

Quality of Service Standards for Grid Supply (Directive No. 421/2020)



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Ethiopian Energy Authority

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Abbreviations

ASAI	Average Service Availability Index
ASIDI	Average System Interruption Duration Index
CAIDI	Customer Average Interruption Duration Index
CAIFI	Customer Average Interruption Frequency Index
EEU	Ethiopian Electric Utility
ENDGC	Ethiopian National Distribution Grid code
ENTGC	Ethiopian National Transmission Grid code
HV	High Voltage
Hz	Hertz
IEC	International Electro-technical Commission
kV	Kilo volt
LV	Low Voltage
MAIFI	Momentary Average Interruption Frequency Index
MV	Medium Voltage
MW	Megawatt
MWh	Megawatt-hour
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
V	Volt



Executive Summary

This Quality of Electricity Service document is aimed at updating the current *one on Electricity Services Quality Standards Directive No. 2/2006*, and in doing so, bring it in line with best regulatory and industry practice. From the best regulatory perspective, the overall quality of electricity to customers can be analysed from the following dimensions:

- i. Quality of Service to Customers;
- ii. Quality of Electricity Supply;
- iii. Continuity of Supply: Interruptions and Outages;
- iv. Quality of Supply from Licensees;

The *Quality of Service to Customers* refers to the **non-technical** aspect of power supply. It deals with the *relationship between licensees and customers*. The *Quality of Electricity Supply* refers to the **technical aspect** of power supply and covers issues relating to the **quality of the voltage waveform**, as well as factors affecting continuity of supply (i.e. interruptions and outages). Power quality can also be affected by the source of supply. It is therefore imperative that the technical performance of the **sources of supply** from the following licensees is examined:

- i. Generation;
- ii. Transmission;
- iii. Distribution and Sale;

, this document has - been structured to address the relevant issues relating to the following **main areas of quality of electricity service**:

- a. Quality of Service to Customers;
- b. Technical Quality of Electricity Supply;
- c. Interruptions and Outages;
- d. Quality of Supply from Licensees;
- e. Administrative penalty for non-compliance to customer service quality standard

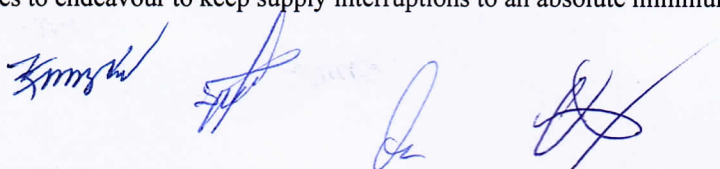
Regarding **Quality of Service to Customers**, the report specifically covers the following customer service issues, among others:

- i. Conditions for Supply, Disconnection and Reconnection;
- ii. Licensee obligation to meet new connection request;
- iii. Changes in Installation;
- iv. Refusal of Service;
- v. Metering and Billing;
- vi. Account and Meter Queries, and Disputed Bills;
- vii. Late Payment;
- viii. Disconnection of Service and Notice of Disconnection;
- ix. Reconnection of Supply;
- x. Response to Customer Complaints;
- xi. Quality of Telephone Call Services;
- xii. Fault Reporting;

On **Technical Quality of Electricity Supply**, this document examines the following issues relating to the quality of the voltage *waveform* and how they affect power quality:

- i. Frequency Excursions;
- ii. Supply Voltage;
- iii. Voltage Flicker;
- iv. Voltage Unbalance;
- v. Voltage Harmonics;

In examining power quality, it is important to note that lack of **continuity of service or interruptions** to supply can result in outages to consumers. This document therefore discusses the consequences of *planned and unplanned outages*, and highlights the need for licensees to endeavour to keep supply interruptions to an absolute minimum.



Concerning the last dimension of electricity quality, the document examines the **Quality of Supply from the licensees**. For Generation Licensees, it is important that they install generating units which are capable of remaining synchronised for frequency changes as specified in the East African Interconnection Code, by ensuring continuous operation when the frequency changes from 50 Hz+3% to 50 Hz – 5% (i.e. 47.50 Hz – 51.50 Hz). To ensure high plant availability and minimum level of outages from generators, it is important that the Authority monitors the operating performance of the power plant by looking at Plant Availability, Planned and Forced Outages, among others.

Regarding the Transmission System, the operating voltage should be kept within $\pm 10\%$ of the nominal voltage and the Authority shall use the following indicators to monitor the transmission licensee's quality of service delivery.

- a. System Planned
- b. ¹ Unavailability Index²;
- c. System Unplanned Unavailability Index³;
- d. Transmission System Availability⁴.

Regarding quality of service delivery from the **distribution segment**, the aim is to reduce the nuisance associated with the frequency and the duration of the outages. In that regard, the following indices shall be used by the Authority to monitor the distribution licensee performance: *SAIDI, SAIFI, CAIDI, MAIFI, CAIFI⁵, ASIDI and ASAI⁶*.

¹ Planned outages are those which are due to scheduled maintenance

² Defined as the sum of all transmission circuits and number of hours in a given period in each circuit, which experiences planned outage, divided by the product of total number of circuits in the system and number of hours in a given period. This value should vary between 2% and 8%.

³ This value should vary between 0.1% and 1%.

⁴ Should be greater than 90%

⁵ **CAIFI** is the inverse or the reciprocal of **Customer Interrupted per Interruption Index (CIII)**. Therefore for performance monitoring or Quality of Service purposes, only one of the indices is used but not both.

⁶ Also called the Service Reliability Index (SRI)

PART ONE

1. General Provisions

1.1 Issuing Authority

This Directive is issued by the Ethiopian Energy Authority (hereafter referred as the “Authority”) pursuant to the authority vested in it by Article 40(2) of the Energy Proclamation No. 810/2013.

1.2 Short Title

This Directive may be cited as the “Ethiopian Electricity Services Quality Standards Directive No **421/2020**”

1.3 Definitions

1.3.1 Words and phrases used in this Directive shall have the meaning and application given to them in the Proclamation No. 810/2013, Electricity Regulations No. 447/2018, and Directives issued there under.

1.3.2 In this Directive, unless the context requires otherwise, the following meanings shall apply:

1.3.2.1 “Availability Factor”: the ratio of installed plant capacity (MW) multiplied by 8760 hours less total annual unserved energy due to all planned and forced interruptions (MWh), to the installed plant capacity (MW) multiplied by 8760 hours;

1.3.2.2 “Complaints Handling Procedure: a procedure that is implemented by a Licensee so as to allow customers to register complaints relating to the performance of the Licensee, and describes how Licensees shall respond to complaints received from customers;

1.3.2.3 “Day”: an official working day;

1.3.2.4 “Forced Interruption”: an interruption encountered when the supply system or a component of it, is taken out of service immediately, either automatically or as soon as switching operations are performed as a result of emergency conditions, or human error or by the malfunctioning of equipment.

1.3.2.5 “Forced Outage Factor”: the ratio of annual unserved energy due to forced interruption (MWh) to the installed plant capacity (MW) multiplied by 8760 hours;

1.3.2.6 “Dependable Capacity”: the ratio of the actual available capacity in MW to the design capacity (name plate rating) in MW;

1.3.2.7 “Network”: shall mean the transmission or distribution lines, all associated equipment and accessories of any Licensee;

1.3.2.8 “Planned Interruption”: an interruption that occurs when a component of the supply system is deliberately taken out of service by the Licensee at a selected time, usually for the purpose of construction, preventative, routine maintenance or repair;

1.3.2.9 “Planned Outage Factor”: the ratio of annual unserved energy (MWh) due to planned interruption that generally involves an overhaul work, either on a unit or component, to the installed plant capacity (MW) multiplied by 8760 hours;

1.3.2.10 “Service Quality Standards: a set of parameters and their corresponding values that are used to evaluate the adequacy of the level of electricity services provided by a Licensee;



1.3.2.11 “Voltage Flicker”: Refers to an increase or decrease in voltage over a short duration⁷ of time which is usually associated with fluctuation load, and sufficient in duration to allow a visual observation of a change in electric light source intensity. Quantitatively, it is expressed as a percentage change in voltage over nominal;

1.3.2.12 “Voltage Harmonic”: Voltage harmonic create telecommunication interference and thermal heating in transformers and if not controlled, can cause solid state equipment to mal-function and create over-voltage due to resonance.

1.3.2.13 “force majeure” causes beyond the reasonable control of and without the fault or negligence of the licensee claiming force majeure. It shall include failure or interruption of the company activities due to causes beyond the licensee’s control, including acts of God, wars, sabotage, riots, hurricanes and another actions of the elements, civil disturbances and strikes.

1.4 Objective

The objective of this Directive is to determine the quality standards of electricity services that are provided by a Licensee in Ethiopia.



⁷ Technically, voltage flicker is measured by the **flicker severity**. Short-term flicker severity in networks at operating voltages less than or equal to 132 kV should be 1.0. This corresponds to flicker perceivable by 50% of the population when reading with a 60W incandescent lamp. The compatibility level for long-term flicker severity in networks at operating voltages less than or equal to 132 kV should be 0.8.

PART TWO

2. Quality of Service to Customers

2.1 Conditions for Supply, Disconnection and Reconnection

2.1.1 New Supply, Improving or Relocation of Existing Supply

1. When requested to, the Licensee shall provide a power supply to a new customer or improve or relocate the existing power supply installations of an existing customer, within the following prescribed times:

- a) 5 working days for single phase, where existing infrastructure can be used;
- b) 15 working days for three phases, where existing infrastructure can be used;
- c) Within two months where LV network extensions are required and within three months where MV network extensions are required;
- d) if new networks have to be installed or if HV extensions are required, the period for providing the supply shall be negotiated between the Customer and the Licensee.

e) Notwithstanding the above standards, the licensee is not liable for not connecting the customer for reasons due to force majeure.

2. Notwithstanding the provision of Article 2.1.1(1), the Licensee and the customer may negotiate an extended period of time to accommodate the delivery of equipment from manufacturers;

3. An accessible, protected, and satisfactory location on the Customer's premises shall be provided by the Customer, unless the Licensee elects to install meters on poles or other locations controlled by the Licensee;

4. All pipes, wires and devices on the Licensee's side of the point of delivery will be furnished, installed and maintained by and at the expense of the Licensee, except such Customer wiring and devices, as may be required by the terms of any supplemental agreements between the Licensee and the Customer;

5. The Licensee may request the Customer to cover the cost of equipment including electric poles, cables or other required equipment for his connection. In that case, any extra or excess amount, provided by the Customer shall be refunded in terms of energy consumption.

2.2 Licensee Obligations to Meet Request for New Connection

1. Where a new or existing customer requests a new supply or improvement to his supply or relocation of his supply lines and associated equipment, as the case may be, the Licensee shall provide an estimate of appropriate charges within 5 days.

2. Upon acceptance of the quotation and making the minimum payment, the Licensee shall make an appointment with the Customer to fit a meter and connect the Customer within the period stipulated in Article 2.1.1, provided that:

- a. The customer has submitted an application for electricity supply in a format required by the Licensee as approved by the Authority;
- b. The customer has provided the Licensee with acceptable identification and all information necessary to enable the Licensee to arrange the provision of supply to the address specified by the customer;
- c. The customer has paid the Licensee all charges for the supply of electricity as approved by the Authority;

3. Upon connecting a new premise, the Licensee shall provide a contract or a supply agreement to the customer, with its terms and conditions of supply approved by the Authority;

- d. If service is not provided, the Licensee shall promptly and automatically refund the customer's deposit plus accrued interests (7%) on the balance if any, in excess to the charges paid for the service applied for.



2.2.1 Changes in Installation

Prior to the Customer making any material changes or modifications in his/her facilities that would substantially alter the electric requirements for the class of service of the premises, the customer shall consult with the Licensee to ascertain the effect, if any, of the proposed changes on the Licensee's facilities or on the Licensee's ability to serve the Customer's additional electric requirements.

2.2.2 Temporary Service

Where service is to be used at an installation for a limited period and such installation is not permanent in nature, the use of the service shall be classified as temporary. In such cases, the customer may be required to pay to the Licensee the cost of the facilities required to provide service, as well as the cost of connection and disconnection of service.

2.3 Refusal of Service

1. A Licensee may refuse to supply an applicant until the applicant has met all the requirements with regard to the service applied for;
2. A Licensee may decline to provide the service under any of the following conditions:
 - a. If the applicant's facilities are inadequate. This implies that the licensee shall not be compelled to commence or to continue to give a supply to any customer unless he is reasonably satisfied that each part of the customer's installation is so constructed, installed and used, so far as is reasonably practicable, as to prevent danger and not to cause undue interference with licensees' systems or with the supply to others;
 - b. The person requesting the service owes the Licensee a delinquent amount for any Licensee services previously provided, whether to the same or different premises ; or
 - c. Insure that customer installation is not done by competent professional Certified by the Authority.
3. If the Licensee refuses to provide service as specified herein, the person requesting such service shall be informed immediately of the reason for the refusal and the actions to be taken by the Customer for the Licensee to fulfill the request;
4. The applicant may file a complaint with the Authority appealing the Licensee's decision regarding the refusal of service.

2.4 Notice of Discontinuance of Supply

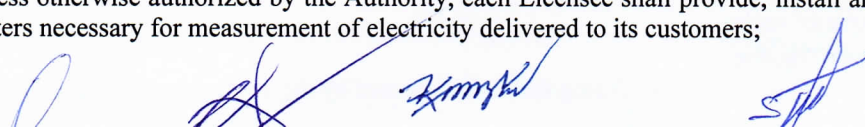
- 2.4.1 Where the Licensee requires interrupting supply to carry out planned maintenance or other planned activities on the network or there is discontinuance of supply, the Licensee shall give notice not less than 48 hours to customers to be affected by the discontinuance.
- 2.4.2 The notice shall be either in the form of letter or advertisements through:
 - Widely disseminated newspaper;
 - Radio and Television spot notice at least twice per a day for two consecutive days;
 - Public notice posting in and around the vicinity of the discontinuance area;
 - All of the above methods;

2.5 Metering and Billing

2.5.1 Frequency of Meter Reading

1. Post paid Customers shall have their meter read at least once in a month;
2. The licensee is required to physically inspect the meters at regular intervals, at least once in every six months, to avoid or minimise electricity theft and ensure that billing is done based on actual energy consumption.

2.5.2 Meter Requirements

1. All electricity sold by the Licensee shall be charged for by meter measurements or by a flat monthly amount;
 2. Unless otherwise authorized by the Authority, each Licensee shall provide, install and continue to own and maintain all meters necessary for measurement of electricity delivered to its customers;
- 

3. The licensee shall install electricity consumption meter that meet all requirements regarding metering performance and accuracy set in the national distribution grid code.

3 The licensee shall allow customers to choose between prepaid and post-paid meter before such installations.

4 Without prejudice to the provision in 3, in case the licensee cannot supply the choice of the customer, the customer may have to either wait until the License can offer the preferred choice or be supplied with the available meter type.

6. Each Licensee shall keep a record of all its meters showing the Customer's names and address.

2.5.3 Meter Tests and Inspection

1. Electricity consumption meters shall be calibrated according to the appropriate load accuracy prior to their installation in customers' premises, and recalibrated once every five years thereafter.

2. Each Licensee shall upon request of a customer, provide for a test of the accuracy of the meter serving that customer;

3. The Licensee shall inform the customer of the time and place of the test and allow the customer or his or her authorized representative, to be present if the Customer so wishes;

4. The customer shall be properly informed of the result of any test on his/her meter;

5. If the meter accuracy is found to be outside the declared limits specified in the supply agreement/national distribution grid code to either the customer's or the Licensee's disadvantage, any fee charged for a meter test shall be refunded to the customer;

6. The record of each test made shall show the identification number and contents of the meter, the standard meter and other measuring devices used, the date and kind of test made, the person who performed the test, the error or percentage of accuracy, and sufficient data to allow verification of all calculations.

7. The Licensee shall provide the means to read, to transfer or refund, as appropriate, the amount of unexpended credit due to a customer when a prepayment meter is replaced or removed as a result of faulty meters;

8. The Licensee shall have the right to inspect a meter at the customer's premises if tampering or theft is detected or suspected. Theft of electricity or meter tampering may be ascertained by studying the purchase patterns of the customer;

9. Where reasonable but unsuccessful attempts have been made to gain access to a meter, the Licensee may call and ask the customer for further enquiries or verification.

10. Where reasonable but unsuccessful attempts to gain access to a meter have been verified with valid justification, the Licensee may disconnect the supply after having delivered a written warning to the customer.

2.5.4 Bill Content for Credit Meter Customers

1. Unless otherwise agreed, all electricity bills for the supply of electricity shall be issued in the name of the customer;

2. The Licensee shall exercise all reasonable means to ensure accurate computation of all monthly service billings;

3. Bills for electricity service shall be delivered to the address of the customer monthly, unless otherwise agreed by the customer and Licensee or unless service is rendered for a period less than one month;

4. Bills shall be prepared as promptly as possible following the reading of meters, or shall be based on a flat monthly amount if the monthly amount is determined;

5. Billing may be based on pro rata estimates which shall be settled annually according to the actual figures;

6. A customer's bill shall clearly consist of the following information:

a. the date of the previous meter reading;

b. the date of the current meter reading;

c. the number of units consumed (or estimated) during the period covered by the account in each tariff class;

- d. the applicable tariff class and rate
- e. the cost of the electricity consumed during the period covered by the bill;
- f. the outstanding balance, if applicable;
- g. any other amounts charged and a description of what the charges are for;
- h. the total amount payable;
- i. the latest date by which the account is to be paid in order to avoid penalties;
- j. Contact details of the service provider's customer service centers ;
- k. Name of consumer, account and meter number;
- l. Acceptable methods of payment, opening hours, etc.
- m. Contact information of the regulatory body in case they want to complain.

2.6 Account and Meter Queries, Disputed Bills

2.6.1 Account Query

a) A licensee should respond to an account query from a customer within 5 working days, if the query was made in writing. To ensure that this is complied with, the licensee must record the receipt date of the account query, as well as the licensee's response date.

b) Failure to do so as stated under 2.6.1(a) will require that the Licensee must provide a justified duly signed written letter to the customer immediately.

2.6.2 Disputed Bills

1. Where there is a dispute between the Customer and the Licensee regarding the bill or any relevant issue, the Licensee shall respond to that enquiry within 5 working days and make an investigation, and report the results in writing to the Customer;
2. Where the dispute is not resolved, the Licensee shall inform the Customer of the complaint procedures of the Authority, as provided in this Directive or any other directive;
3. The Customer shall not pay the disputed portion of the bill which exceeds the amount of the Customer's average usage for the billing period at current rates, until the resolution of the dispute.
4. The Licensee must accept the payment of the customer which amounts to the customer usage average until the dispute portion of the bill is resolved.

2.6.3 Responding to Meter Queries

1. Where a customer requests the Licensee about the accuracy of his meter, the Licensee shall, within 10 days, investigate and prove that the meter functions properly or replace with a properly functioning meter if proven that the existing meter is faulty;
2. In the event that a test on the meter proves that the meter is accurate, the cost of the test would be charged to the customer;
3. If however, the meter is found to be inaccurate with respect to the declared and acceptable limits in the supply agreement, the cost of the test shall be absorbed by the licensee;

2.6.4 Bill Adjustment

1. If a meter test reveals a meter accuracy to be outside the allowable limits specified in the supply agreement, the Licensee shall correct previous readings consistent with the inaccuracy found in the meter for the period that has revealed unusual consumption by the Customer;
2. If a meter is found not to register for any period of time, the Licensee may make a charge for units used but not metered or make a refund for units not used during that period of time, based on consumption patterns by the same Customer at the same location.

2.7 Payment Locations

The Licensee shall ensure that, wherever practical, facilities are provided within or close to Customers premises areas to afford Customers, a reasonable opportunity to pay their accounts and to resolve account queries.

2.8 Conditions for Disconnection of Service

Before disconnection, the licensee shall ensure that the following conditions have been fulfilled:

1. The licensee has given a written warning to the customer of at least seven working days that electricity supply shall be disconnected if payment is not made within the payment period;
2. If possible, the licensee should request for a direct contact with the customer before the disconnection;
3. The Licensee may disconnect the customer for any of the following reasons:
 - i. Failure to comply with the terms and conditions of the contract or supply agreement;
 - ii. The customer has not paid the amount correctly billed to his address by the relevant date provided that:
4. The *relevant payment date* is clearly shown on the bill;
5. The relevant payment date is at least 21 days from the date of delivery of the bill to the supply address or a delivery address provided by the customer, which is acceptable to the Licensee;
6. The payment date has not been superseded by a subsequent payment date issued to the same customer at the same supply address;
7. The Licensee has clearly verified in its record that the bill has not been paid;
8. The Licensee has given a written warning to the customer that the electricity supply shall be disconnected if payment is not made within the payment period, and the customer has not responded to the letter;
9. The customer has violated the Licensee rules pertaining to the use of service in a manner which interferes with the service of others or the operation of sub-standard equipment, if a reasonable attempt has been made to notify the customer and the customer is provided with a reasonable opportunity to remedy the situation;
10. The customer has tampered with or has by-passed the Licensee's meter or equipment;
11. Without prejudice to the provisions of this Directive, the Licensee may disconnect a Customer's electricity supply in the following manner:
 - i. Without notice, where the Customer is connected to the Licensee's network illegally;
 - ii. Without notice, where the Licensee considers a Customer's installation to be dangerous to the health and or integrity of the network and/or the quality of supply to other Customers ;
 - iii. Where, due to any act of omission of a Customer, a meter located in his premises is inaccessible to be read for a period of two consecutive bills ; provided that the Licensee gives to the Customer a written warning that unless he provides access by a given date, electricity supply to the Customer shall be disconnected ;

2.9 Prohibition of Disconnection of Service

1. The licensee shall not disconnect a customer for non-payment on weekends or on public holidays and in premises where there is particular events as listed here; ongoing wedding, recently delivered child, bed fast patient supported by electricity as in sub Article 4 below and ongoing mourning for a dead person;
2. The Licensee shall not disconnect a Customer for electricity non-payment where:
 - a. The Customer has entered into payment arrangement with the Licensee and payments are being made in accordance with the arrangement;
 - b. The Customer has made a complaint concerning the unpaid bill in accordance with the Licensee or the Authority complaint procedure and the complaint remains unresolved;
3. The Licensee shall not disconnect electricity supply to any premises where a life support machine is in use. Provided that the customer has notified the licensee that the life support machine is in use.
4. The Licensee shall not carry out disconnections if payment points and a reconnection service are not available during the next 24 hours;

2.10 Notice of Disconnection

Whenever the Licensee disconnects electricity supply to a Customer's premises, the Licensee shall leave a written notice of disconnection advising the Customer of the following:

- a. The date and time of disconnection;
- b. The reason for disconnection;
- c. The actions to be taken by the Customer to have the electricity supply reconnected;
- d. The contact address and telephone number of the Licensee.

2.11 Reconnection of Electricity Supply

The Licensee shall reconnect electricity supply to the Customer in the following circumstances:

1. Whenever a Customer, disconnected for non-payment of electricity bill, pays all the Licensee's charges or enters into an acceptable payment arrangement with the Licensee;
2. Where a customer has been disconnected for default in consumption bill payment, the Licensee shall reconnect the supply within 24 hours after the customer has effected payment of owed invoices and service charges.
3. Whenever a Customer, disconnected for theft of electricity or for illegal connection to the Licensee's network, rectifies his electricity supply arrangements to the satisfaction of the Licensee and pays all charges owed to the Licensee or enters into an acceptable payment arrangement to pay the charges.
4. Whenever a Customer disconnected for the reason under this Directive, rectifies the problem associated with the installation, and the installation is certified by an authorized person in accordance with the Licensee's requirements;
5. Whenever a Customer, disconnected for failure to provide access to the meter in his premises, provides access or makes reasonable access arrangements and pays necessary reconnection fee;
6. Reconnections shall be effected as promptly as possible, but not later than the first working day after the account has been settled satisfactorily and the reconnection fee has been paid.

2.12 Restoring Supply Following Distribution System Failure

1. Where the supply to a customer is discontinued as a result of a failure of the distribution system, the Licensee shall restore supply within 2 hours;
2. The time limit prescribed in Article 2.12(1) of this Directive shall only apply if the Licensee is made aware of the supply interruption.

2.13 Response to Customer Complaints

To ensure delivery of efficient service to its customers, the licensee is required to respond to all written complaints in accordance with the complaints procedure described below. In order to ensure compliance, the licensee is required to record the date of receipt of customer's complaint, as well as the date of licensee's response.

2.13.1 Customer Complaints Handling Procedure

1. The Licensee shall implement a Complaints Handling Procedure that allows customers to register complaints relating to the Service Quality Standards of the Licensee and that describes how Licensees shall respond to complaints received from customers.
2. The Complaints Handling Procedure shall include the provision that the Licensee will register all complaints and respond to all complaints within 10 days. The Licensee shall therefore keep a record of all complaints that shall indicate the name and address of the complainant, the date and nature of the complaint and its disposition.
3. Licensees shall send a copy of the Complaints Handling Procedure and all revisions thereafter to the Authority. A copy of the Complaints Handling Procedure, upon request, shall be freely given to any customer of the Licensee.
4. The Licensee shall publicise the existence of the Complaints Handling Procedure and revisions thereof. The Licensee shall report to the Authority, the method by which it has publicised the Complaints Handling Procedure and the number of copies of the Procedure that are given to customers upon request.
5. The Authority may investigate complaints made by customers of the Licensee provided that the customer has first presented his/her complaint to the Licensee and is not satisfied with the response given by the Licensee or where the Licensee has failed to respond within the prescribed period.
6. The Licensee's Complaints Procedure shall indicate that customers have the right to complain to the Authority or bodies authorised by the Authority, if they consider that the response by the Licensee to their complaint is unsatisfactory.

2.13.2 Record of Complaints

1. The Licensee shall keep records of all complaints and shall prepare and submit annual complaint analysis report to the Authority;
2. The Authority may prepare and issue to Licensees a format suitable for the complaints analysis report;

2.13.3 Complaints Procedure

The Complaints Procedure shall be prepared by the Licensee within 6 months of the date of the issuing of a Licence or of this Directive, whichever is the latest;

2.14 Quality of Telephone Call Services

In order to ensure quick response to customer requests, the licensee is required to provide its customers with telephone call services. The call system must ensure that it can offer call services for emergencies, and services for interruption requests and general complaints, as well as those related to contract management.

2.14.1 Quality of Call Centre

- a. Average waiting time max 120 seconds.
- b. Telephone availability (at least) 95% of the time
- c. Percentage of Unanswered calls 5% of calls.
- d. Call Centre Opening Hours 24 hrs./day.

2.15 Fault Reporting Process

1. The Licensee shall provide a facility for Customers to report interruptions during normal office hours and a 24-hour telephone service to receive reports of interruptions and emergencies;
2. The Licensee shall request and record the following information from a Customer reporting a fault:
 - a. the Customer's name;
 - b. physical address and telephone number (if any);
 - c. the nature of the fault;

2.16 Making and Keeping Appointments

1. If a customer requests that the Licensee visit the customer's property in connection with the supply of electricity or other services covered, the Licensee shall:
 - i. offer an appointment;
 - ii. Carry out the necessary task by keeping that appointment;
2. If the Licensee has to change the appointment, then the Licensee shall notify the customer of the change of that appointment, at least one working day in advance. However the Licensee cannot change the appointment more than once.
3. If the customer has to change the appointment, then the customer shall notify the Licensee of the change of that appointment, at least one working day in advance.

2.17 Information for Credit Meter Customers

The following information shall be provided to credit meter customers after electricity service is provided:

1. the scheduled frequency of meter readings;
2. the method used to estimate electricity consumption during periods when no meter readings are taken;
3. the format of the electricity account;
4. the methods of payment of the account and the period allowed for payment before penalties are applied;
5. the location of payment venues and the hours of business;
6. the penalties for late payment, for non-payment and for the disconnection/reconnection process;
7. the process to initiate an account query or meter accuracy query, and the fees charged for accuracy audits;
8. the penalties applied in the case of tampering, by-passing of meters, or any other method used to procure electrical energy illegally;

2.18 Information for Prepayment Meter Customers

1. The Licensee shall provide every prepayment meter Customers with information listed under 3/2.17 where applicable;
2. The Licensee shall periodically provide the following additional information to every prepayment meter Customer:
 - i. the applicable tariff (which shall also be displayed at the vending stations);
 - ii. the location of points of sale of top-up credit and the hours of business;
 - iii. how to purchase top-up credit and correctly unload the credit into meters

2.19.1 Provision of Vending Stations

Where practical, vending stations or credit top-up vendors should be made accessible to prepayment meter customers through their normal course of business activities or special designated licensee sale points or customer service centers.

PART THREE

3. Quality of Electricity Supply

The technical quality of electricity supply can be analysed by examining *the voltage waveform imperfections*. If such imperfections are not controlled, they can affect the proper functioning of equipment, depending on its immunity level or standard. An acceptable power quality should therefore allow a piece of equipment to function in its intended manner, without significant loss of performance or life expectancy. The quality of electricity can be assessed by examining the following issues:

- a. Voltage Quality;
- b. Continuity of Supply: Supply Interruptions and Outages;

The Quality of Electricity Supply shall therefore comply with the provisions of the Grid Code to be issued by the Authority. The Authority shall be responsible for determining and setting the Licensee's *network performance indices* as well as the format in which these are reported.

3.1 Voltage Quality

3.1.1 Frequency Fluctuation

1. The quality of the frequency is assessed by the number and duration of fluctuations which are outside the permitted frequency range. For power quality, the frequency excursion is defined as one in which the frequency fluctuation exceeds the acceptable range. The Transmission System licensee is responsible for the frequency of each licensee's system or network, having an obligation under these regulations to use reasonable endeavors to maintain system frequency **within 50 Hz $\pm$ 1%**, according to the national grid code.
2. The acceptable frequency for various operating scenarios such as when a major generator is tripped, a major transmission element fails or large loads are suddenly disconnected etc., would be subject to the variations to be set out in the Grid Code to be issued by the Authority.

3.1.2 Supply Voltage

1. The licensee shall supply the terminals of a low voltage customer with a nominal value of 230 volts phase to neutral. In the case of a multiphase supply the nominal voltage shall be 400 volts phase to phase.
2. The voltage of all networks shall be kept within the following voltage ranges, such that the licensees' permitted variation in voltage about the nominal voltage shall be in accordance with the ENDGC to be issued:
 - a. for low voltage supplies $\pm 10\%$;
 - b. for medium voltage $\pm 6\%$;
 - c. for high voltage supplies $\pm 10\%$;

3.1.3 Voltage Flicker

The voltage flicker limits, shall be set in accordance with the **EAPP Interconnection Code** which specifies that in general, the total voltage flicker at a connection point shall not exceed:

- a. $\pm 1\%$ of the steady voltage level, when these occur repetitively;
- b. $\pm 3\%$ of the steady voltage level, when these occur frequently;

3.1.4 Voltage Unbalance

- a. The Licensee is responsible for limiting the unbalanced load drawn by its customers.

- b. The Licensee shall ensure that its network does not contribute significantly to unbalance conditions.
- c. The acceptable or compatibility level for voltage unbalance at all voltage levels shall be set at 3%, in accordance with IEC 61000-4-30⁸.
- d. For power quality measurement, the Authority shall set a number of sites which should not exceed the voltage unbalance limit in percentage terms.
- e. The Authority shall therefore request that the number of delivery points which experience voltage unbalance outside the compatibility level, should be measured and recorded every six months.

3.1.5 Voltage Harmonics

- a. The compatibility levels for harmonic voltage (as a percent of the nominal voltage), shall be set based on the following standards in the EAPP Interconnected Code, but aligned with the EEU Customer Service Policy and Procedure.

Table 4-1. Standards for Voltage Harmonics

Voltage Level	Acceptable Harmonic Distortion Levels
230 kV – 500 kV	Total Harmonic Distortion not exceeding 4 %, with no individual distortion exceeding 1%
110 kV – 132 kV	Total Harmonic Distortion not exceeding 4 %, with no individual distortion exceeding 1.5%
66 kV	Total Harmonic Distortion not exceeding 5%, with no individual harmonic exceeding 3%
33 kV	Total Harmonic Distortion not exceeding 5%, with no individual harmonic exceeding 3
15 kV	Total Harmonic Distortion not exceeding 10%, with no individual harmonic exceeding 3

- b. To test for compliance, measurements shall be taken for a period of at least one week at the delivery points, in accordance with Ethiopian standard or IEC 61000-4-7⁹.

3.2 Interruptions and Outages

Service interruptions to power supply relate to loss of supply to the consumer and can generally be classified as follows:

- Very short outages: Outages which are less than 1 second;
- Short outages : Outages which last between 1 second and 3 minutes;
- Long outages: Outages which last more than 3 minutes, and which can further be sub-divided into:
 - a. Planned outages;
 - b. Unplanned outages;

Planned outages occur when work is to be carried out by the licensee according to a planned maintenance schedule, and about which consumers have been given prior information in order to reduce any inconvenience.

Unplanned outages on the other hand, refer to forced outages by incidents either at the generating station or on the network, which usually result in load shedding.

3.2.1 Service Interruptions

1. The Licensee shall endeavour to keep supply interruptions to an absolute minimum and in the case of planned interruptions shall, except under exceptional circumstances, ensure that customers are given at least 48 hours notice prior to the interruption;
2. The Licensee shall make use of the appropriate media to inform its Customers of future major planned interruptions. The following information shall be provided:

⁸ IEC (International Electrotechnical Commission) is the world's leading organization for the preparation and publication of International Standards for all electrical, electronic and related technologies. IEC 61000-4-30: Refers to Electromagnetic Compatibility (EMC), Part 4-30: Testing and Measurement Techniques, Power Quality Measurement Methods.

⁹ IEC 61000-4-7: Refers to Electromagnetic Compatibility (EMC), Part 4-7: Testing and Measurement Techniques: General Guide on Harmonics and Inter harmonics, for Power Supply Systems and Equipment Connected.

- a. the time that the interruption(s) will occur or is/are planned to occur;
 - b. the area(s) that will be affected;
 - c. the reason for the planned interruption(s);
 - d. the time at which it is anticipated that the supply will be restored; and
3. The Licensee shall make use of the appropriate media to inform its Customers of the reason for any previous major unplanned interruptions;
 4. When interruption occurs, a Licensee shall seek to restore service within the shortest possible time consistent with prudent operating principles, so that the smallest number of Customers is affected;
 5. Each Licensee shall make reasonable provisions to meet emergencies resulting from a failure of service, and shall issue instructions to its employees covering procedures to be followed in the case of an emergency in order to prevent or mitigate the interruptions or impairment of service;

3.2.2 Record of Interruptions

1. Except for momentary interruptions¹⁰ lasting not more than three minutes each **and which do not cause a major disruption of service**, each Licensee shall keep a complete record of all unplanned and planned interruptions;
2. The record under Article 4.2.2(1), shall include the cause of interruption, the date, duration, approximate number of Customers affected, and in cases of emergency interruptions, the remedy and steps taken to prevent recurrence;
3. The Licensee shall issue quarterly reports to the Authority containing the records provided under Article 4.2.2(1);

3.2.3 Measuring Extent of Outages

In order to measure the extent of interruptions (i.e. the number and duration of outages), the Authority shall use the following industry indices: SAIFI, SAIDI, CAIDI, MAIFI, ASIDI and ASAI. The number and duration of long outages are usually measured using SAIFI, SAIDI, CAIDI, ASIDI and ASAI while MAIFI is commonly used for short or very short outages.

1. SAIFI

SAIFI measures the *number of times or the frequency of interruptions* to supply per customer, in a given period in the distribution system. It is defined as follows:

$$\text{SAIFI} = \text{Total Number of Customer Interruptions caused in a given period} \div \text{Total Number of Customers.}$$

For the sake of transparency, the data for planned and unplanned interruptions, as well as those relating to load shedding would be separately analysed.

2. SAIDI

SAIDI measures the *average duration of interruption* to electricity supply per customer, over a given period in the distribution system. It is defined as:

$$\text{SAIDI} = \text{Sum of the Duration of Customer Interruptions (Minutes or hours) in a given Period} \div \text{Total Number of Connected Customers.}$$

Even though the total customer interruptions covers planned, unplanned and load shedding, for the sake of transparency, the data from the three interruption sources would be separately analysed.

3. CAIDI

This index measures the average time each customer is without electricity per interruption, within a certain period.

It is defined as:

$$\begin{aligned} \text{CAIDI} &= \text{Sum of all Customer Interruption Duration} \div \text{Total Number of Customer Interruptions} \\ &= \text{SAIDI} \div \text{SAIFI} \end{aligned}$$

¹⁰ This refers to short or very short interruptions less than 3 minutes, which do not cause a major disruption of service, and are described as short-duration events. The term "**momentary interruption**" is usually used in North America as a synonym to **short interruption**. The upper limit of the duration of a short interruption varies between different countries but this does not exceed 3 minutes.

4. MAIFI¹¹

MAIFI is the average number of short or very short outages, (usually less than 3 minutes), per customer and per year. It therefore measures the average number of momentary interruptions that a customer experiences during a given time period.

MAIFI = Sum of number of interruptions X customers affected ÷ Total number of customers.

5. CAIFI

Customer Average Interruption Frequency Index (CAIFI), gives the average number of **long interruptions** during a given year for those customers that experience at least one long interruption (usually greater than 3 minutes), during that year. Like SAIFI, it is expressed in interruptions per customer per year. It is calculated using the following expression:

$$CAIFI = \Sigma N \div NC$$

Where:

N = Number of long interruptions, greater than 3 minutes

NC = Total number of customers that have experienced at least one interruption during the reporting year.

6. ASIDI

Average System Interruption Duration Index (ASIDI), gives the average duration of an interruption, weighted by the rated or contracted power, rather than by the number of customers affected. It is expressed in minutes per year, and calculated using the following expression:

$$ASIDI = \Sigma(L_i \times r) \div L_T$$

where:

L_i = Rated or contracted power interrupted by each incident;

r = Restoration time for each incident;

L_T = Total rated, contracted or interrupted power in the system for which the index is calculated¹².

7. ASAI

The Average Service Availability Index (ASAI) is the total number of customer hours that service was available during a given time period, to the total customer hours demanded. This is sometimes called the service reliability index. ASAI is calculated as follows:

$$ASAI = 1 - \frac{\Sigma(N_i \times r)}{NC \times T}$$

where:

r = Restoration time (Hours)

N_i = Total number of customers interrupted

NC = Total number of customers served

T = Time period under study (Hours)

For quality of service performance monitoring of outages, the Authority shall use the following indices shown in Table 4-2.

Table 4-2. Indices for Distribution System Performance Monitoring

Index	Method
SAIDI – Duration of Unplanned Interruptions	The calculation will exclude load shedding and exceptional events
SAIFI – Frequency of Unplanned Interruptions	The computation will exclude load shedding and exceptional events
SAIDI – Duration of Planned	Measures the duration of planned interruptions.

¹¹ Most distribution systems only track momentary interruptions at the substation, which does not account for pole-mounted devices that might momentarily interrupt a customer. MAIFI is rarely used in reporting distribution indices because of the difficulty in knowing when a momentary interruption has occurred.

¹² The "rated or contracted power" may be the rating of a distribution transformer, the contracted power of an MV or HV customer, or the transformer rating in a delivery point.

Outages	It will also give an indication of the effectiveness of the licensee's maintenance methods.
CAIDI	Measures the average duration of an interruption.
MAIFI	Measures the average number of short or very short interruptions (usually less than 3 minutes) , per customer and per year. Results can be disaggregated for different voltage levels
CAIFI	Measures the average number of long interruptions (usually over 3 minutes) over the year.
ASIDI	Measures the average duration of an interruption, weighted by the rated or contracted power of an MV or HV customer, or the transformer rating in a delivery point.
ASAI	Measures service reliability. The ASAI is usually calculated on either a monthly basis (730 hours) or a yearly basis (8,760 hours), but it can also be calculated with respect to any time period

PART FOUR

4. Quality of Supply by Licensees

4.1. Generation Licensee

4.1.1 Frequency

Generators installed in the system, shall be required to be capable of *remaining synchronised* for frequency changes as specified in the **EAPP Interconnection Code/ENTGC**. In that regard, the design of generating units must ensure continuous operation when the frequency changes from 50 Hz+3% to 50 Hz – 5% (i.e. 47.50 Hz – 51.50 Hz).

The Authority shall determine compliance by requesting the Transmission Licensee to submit periodic records of the *number, magnitude and duration* of frequency excursion events. The Authority shall also request information on the times that the generating units are *desynchronised* when the frequency is within 47.50 Hz – 51.50 Hz.

4.1.2 Plant Availability Index

The Authority shall monitor the operating performance of each power plant based on the plant's availability by using the **Plant Availability Index** which is defined as:

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

where:

PAI = Plant Availability Index;
H = Number of Hours of Annual Availability;
AC = Available Capacity (MW);
K = Total Installed Capacity in MW;

Alternatively, the plant availability can be determined using the Plant Availability Factor (PAF) which is defined as follows:

$$PAF = \frac{\text{Installed Capacity (MW)} \times 8760 - \text{Unserved Energy due to Outages over the Period (MWh)}}{\text{Total Installed Capacity (MW)} \times 8760}$$

The benchmark for assessing plant availability is shown in **Appendix 1**.

4.1.3 Forced Outage Factor

Another parameter which shall be used to monitor the performance of each power plant is the *Forced Outage Factor*, which is defined as the ratio of annual unserved energy due to forced interruption or outages (MWh), to maximum generation potential of the power plant. The Forced Outage Factor is given as:

$$\text{Forced Outage Factor} = \frac{\text{Amount of unserved energy due to forced outages (MWh)}}{\text{Power Plant Installed Capacity (MW)} \times 8760 \text{ Hours}}$$

The benchmarks for monitoring the Forced Outage Factor for hydro and thermal power plant are shown in **Appendix 1**.



4.1.4 Planned Outage Factor

Planned Outage Factor is the ratio of annual unserved energy (MWh) due to **planned interruption which involve scheduled maintenance activities**. It is defined as the ratio of annual unserved energy due to planned interruption or scheduled maintenance activities (MWh), to the maximum generation potential of the power plant. The Planned Outage Factor is given as:

$$\text{Planned Outage Factor} = \frac{\text{Amount unserved energy due to planned outages (MWh)}}{\text{Power Plant Installed Capacity (MW) X 8760 Hours}}$$

The benchmarks for monitoring Planned Outage Factor for hydro and thermal power plants are specified in **Appendix 1**.

4.1.5 Plant Capacity

In addition to plant availability, the Authority shall also monitor power plant effective capacity by determining the dependable plant capacity, which is defined as:

The ratio of the actual available capacity in MW to the design capacity (name plate rating) in MW.

The benchmark for assessing power plant dependable capacity is specified in **Appendix 1**.

4.2 Transmission System

4.2.1 System Security and Performance

The Authority would require that the transmission system security is in accordance with the n-1 criterion, as specified in the EAPP Interconnection Code. To ensure compliance, the Authority shall use the following indicators to monitor the transmission licensee's quality of service delivery.

- a. Transmission System Planned¹³ Unavailability Index, defined as the sum of all transmission circuits and number of hours in a given period in each circuit, which experiences planned outage, divided by the product of total number of circuits in the system and number of hours in a given period¹⁴;
- b. Transmission System Unplanned Unavailability Index¹⁵;
- c. Transmission System Availability¹⁶.

The benchmarks for assessing transmission system performance are indicated in **Appendix 2**.

4.2.2 Transmission System Voltage

The transmission system operating voltage shall be kept **within ±10% of the nominal voltage**. To ensure quality of service delivery from the licensee, the Authority may request information on the *number, magnitude and duration* of voltage excursions from the Transmission System licensee. This information could relate specifically to the number of transformer stations where the voltage level exceeded the allowable range.

4.3 Distribution System

The quality of service delivered by the distribution licensee shall be monitored by the Authority with respect to the security of the system and effectiveness of the maintenance practices employed by the licensee. The quality of service monitoring will focus on reducing the nuisance associated with the number of times (or frequency) of outages, as well as the duration of the outages. Consequently, the quality of service indices indicated above in Table 4-1, would be used to monitor the distribution system licensee's performance.

Even though a range of indicators are in use in different countries, the use of multiple indicators to quantify the continuity of supply results in more information being available and gives more possibilities to observe trends. **SAIFI and SAIDI** are the basic indices, usually reported in almost all countries, albeit under different names. *With both SAIFI and SAIDI, a reduction in value indicates an improvement in the continuity of service. With CAIDI this may not be the*

¹³ Planned outages are those which are due to scheduled maintenance

¹⁴ This value should vary between 2% and 8%.

¹⁵ This value should vary between 0.1% and 1% for the transmission system.

¹⁶ Should be greater than 90% for the transmission system.

case since a reduction in both SAIDI and SAIFI could still result in an increase in CAIDI. Whereas CAIDI remains a useful index and could be tracked over a period of time, **it is not suitable for comparisons or for trend analysis.**

The benchmarks for assessing the distribution system performance are shown in **Appendix 3.**

PART FIVE

5. Measurement of Customer Satisfaction

Customer satisfaction is measured by conducting a “*Customer Satisfaction Survey*” and *drawing inferences from the survey results based on a reasonable sample size.* The survey is conducted through well-designed questionnaire using sample surveys. In designing the survey questions, it is imperative that the questions are structured to avoid any ambiguity, and should also allow for inter-period comparisons.

The survey should cover all the customer categories and should represent a reasonable sample (about 1,000 customers). This is to ensure robustness of the survey results. As a guide, the questions should at least cover the following areas of Quality of Service:

- **Quality of Supply:** Duration and number of outages, information to customers during incidents;
- **Technical Quality of Electricity:** Voltage stability, voltage dips, voltage waveform anomalies and frequency excursions etc.;
- **Quality of Customer Services:** Meter reading, billing promptness, resolution of billing disputes, connections, ease of contact etc.

In addition to sample surveys, *Event Surveys* can be conducted, which focus on customers who had occasional contacts with the licensees. The Event Survey usually focus on the following questions:

- Complaints arising out of contract management;
- Complaints and issues arising from voltage instability;
- Appointment for specific interventions;
- Connection requests;
- Meter checking requests;
- Billing issues or query.



PART SIX

6. Administrative penalty for non-compliance to customer service quality standard

The purpose of this administrative penalty is to reduce the risk of harm and level of the field for the licensees that operate fairly and in accordance with the Customer service standard; the objective of customer service standard is to determine the quality standards of electricity services that are provided by a Licensee in Ethiopia. The administrative penalty is applied when there is a clear evidence that a licensee is not complying with customer's service quality standard.

As per article 76/3/ of energy regulation, EEA could impose administrative penalty on the service provider for non-compliance based on the gravity of the fault up to ten Million Birr (10,000,000);

7.1 The magnitude of financial penalty levied on a licensee, will be determined based on Non-compliance Level and Impact level

TABLE 1: Impact Levels

Impact Level	Description
Low	The potential or actual impact of a breach noncompliance was negligible or there was no impact.
Medium	The potential or actual impact of a breach noncompliance was material.
High	The potential or actual impact of a breach noncompliance was severe.

7.2 The non-compliance level is determined by assessment of the frequency of noncompliance and described as (Low, Moderate, High and Severe)

TABLE 2: Non-Compliance Level Criteria

Non-Compliance Levels				
Noncompliance frequency	Low	Moderate	High	Severe
	0 or 1 (noncompliance frequency)	2 (noncompliance frequency)	3 (noncompliance frequency)	4 (noncompliance frequency)
Severity	Low	Moderate	High	Severe

7.3 The amount of financial penalty imposed on the licensee takes into account the following conditions during the assessment of the noncompliance

- a. the circumstances in which the noncompliance occurred;

- b. the severity of the noncompliance;
- c. the extent to which the noncompliance was inadvertent, negligent, deliberate or otherwise;
- d. the length of time the noncompliance remained unresolved;
- e. the actions of the *licensee* on becoming aware of the noncompliance
- f. whether the *licensee* disclosed the matter to the *EEA* on its own or whether it was prompted to do so;
- g. any benefit that the *licensee* obtained or may have obtained as a result of the noncompliance;
- h. any previous noncompliance by the *licensee* of the *rules* or of the conditions of its *license*;
- i. the actual or potential impact of the noncompliance on customers & the community;
- j. the actual or potential impact of the noncompliance on the *reliability* of the *integrated power system*;
- k. the immediacy of the threat that the noncompliance poses to the *reliability* of the *integrated power system*
- l. presence and quality of the *licensee*'s compliance program;
- m. past case communications concerning past remedies implemented for related noncompliance,
- n. The level of cooperation provided by the *licensee* in resolving the investigation,
- o. Failure of a party to comply with a directive or order given by the *EEA*.
- p. Noncompliance with the provisions issued under the proclamation, the energy regulation & directive
- q. Such other matters as the *EEA* considers appropriate.

7.4 The amount of financial penalty to be posed for noncompliance is described as;

Non-Compliance Level (Severity and Non compliance Frequency)								
Impact Level	Low		Moderate		High		Severe	
	Range Limit (in birr)		Range Limit (in birr)		Range Limit (in birr)		Range Limit (in birr)	
	Min	Max	Min	Max	Min	Max	Min	Max
Low	20,000	250,000	20,000	500,000	30,000	750,000	50,000	1,000,000
Medium	20,000	1,000,000	40,000	2,500,000	60,000	5,000,000	100,000	7,500,000
High	40,000	2,500,000	80,000	5,000,000	120,000	7,500,000	200,000	10,000,000

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PART SEVEN

7. Final Provisions

7.1 Liability

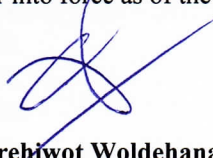
1. All installations of wires, meters, transformers or other materials or equipment made by the Licensee shall remain the property of the Licensee and shall not be tampered or interfered with directly or indirectly, by the Customer or any other unauthorized persons;
2. The Customer shall be liable for any damage or loss to the property of the Licensee or other persons, and injury to the Licensee employees or other persons, through such unauthorized tampering or interference.

7.2 Performance Report, Assessment, publications and sanctions for non compliance

1. The Licensee shall provide detailed six-monthly report to the Authority on actual performance against **Service Quality Standards** defined in this Directive, as well as in the Operational Performance as defined in the **Performance Code**, covering Periodic Reporting and Performance Monitoring.
2. The Authority shall prepare and publish an annual report on the *overall performance of Licensees* against **Service Quality Standards** as defined in this Directive, as well as in the **Performance Code**, covering Periodic Reporting and Performance Monitoring.
3. **Consideration of obligation of a license holder: Holders of** generation electricity supply license; electricity transmission license; electricity distribution and sale licensee's license will have to abide by the minimum service as presented in **Appendix 4** Non compliance to the Minimum service standards is subject to penalty as structured in same Appendix

7.3 Effective date of this Directive

This Directive shall enter into force as of the -----



Dr. Frehiwot Woldehana

State minister Ministry of Water Irrigation and Energy

Energy Board Chair Person



Appendices 1. Performance Monitoring Criteria - Supply Reliability

Appendix 1. Generation System Benchmarks

Indicator	Standard
Frequency of Synchronization	50Hz+3%, 50Hz-5% (i.e.47.5Hz – 51.5Hz)
Plant Availability: - Hydro - Thermal - Wind - Geothermal - Waste-to-energy - Solar PV - Diesel - Biomass	≥90% ≥85% ≥85% ≥90% ≥90% ≥90% ≥90% ≥85% ≥90%
Forced Outage Factor: - Hydro - Thermal - Wind - Geothermal - Waste-to-energy - Solar PV - Diesel - Biomass	≤3% ≤5% ≤5% ≤5% ≤5% ≤5% ≤5% ≤5%
Planned Outage Factor: - Hydro - Thermal - Wind - Geothermal - Waste-to-energy - Solar PV - Diesel - Biomass	≤7% ≤10% ≤5% ≤5% ≤5% ≤5% ≤10% ≤5%
Dependable Capacity: - Hydro - Thermal - Wind - Geothermal - Waste-to-energy - Solar PV - Diesel - Biomass	≥95% ≥95% ≥90% ≥95% ≥90% ≥90% ≥90% ≥90%
Capacity Factor¹⁷: - Hydro - Thermal - Wind - Geothermal - Waste-to-energy - Solar PV - Diesel - Biomass	≥60% ≥80% ≥30% ≥90% ≥80% ≥20% ≥80% ≥80%

Appendix 2. Transmission System Benchmarks

Indicator	Standard
Transmission System Unplanned Unavailability (Forced Outages)	$\leq 1\%$
Transmission System Planned Unavailability Index (Due to outages scheduled form routine maintenance)	$\leq 4\%$
Transmission System Availability	$\geq 95\%$
Transmission System Voltage	$\pm 10\%$ of nominal voltage ¹⁸

Appendix 3. Distribution System Benchmarks

Indicator	Low Standard	High Standard
SAIDI (Excludes load shedding and exceptional events):		
Duration of unplanned or forced interruptions per customer, per year	12 Hours	8 Hours
Duration of planned outages or interruptions per customer, per year	5 Hours	1 Hour
SAIFI (Excludes load shedding and exceptional events)¹⁹:		
Frequency or number of unplanned or forced interruptions per customer, per year	15 Times	11 Times
Frequency or number of planned interruptions per customer, per year	10 Times	5 Times
MAIFI	To be tracked	To be tracked
CAIFI	To be tracked	To be tracked
ASIDI	To be tracked	To be tracked
ASAI	To be tracked	To be tracked

NB: Benchmarks set based on AFUR (2013) "Guidelines on Quality of Service for Electricity"

¹⁸ Based on the limits in the Energy Regulation

¹⁹ CAIFI is the inverse or the reciprocal of Customer Interrupted per Interruption Index (CIII). Therefore Quality of Service purposes, only one of the indices is used, but not both