

**DIRECTIVE ON OVERHEAD ELECTRIC LINES AND QUALITY OF SUPPLY No.
EEA/1/2005**

CHAPTER ONE

GENERAL

1 Issuing Authority

This Directive is issued by the Ethiopian Electricity Agency pursuant to the authority vested in it by Articles 55, 67 and 69 of Electricity Operations Council of Ministers Regulations No. 49/1999.

2 Short Title

This Directive may be cited as the “Directive on Clearance of Overhead Electric Lines, and Quality of Supply No. EEA/1/2005”.

3 Definitions

Unless their context requires otherwise, words used in this Directive hereto shall have the definitions given to them in the Electricity Proclamation No. 86/1997, Electricity Operations Council of Ministers Regulations No. 49/1999, and Directives issued thereunder. Other definitions used in this Directive are:

- 3.1 “Apparatus” means any plant, equipment and appliances used for the purposes of generating, transmitting or distributing electric energy, and also includes electric lines, fittings, and appliances designed for use by consumers of electric energy for lighting, heating, motive power and other purposes;
- 3.2 “Electric Line” means a wire, conductor or other means used for the purpose of transmitting or distributing electric energy, and any casing, coating, covering, tube, pipe or insulation enclosing, surrounding or supporting that line, or any part thereof;
- 3.3 “Insulated Conductor” means a conductor encased within material of sufficient composition and thickness giving it electrical insulation;
- 3.4 “Insulation” means non-conducting material enclosing, surrounding or supporting a conductor, or any part thereof, and of such quality and thickness as to be suitable for the purposes of the Article in which the term is used;
- 3.5 “kV” means 1,000 volts.
- 3.6 “Overhead Electric Line” means any electric line which is placed above ground and in the open air.
- 3.7 “Support” means any stays and struts used for carrying electric lines or apparatus but does not include insulators, their fittings or any building or structure the principal purpose of which is not the support of electric lines or apparatus.

4 Objective of the Directive

The objective of this Directive is to set standards for the clearance spaces associated with transmission and distribution lines for the purpose of the protection of persons from risk and property from damage, as well as to specify the quality of supply voltage.

CHAPTER TWO

OVERHEAD ELECTRIC LINES AND QUALITY OF SUPPLY

5 Restriction on Placing Electric Lines Above Ground

No Licensee shall use any electric lines, wires, cables or supports above ground, except those in generating stations or substations, which do not comply with this part of the Directive.

6 Clearance of overhead electric lines

6.1 Subject to Sub-Article (6.2) of this Article, the height above ground of an overhead electric line shall not, at any time, be less than the following minimum distances corresponding to the voltage of the line:

6.1.1 For a line with a voltage not exceeding 1kV - 5.5 meters above a road accessible to vehicular traffic and 4.6 meters above any other point

6.1.2 For a line with a voltage exceeding 1kV but not exceeding 33kV - 6.7 meters above a road accessible to vehicular traffic and 5.2 meters above any other point

6.1.3 For a line with a voltage exceeding 33kV but not exceeding 66kV - 8.0 meters above a road accessible to vehicular traffic and 6.5 meters above any other point

6.1.4 For a line with a voltage exceeding 66kV but not exceeding 132kV - 8.0 meters above a road accessible to vehicular traffic and 7.0 meters above any other point

6.1.5 For a line with a voltage exceeding 132kV but not exceeding 230kV - 10.5 meters above a road accessible to vehicular traffic and 8.0 meters above any other point

6.1.6 For a line with a voltage exceeding 230kV but not exceeding 400kV - 12.0 meters above a road accessible to vehicular traffic and 10.0 meters above any other point

6.2 The provisions of this Article do not apply to any overhead electric line at a point where it is not over a road accessible to vehicular traffic and at the same time which:

6.2.1 is surrounded by insulation, or

6.2.2 is not surrounded by insulation and is at least 4.3 metres above ground and connects apparatus mounted on a support to any overhead line, or

6.2.3 is connected with earth.

6.3 An overhead electric line other than a low voltage insulated conductor shall not, at any time, be attached to the façade of any building.

6.4 A low voltage insulated conductor shall not, at any time, be closer to a part of a building or structure than the following minimum distances:

6.4.1 Vertically from ground 2.5 meter

6.4.2 windows and doors 0.3 meter

6.4.3 Each side of and below windows 0.5 meter

6.4.4 Each side of doors and balconies 1.0 meter

- 6.4.5 From metallic parts of buildings and structures 0.05
meter
- 6.5 An overhead electric line shall not, at any time, be closer to a part of a building or structure than the following minimum distances corresponding to the voltage of the line:
- 6.5.1 Vertically above those parts of a building or structure normally accessible to a person - 3.7 meters for a line with a voltage not exceeding 1kV and 4.6 meters for a line with a voltage exceeding 1kV but not exceeding 33kV
 - 6.5.2 Vertically above those parts of a building or structure not normally accessible to a person but on which a person can stand - 2.7 meters for a line with a voltage not exceeding 1kV and 3.7 meters for a line with a voltage exceeding 1kV but not exceeding 33kV
 - 6.5.3 In any other direction from those parts of a building or structure not normally accessible to a person - 0.6 meters for a line with a voltage not exceeding 1kV and 2.7 meters for a line with a voltage exceeding 1kV but not exceeding 33kV
 - 6.5.4 In any other direction from windows, openings and balconies and those parts of a building or structure normally accessible to a person - 1.5 meters for a line with a voltage not exceeding 1kV and 2.7 meters for a line with a voltage exceeding 1kV but not exceeding 33kV
 - 6.5.5 In any direction from a footbridge - 4.6 meters for a line with a voltage not exceeding 33kV
- 6.6 The provisions of Sub-Article (6.5) of this Article do not apply to the connection of an overhead electric line to a pole or tower, or to that part of an overhead electric line close to a building or structure for the purposes of supplying electricity to the building or structure.
- 6.7 An overhead electric line shall not, at any time, be closer to the track of a small gauge railway/tramway system than the following minimum distances corresponding to the voltage of the line:
- 6.7.1 Not exceeding 1kV 7.0 meter
 - 6.7.2 Exceeding 1kV but not exceeding 66kV 8.5 meter
 - 6.7.3 Exceeding 66kV but not exceeding 230kV 10.5 meter
 - 6.7.4 Exceeding 230kV but not exceeding 400kV 12.0 meter

7 Clearance from Vegetation

- 7.1 The growing of trees under overhead electric lines shall not be allowed. An overhead electric line shall not, at any time, be closer to vegetation in all directions than the following minimum distances corresponding to the voltage of the line:
- 7.1.1 Not exceeding 33kV 2.5 meter
 - 7.1.2 Exceeding 33kV but not exceeding 66kV 6.0 meter
 - 7.1.3 Exceeding 66kV but not exceeding 132kV 13.0 meter

7.1.4 Exceeding 132kV but not exceeding 230kV 15.0 meter

7.1.5 Exceeding 230kV but not exceeding 400kV 19.0 meter

7.2 The space vertically above the overhead electric line shall be kept clear of vegetation at all times.

8 Clearance from Other Lines

8.1 An overhead electric line shall not, at any time, be closer to a part of communication line than the following minimum distances corresponding to the voltage, of the line:

8.1.1 Not exceeding 1kV 1.2 meter

8.1.2 Exceeding 1kV but not exceeding 33kV 1.8 meter

8.1.3 Exceeding 33kV but not exceeding 132kV 4.6 meter

8.1.4 Exceeding 132kV but not exceeding 230kV 6 meter

8.1.5 Exceeding 230kV but not exceeding 400kV 9 meter

8.2 The provisions of Sub-Article (8.1) of this Article do not apply to fibre-optic communication lines.

8.3 An overhead electric line shall not, at any time, be closer to another overhead electric line than the following minimum distances corresponding to the voltage of the line:

8.3.1 Not exceeding 1kV 0.6 meter

8.3.2 Exceeding 1kV but not exceeding 33kV 1.2 meter

8.3.3 Exceeding 33kV but not exceeding 66kV 4.0 meter

8.3.4 Exceeding 66kV but not exceeding 230kV 4.5 meter

8.3.5 Exceeding 230kV but not exceeding 400kV 7.0 meter

8.4 The nominal voltage of the lower circuit of an overhead line must not be greater than the nominal voltage of the upper circuit.

9 Harmonic Voltage Distortion

9.1 Individual harmonic voltage distortion levels for the low and medium voltage supplies, where harmonic voltage distortion refers to the rms voltage as percentage of rms of the fundamental, shall not be more than the following maximum values:

9.1.1 For harmonic order 3 5%

9.1.2 For harmonic order 5 6%

9.1.3 For harmonic order 7 5%

9.1.4 For harmonic order 9 5%

9.1.5 For harmonic order 11 3.5%

9.1.6 For harmonic order 13 3%

9.2 Total Harmonic Distortion shall not be more than 8%

CHAPTER THREE

MISCELLANEOUS PROVISIONS

10 Erection of poles and towers

Poles, towers and other structures supporting overhead electric lines shall:

- 10.1 be as vertical as is practicable;
- 10.2 not lean over the kerb line in the direction of a vehicular carriageway more than 5 degrees from the perpendicular; and
- 10.3 elsewhere not lean more than 10 degrees from the perpendicular.

11 Position, insulation and protection of electric lines

11.1 Any part of an electric line placed above ground, which is not connected with earth and which is ordinarily reached by hand from any scaffolding, ladder or other construction erected or placed on, in, against or near to a building or structure shall be:

- 11.1.1 de-energised, or
- 11.1.2 so insulated that it is protected against mechanical damage or interference, or
- 11.1.3 adequately protected to prevent danger.

11.2 Nothing in this Article shall require the Licensee to insulate or protect any part of any electric line placed above ground which, but for the provisions of Article (11.1), would not be required to be insulated or protected, unless:

- 11.2.1 it has been given reasonable notice of the erection of the building or structure which would cause that line to become accessible, and
- 11.2.2 unless otherwise agreed between them, the person responsible for the erection of that building or structure which would cause that line to become accessible shall have paid, or undertaken to pay, the reasonable cost of the insulation of the line.

11.3 Nothing in this Article shall be taken to allow the application of temporary insulation to any electric line other than a low voltage line.

12 Penalty

Any person who contravenes the provisions of this Directive shall be penalized in accordance with the appropriate provisions of the Proclamation and Regulations.

13 Effective Date

This Directive shall enter into force as of the 10th day of December 2005.

Done at Addis Ababa, this 9th day of December 2005.

General Director of the Ethiopian Electricity Agency

Annex: DSM Guidance Notes

Introduction

1 Overview

- 1.1 These Guidance Notes describe the economic and financial analyses and criteria to be used by Licensees and the Agency to evaluate DSM Activities proposed by Licensees in their DSM Plan. It also describes the financial analyses to be used in deciding on:
- i) the level of incentives to be provided by Licensees to Participants to encourage participation, and
 - ii) any reductions in the level of charges to Beneficiaries for the DSM measures provided to Participants by Licensees.
- 1.2 Licensees should submit economic and, where appropriate, financial discounted cash flow analyses in their DSM Plans for Activities that meet the economic and financial criterion described below. Licensees may also submit to the Agency for information those economic analyses of Activities that do not meet the economic criterion described below and that are not included in Licensees' proposed DSM Plans.
- 1.3 Only those Activities that meet the economic and financial criterion shall be submitted by Licensees for approval by the Agency and shall be approved by the Agency and incorporated in the Approved DSM Plan.

Economic evaluation

2 Economic criterion

The Agency shall use the expected economic internal rate of return of the DSM Activities to determine their viability for approval.

3 Validity of economic analyses

Economic analyses of DSM Activities submitted by Licensees in their DSM Plan shall have been conducted within five years prior to the date of submission of the DSM Plan.

4 Economic costs

Economic costs used in the economic evaluation may include any of following, irrespective of who incurs the costs of the DSM Activities:

- a) the full cost of the DSM equipment and its installation cost,
- b) the cost of administering the DSM Activity,
- c) the cost any resources used by consumers to understand and make use of DSM measures introduced under the DSM Activity, and

5 Economic benefits

Economic benefits used in the economic evaluation may include any of the following, irrespective of who gains from the DSM Activities, provided that they are Ethiopian citizens:

- a) reductions in the Licensee's capital or operating costs, calculated using the marginal costs of electrical energy, generation capacity and transmission and distribution network capacities.,
- b) reductions in customers capital or operating costs,
- c) reasonable monetisation of external benefits expected to arise from the DSM program including reduced or avoided environmental damage or other benefits of reduced energy consumption [*eg., the health costs of emissions or the monetary value of greenhouse gas emission credits that could be earned through the international Clean Development Mechanism or other climate change programmes*].

6 Economic analysis

The economic analysis shall:

- a) be presented in constant (real) Ethiopian Birr of any given year,
- b) be presented over a time period of not less than ten years.

Financial evaluation

7 Financial evaluation of Participants in the DSM Activities

- 7.1 Licensees shall not submit for approval and the Agency shall not approve DSM Activities that involve incentives, including subsidies or subsidised equipment, to consumers or third-parties if the consumers or third-parties could reasonably be expected to undertake the activity themselves without those incentives.
- 7.2 Licensees shall describe the reasons that the DSM Activities would not be implemented by consumers or third parties within five years, or other timeframes agreed with the Agency, without the proposed DSM incentives and that the DSM Activities would overcome or remove those barriers to implementation.
- 7.3 The Agency shall use the expected financial internal rate of return of the DSM Activities as well as their payback period to determine their viability for approval.

8 Financial costs to DSM Activity Participants

Licensees shall include the following financial costs that would be incurred by Participants under the proposed DSM Activities if the Participants were to undertake the Activities without support or incentives provided under the DSM Activities:

- a) equipment purchase and installation costs for the DSM measures,

- b) operating costs of the DSM measures,
- c) the cost any other resources used by Participants to understand and make use of DSM measures.

9 Financial benefits to DSM Activity Participants

Licensees shall include the following financial benefits that would be incurred by Participants under the proposed DSM Activities if the Participants were to undertake the Activities without support or incentives provided under the DSM Activities:

- a) reductions in the costs of purchasing electrical energy, electrical demand and, where appropriate, other energy,
- b) any customer savings from reduced taxes on energy bills.

10 Financial analysis

The financial analysis shall:

- a) be presented as a discounted cash flow analysis,
- b) be conducted over a period of not less than five years,
- c) be presented in constant (real) Ethiopian Birr of any given year.

ELECTRICITY SERVICES QUALITY STANDARDS DIRECTIVE – No. 2/2005

DRAFT awaiting approval

PART ONE

GENERAL

1. Issuing Authority

This Directive is issued by the Ministry of Infrastructure (hereafter referred as the “Ministry”) pursuant to the authority vested in it by Articles 28 (2) of the Electricity Proclamation No. 86/1997 and Article 77 of the Electricity Operations Council of Ministers Regulations No. 49/1999.

2. Short Title

This Directive may be cited as the “Electricity Services Quality Standards Directive No. 2/2005”.

3. Definitions

3.1 Words and phrases used in this Directive shall have the meaning and application given to them in the Proclamation No. 86/1997, Electricity Operation Regulations No. 49/1999, and Directives issued there under.

3.2 In this Directive, unless the context requires otherwise:

3.2.1 “Availability Factor” shall mean the ratio of installed plant capacity (MW) multiplied by 8760 hours less total annual unserved energy due to all planned and forced outages, to the installed plant capacity (MW) multiplied by 8760 hours.

3.2.2 “Accounts Receivable Lag” shall mean the ratio of the accounts receivable balance at the end of the year to the average daily revenues.

3.2.3 “Billing Lag” shall mean the number of days after meter reading until the time the bill is sent to the customer.

3.2.4 “Complaints Procedure” shall mean 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.

3.2.5 “Day “ shall mean a government working day. It excludes weekend days and national holidays.

- 3.2.6 “EEPCo” shall mean the Ethiopian Electric Power Corporation.
- 3.2.7 “Fiscal year” shall mean the fiscal year of the Government of Ethiopia which is based on the Ethiopian calendar.
- 3.2.8 “Forced Interruption” shall mean an interruption encountered when a component of the supply system 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.
- 3.2.9 “Forced Outage Factor” shall mean the ratio of annual un-served energy (MWh) due to forced removal of a unit or component from service for work to the installed plant capacity (MW) multiplied by 8760 hours.
- 3.2.10 “MW Capacity” shall mean the ratio of the actual available capacity in MW to the design capacity (name plate rating) in MW.
- 3.2.11 “Network” shall mean the transmission or distribution lines, all associated equipment and accessories of any Licensee.
- 3.2.12 “Non momentary outage” shall mean an outage that lasts for more than 2 minutes.
- 3.2.13 “Planned Interruption” shall mean 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 maintenance or repair.
- 3.2.14 “Planned Outage Factor” shall mean the ratio of annual un-served energy (MWh) due to planned work that generally involves an overhaul work, either on a unit or component, to the installed plant capacity (MW) multiplied by 8760 hours.
- 3.2.15 “Service Quality Standards” shall mean 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

4. Objective of the Directive

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

PART TWO

CUSTOMER COMPLAINTS HANDLING

5. Customer Complaints Procedure

- 5.1 The Licensee shall implement a Complaints 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.
- 5.2 The Complaints Procedure shall include the provision that the Licensee will register all complaints and will acknowledge all written complaints within 10 days and will respond to all complaints, whether written or verbal, within 20 days.
- 5.3 A copy of the Complaints Procedure and all revisions to the Complaints Procedure shall be sent to the Agency. A copy of the Complaints Procedure, upon request, shall be given freely to any customer of the Licensee.
- 5.4 The Licensee shall publicise appropriately the existence of the Complaints Procedure and revisions thereof. The Licensee shall report to the Agency the method by which it has publicised the Complaints Procedure and the number of copies of the Procedure that are given upon request.
- 5.5 The Agency or bodies authorised by the Agency shall investigate complaints made by customers of the Licensee provided that the customer has first complained to the Licensee and is not satisfied with the response of the Licensee or where the Licensee has failed to respond within the prescribed period.
- 5.6 The Licensee's Complaints Procedure shall indicate that customers have the right to complain to the Agency or bodies authorized by the Agency if they consider that the response by the Licensee to their complaint is unsatisfactory.

6. Record of Complaints

- 6.1 The Licensee shall keep records of all complaints and shall prepare and submit annual complaint analysis report to the Agency.
- 6.2 The Agency may issue from time to time format for the complaints analysis report.

7. Application

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

PART THREE

CUSTOMER SERVICE QUALITY STANDARDS – DISTRIBUTION AND SALE

8. Restoring a Supply Following a Distribution System Failure

- 8.1 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.
- 8.2 This shall only apply if the Licensee is made aware of the interruption to supply.

9. Providing an Estimate of Charges

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 3 days.

10. Giving Notice of Supply Interruption

Where the Licensee requires interrupting supply to carry out planned maintenance or other planned work to the network, the Licensee shall notify the customers 24 hours before the interruption is to take place.

11. Voltage Problems

Where a customer requests the Licensee to rectify voltage problems of his supply, the Licensee shall investigate and, where the work only requires improvement to the low voltage network, give a solution to the problem within 15 days, or challenge the request.

12. Responding to Meter Accuracy Queries

Where a customer requests the Licensee about the accuracy of his meter, the Licensee shall investigate and respond within 10 days, or challenge the request.

13. Responding to Queries from Customers

If a customer enquires in writing about:

- a) the accuracy of his account;
- b) the accuracy of an estimate of charges, or
- c) any other relevant issue.

the Licensee shall respond to that enquiry within 5 days.

14. Making and Keeping Appointments

- 14.1 If a customer requests that the Licensee visit the customer's property in connection with the supply of electricity or other services covered in this Part, the Licensee shall:
 - a) offer an appointment; and

b) keep that appointment.

14.2 If the Licensee has to change the appointment then the Licensee shall notify the customer the change of that appointment at least one day in advance. However the Licensee cannot change the appointment more than once.

15. Providing a New Supply, Improving or Relocating Existing Supply Installations

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

- a) For single phase_____4 days
- b) For three phase_____13 days

15.2 The prescribed time runs from the time that the prospective customer has agreed terms with the Licensee

16. Re-connecting Supply Following Payment

16.1 Where a customer has been disconnected for default in payment the Licensee shall reconnect the supply within 24 hours after the customer has effected payment of owed invoices and overcharges

16.2 This standard shall not apply in those cases where the supply has been disconnected because of any illegal act of the customer.

17. Meter Reading

Customers shall have their meter read at least once in a month.

PART FOUR

AVERAGE SYSTEM STANDARDS FOR RELIABILITY OF SUPPLY AND COMMERCIAL SERVICE QUALITY – DISTRIBUTION

18. Planned and Forced Interruptions

The Licensee shall not exceed the values prescribed in Table 1 for the parameters described.

Type of measure	Measured as	Values
Frequency of outages caused by planned interruptions	Interruption frequency per customer per year (numbers)	5
Duration of outages caused by planned interruptions	Interruption duration per customer per year (hours)	5

Frequency of non - momentary outages caused by unplanned interruptions	Interruption frequency per customer per year (numbers)	15
Duration of non - momentary outages caused by unplanned interruptions	Interruption duration per customer per year (hours)	20

Table 1. Average parameters for planned & forced interruptions with prescribed values

19. Technical and Non-Technical Losses

19.1 The Licensee shall not exceed combined transmission and distribution technical and non-technical losses set out in Table 2.

19.2 Beyond fiscal year 2001, the Licensee shall maintain the overall losses below the level of 12%.

Table 2. Overall losses of Transmission and Distribution Networks

<u>Fiscal Year</u>	<u>Losses in %</u>
1997	19%
1998	18%
1999	16%
2000	14%
2001	12%

20. Revenue Collection

20.1 From fiscal year 1997 to 1999 the Licensee shall maintain the Billing Lag below the level of 30 days .

20.2 Beyond fiscal year 1999, the Licensee shall maintain the Billing Lag below the level of 25 days.

20.3 The Licensee shall not exceed the Accounts Receivable Lag targets set out in Table 3.

20.4 Beyond fiscal year 2001, the Licensee shall maintain the Accounts Receivable Lag below the level of 35 days.

Table 3. Accounts Receivable Lag

<u>Fiscal year</u>	<u>Accounts Receivable Lag (days)</u>
1997	50
1998	45
1999	41
2000	38
2001	35

PART FIVE

SERVICE QUALITY STANDARDS – GENERATION (ONLY FOR HYDRO)

21. Forced Outage

Forced outage factor shall not exceed 0.5%.

22. Planned Outage

Planned outage factor shall not exceed 2.5%.

23. Availability

Availability factor shall not be less than 97%.

24. MW Capacity

MW capacity for each unit shall not be less than 90%.

PART SIX

SERVICE QUALITY STANDARDS – TRANSMISSION

25. Losses

25.1 The Licensee shall not exceed combined transmission and distribution technical and non -technical losses set out in Table 2.

25.2 Beyond fiscal year 2001, the Licensee shall maintain the overall losses below the level of 12%.

PART SEVEN

MISCELLANEOUS

26. Annual Report and Publication of Performance

26.1 The Licensee shall provide detailed annual reports to the Agency on actual performance against Service Quality Standards defined in this Directive.

26.2 The Licensee and the Agency shall publicize performance against targets.

26.3 Distribution and Sales Licensee shall publicize performance by means of posters prepared annually and located at cash collection offices and/or in leaflets sent with one invoice each year to customers as may be appropriate.

27. Effective Date

This Directive shall enter into force as of the ___th day of _____ 2005.