied from the transmission company to the connection point of the distribution company.

## SCHEDULE 4

**Regulation 13(7)(c)**

## Standards for Voltage Sags, Voltage Dips, Voltage Swells, Voltage Imbalance, Harmonics, Flickers and other Power Quality Disturbances

**Voltage Flicker**

(1) The total voltage flicker at a connection point shall not exceed:

a. ±1% of the steady voltage level, when these occur repetitively;

b. ±3% of the steady voltage level, when these occur frequently;

**Voltage Imbalance**

(1) The Licensee shall be responsible for limiting the unbalanced load drawn by its Consumers.

(2) The Licensee shall ensure that its network does not contribute significantly to voltage unbalance conditions.

(3) The acceptable or compatibility level for voltage unbalance at all voltage levels shall be set at 3% in accordance with IEC 61000-4-30.

**Voltage Harmonics and test for compliance**

(1) The compatibility levels for harmonic voltage, as a percent of the nominal voltage, shall comply with the standards provided in the table below:

Table 4. Standards for Voltage Harmonics

| **Voltage Level** | **Acceptable Harmonic Distortion Levels** |
|---|---|
| 220 kV | Total Harmonic Distortion of 1.5%, with no individual distortio exceeding 1% |
| 110 kV | Total Harmonic Distortion of 2.5%, with no individual distortio exceeding 1.5% |
| MV | Total Harmonic Distortion of 5%, with no individual distortion e ceeding 3.0 % |
| LV | Total Harmonic Distortion of 8%, with no individual distortion e ceeding 3.0 % |

## SCHEDULE 5

**Regulation 16**

## Reporting Guidelines

In addition to the technical standards in Schedule 4, the generation, transmission and distribution licensees are required to report on the quality of supply using the following format.

| (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|
| **Key Performance Indicators** | **Minimum Standard** | **Total Number** | **Number (Standard achieved)** | **% of Total (Success)** |
| **Generation:** | | | | |
| Station Reliability Index (SRI) | | | | |
| Station Availability Index (SAI) | | | | |
| **Transmission:** | | | | |
| SAIDI-T | | | | |
| SAIFI-T | | | | |
| MAIFI-T | | | | |
| Outage per 100km | | | | |
| Voltage Dips | | | | |
| Frequency Dips | | | | |
| Transmission Losses | | | | |
| Energy Not Served | | | | |
| AIT | | | | |
| AIF | | | | |
| System Reliability - Duration | | | | |
| System Reliability - Frequency | | | | |
| **Distribution:** | | | | |
| SAIDI | | | | |
| SAIFI | | | | |
| CAIDI | | | | |
| CAIFI | | | | |
| MV Fault | | | | |
| LV Fault | | | | |
| Technical Losses | | | | |
| Non-Technical Losses | | | | |

NOTE 1: In column 3, list for each status of the distribution network or consumer classification shown in column 1, the total number for the year.

NOTE 2: In column 4, list the total number that were within the period prescribed as the minimum standard in column 2.

NOTE 3: The value in column 5 is the value in column 4 divided by the value in column 3 multiplied by 100.

## EXPLANATORY MEMORANDUM

**(This explanatory memorandum is not part of these rules but is intended to indicate its general purpose)**

This statutory instrument is made pursuant to section 66 of the Sierra Leone Electricity and Water Regulatory Commission Act 2011. This instrument is divided into 4 parts.

Part 1 covers the interpretation and application provisions. The interpretation provision defines words and expressions used throughout the instrument. The application provision stipulates that the instrument applies to electricity generation, transmission and distribution licensees.

Part II covers provisions relating to service providers, performance indicators, emergency response plan, reliability of supply and record of planned and unplanned interruptions.

Part III covers provisions on quality of supply, major interruptions, voltage and frequency and the calculation of performance indices.

Part IV contains provisions relating to reporting and other miscellaneous provisions.

*Made this 13th day of December, 2019.*

MOHAMED D. B. SESAY
Chairman

PRINTED AND PUBLISHED BY THE GOVERNMENT PRINTING DEPARTMENT, SIERRA LEONE
EXTRAORDINARY GAZETTE NO. 91 OF 13TH DECEMBER, 2019