

GOVERNMENT NOTICE NO. 11

ELECTRICITY ACT  
(CAP. 73:01)

ELECTRICITY BY-LAWS, 2012  
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IN EXERCISE of the powers conferred by section 52 of the Electricity Act, the Malawi Energy Regulation Authority makes the following By-laws—

## PART I—PRELIMINARY PROVISIONS

1. These By-laws may be cited as the Electricity By-laws, 2012. Citation
2. In these By-laws, unless the context otherwise requires— Interpretation

“additional earth” means earthing equipment of an approved type, applied after the issue of a safety document;

“applicant” in relation to a service, means a natural person or legal entity in the process of seeking to become a customer of a service provider;

“apparatus” means any item of electrical machinery or equipment in which conductors are used or supported, or of which they form part;

“auditor” means a person registered as an accountant or auditor in terms of the Public Accountants and Auditors Act; Cap. 53:06

“authorized person” means an authorized person appointed by the licensee in writing to carry out specific operational duties;

“billing error” means an error by a service provider resulting in incorrect charges to the customer—

(a) billing errors include—

(i) incorrect meter readings or clerical errors by a service provider representative, such as applying the wrong rate;

(ii) performing an incorrect calculation; or

(iii) failure by the service provider to send a bill to a customer;

(b) billing errors do not include—

(i) errors resulting from theft or unauthorized use, switched or mismarked meters by other than the service provider;

(ii) inaccessible meter location; or

(iii) failure of the customer to take advantage of a rate or condition of service that may apply;

“business day” means any day other than Saturday, Sunday or a public holiday;

“cable” means an insulated conductor or an assemblage of such conductors enclosed within a common sheathing;

“caution notice” means a notice in writing conveying a warning against interference;

“circuit main earth” means earthing equipment of an approved type, applied before the issue of, and at a position recorded in a safety document;

“Committee” means the Electrical Installations Permits Committee established under these By-laws;

“competent person” means a person appointed by a licensee in writing—

(a) having sufficient technical knowledge or experience to enable him avoid danger and who may be nominated to receive and clear specified safety documents; or

(b) being capable of installing electrical installations and of altering, extending and maintaining existing electrical installations;

“complaint” means any communication by an applicant or a customer to a service provider alleging—

(a) the service provided by the service provider to be inadequate and in need of improvement;

(b) a breach of the contract, if any, under which the service provider provides electricity service to that customer; or

(c) a breach by the service provider of any applicable law;

“conductor” means a bar, tube, wire or line used for conducting electricity;



“customer installation” means the consumer’s electrical wiring together with any electricity consuming device connected with such installation;

“control engineer” means—

(a) for the generation control centre, an engineer responsible for the operation of the generation equipment;

(b) for the Load Dispatch Centre, an engineer responsible for coordinating generation, transmission and supply operation; or

(c) for the Area Control Centre, an engineer responsible for the operation of the distribution systems in a designated area;

“danger” means a risk to health, life or bodily injury;

“danger notice” means a notice of durable material inscribed with the word “DANGER” in white letters at least 31 mm in height together with a red symbol, illustrating a skull and cross-bones, all on a red background;

“dead” means disconnected from a live system and fully discharged;

“designated engineer” means an engineer appointed by a licensee to be responsible for the application of these By-laws;

“disconnection notice” means a notice stating—

(a) in bold-face at the top of the notice. “Disconnection Notice”;

(b) the date on or after which disconnection will occur;

(c) that if the customer disputes the reason for disconnection, the customer may file a complaint with the service provider and request that the Authority mediates or arbitrates the dispute between the customer and the service provider in the event that the customer remains unsatisfied with the service provider’s reason for disconnection of service to the customer; and

(d) the address and telephone numbers of the Authority;

“earth” means the conductive mass of the earth, whose electric potential at any point is conventionally taken as zero;

“earthed and connected with earth” means connected with the general mass of earth in such manner as will ensure at all times an immediate and efficient discharge of electricity and cognate expressions shall be construed accordingly;

“electrical inspector” means a person appointed in accordance with by-law 102;

“electrical installation work” means the installation, alteration or repair, wholly or partially, of any conductor, apparatus or system of wiring in or upon premises, connected or intended to be connected to a supply of electricity;

"electrical installations person" means a person who carries out electrical installations work and holds a valid permit issued under these By-laws;

"electric line" means a cable, overhead line or other equipment intended to be used for the purpose of conveying, transmitting or distributing electricity together with any casing, covering, tube, pipe or insulation surrounding or supporting the same, or any part thereof or any apparatus connected therewith for the purpose of conveying, transmitting or distributing electricity;

"estimated system expansion cost" has the meaning given in by-law 179;

"extra-low-voltage" means normal operating voltage not exceeding 30 volts alternating current or 50 volts direct current;

"failing load" means a load on a support which, if exceeded will result in the conductor not being supported in accordance with these By-laws;

"high-voltage" means voltage exceeding 650 volts AC;

"high-voltage live line work" means work in an approved manner on the conductors or apparatus of a high-voltage overhead line, with the conductors being live;

"immediate supervision" means supervision by a person, having adequate technical knowledge, experience and competence, who is continuously available at the location where work or testing is in progress and attends the work area as is necessary for the safe performance of the work or testing;

"insulated conductor" means a conductor covered with insulation suitable for the normal operating voltage;

"insulation" means non-conducting material rounding, or supporting a conductor or any part thereof;

"isolated" means disconnected from an associated plant, apparatus or conductor by an isolating device in the isolating position or by adequate physical separation with sufficient gap;

"isolating device" means a device for rendering plant and apparatus isolated;

"key-safe" means an approved type of device used for the secure retention of keys;

"Licensed Activity" means an activity for the generation, distribution, transmission, import or export of electricity for which a licence is intended to be or has been granted under the Act;

"limitation-of-access" means a safety document that defines the limits and nature of work that may be carried out from the ground level in high voltage substations or when verbal instructions are not considered sufficient for that purpose, and where a permit-to-work or sanction-for-test is not applicable on medium voltage network;

"live" means electrically charged;

"line conductor" means a conductor of an overhead line;

"low-voltage" means normal operating voltage exceeding 30 volts AC or 50 volts direct current but not exceeding 250 volts;

"main" means an electric line through which electricity is supplied or is intended to be supplied by the service line;

"medium-voltage" means normal operating voltage exceeding 250 volts but not exceeding 650 volts;

"metal armouring" means a metal wire or a metal type completely covering a cable and manufactured as an integral part of the cable;

"metal sheathing" means a continuous and water tight metal sleeve surrounding a cable and manufactured as an integral part of the cable;

"metal-work" means any metal-work other than—

- (a) a conductor and its associated live parts; or
- (b) an earth conductor;

"overhead line" means a conductor erected above ground and in the open air and includes any pole-mounted substation or switchgear associated therewith;

"permit" means a permit issued under these By-laws;

"permit-to-work" means a safety document specifying the high-voltage apparatus made safe to work on and the work that is to be carried out;

"personal supervision" means supervision by a person having adequate technical knowledge, experience or competence such that he is always in the presence of the person being supervised while the work or testing is being carried out;

"plant" means a mechanical plant including all machinery and equipment not elsewhere defined as apparatus;

"pole mounted substation" means transformer equipment, high-voltage switchgear or high-voltage apparatus mounted on a support and associated with the operation and control of an overhead line;

"private owner" means—

- (a) a person producing electricity for own use and not for sale; and
- (b) a person who generates electricity for own use and in these By-laws, where the context admits, licensee includes a private owner;

"protective multiple earthing" means more than one connection with earth in accordance with these By-laws;

"ring-fence" means the keeping of separate accounting records in respect of a licensed activity so that revenue and cost, assets and liabilities, reserves and provisions of or reasonably attributable to the licensed activity are separately identifiable in the books of the licensee from those of any other activity, business or operations of the licensee;

"safety distance" means the distance from the nearest high-voltage exposed conductor not earthed, or from an insulator, supporting a high-voltage conductor which must be maintained to avoid danger;

"safety document" means a limitation of access, permit-to-work or sanction-for-test;

"safety lock" means a device, for instance a padlock, used exclusively for approved purposes, such as locking off the points at which the circuit can be energized, and different from all other standard locks used in systems;

"sanction-for-test" means a safety document specifying the high-voltage apparatus made safe for testing, and the conditions under which the testing is to be carried out;

"senior authorized person" means an authorized person appointed in writing by a licensee, to carry out specific operational duties that may include authority to issue and cancel safety documents;

"service cable" means the final cable provided by the service provider connecting to the service provider's network;

"service line" means an electric line through which electricity may be supplied or is intended to be supplied by the licensee to a consumer either from a mains or directly from the premises of the licensee;

"service provider" means a person licensed by the Authority as a distributor of electricity;

"special pricing agreement" means an agreement between a licensee who distributes electricity and a customer whereby the licensee, notwithstanding these By-laws, offers to the customer charges or tariffs lower than those approved by the Authority for that licensee;

"supply terminals" means the end of a service line at which the supply of electricity is delivered from the said line to the consumer;

"support" means a structure or pole for supporting an overhead line and includes any stay or strut associated therewith;

"switching" means the operation of circuit breakers, isolators, disconnectors, fuses or other methods of making or breaking an electrical circuit or the application and removal of circuit main earths;

"system" means an electrical system in which conductors and apparatus are electrically connected to a common source of supply.

"system expansion" means an expansion of the capacity of a service provider's network, including transformer upgrading, in order to connect more customers to an area served by the existing distribution network;

"system extension" means an extension of a service provider's existing electricity distribution system to an area not previously served by the service provider and shall not include a customer service cable;

"tariff" means a price or schedule of prices for the supply and distribution of electricity to customers by a service provider as approved by the Authority;

"terms and conditions of service" means, with respect to any particular service provider, the terms and conditions on which the Authority has authorized the service provider to sell electricity to its customers;

"telecommunication" bears the meaning as defined in the Communications Act; Cap. 68 01

"telecommunication line" bears the meaning as defined in the Communications Act. Cap. 68 01

"telecommunication lines protection" means standards to enforce section 40 (2) (b) of the Communications Act; Cap. 68 01

"voltage" means—

(a) the electro-motive force existing between any pair of live conductors forming part of the common supply of electricity or between any part of either of such conductors and earth; and

(b) in the case of alternating current, means the virtual voltage or root-mean square value as determined by the square root of the mean value of the squares of the instantaneous values of the voltage during complete cycle;

"working and access clearance" means the distance to be maintained from the nearest live exposed high-voltage conductor, to ensure observance of the safety distance in work on systems; and

"working party" means—

(a) persons under the immediate supervision of a competent or senior authorized person and shall be a member of the working party; or

(b) a competent or senior authorized person when working alone.

#### PART II—LICENSING

3. A person applying for issue, transfer, amendment or renewal of a licence shall pay the application fee specified in Part A of the First Schedule hereto. Licence application fees

4. The objects of the licensing system are to promote— Objects of licensing  
(a) effective, reliable and appropriate systems of electricity supply;

- (b) long-term sustainability of resources;
- (c) efficiency and cost effectiveness;
- (d) management of quality of supply and services;
- (e) responsiveness to the interests of customers;
- (f) justice, equity and transparency in the electricity supply industry;
- (g) health and safety of persons;
- (h) responsible protection of the environment;
- (i) recognition and response to regional policies, objectives and developments; and
- (j) responsiveness to customers, private, non-governmental and statutory institutions where to do so would support the purposes of the Act.

## Applications

5.—(1) An application for the issue, renewal, amendment or transfer of a licence shall be made in Form EA 1 for generation, Form EA 2 for transmission, import or export and Form EA 3 for distribution contained in Second Schedule hereto and shall be accompanied by the appropriate application fee in accordance with by-law 3 hereof.

(2) Any person making an application shall, in so far as it is applicable to an application, include the following information in an application under paragraph (1)—

(a) the name, nationality and postal, physical and business address of the applicant, and in the case of an application for a transfer of a licence, this information shall be provided with regard to both the licensee and the proposed transferee;

(b) the type of application, namely an application for the issue, renewal, amendment or transfer of a licence;

(c) the type of activity to which the application applies, namely generation, transmission, supply, distribution, importation or exportation of electricity;

(d) in the case of an application for the issue or amendment of a licence—

(i) the proposed location of where the applicant intends to erect or alter plant;

(ii) a description, including a schematic layout, of the proposed plant which the applicant intends to erect or alter; and

(iii) a description, including a schematic layout, of the area within which the applicant intends to carry out the activities to be authorized under the licence;

(e) in the case of an application for the issue of a licence, a complete list of the standard tariffs which the applicant intends to charge, to be specified in the schedule of approved tariffs to be contained in the relevant licence; and

(f) in the case of the issue, renewal, amendment or transfer of a licence, an outline of the intended operational and business plan, unless such plan has already been submitted during a previous application and has not changed in which case such previous plan shall be attached.

(g) in the case of an application for a licence, an estimate of the expected income and expenditure during the first full year of operation and one additional year of the relevant activity to be carried on by the applicant under a licence;

(h) in the case of an application for the issue, amendment or transfer of a licence, copies of letters of recommendation as to the credit worthiness of the applicant or transferee from at least one local commercial bank and one reputable international bank;

(i) in the case of an application for the issue, amendment or transfer of a licence, a copy of the advertisement referred to in by-law 6 and a copy of the newspaper in which such advertisement was placed;

(j) in the case of application for amendment or transfer of licence, the reasons for such amendment or transfer shall be given;

(k) such other particulars the Authority may require in general or in the case of a particular type of or particular licence, or in terms of the Act or any subsidiary legislation made thereunder, in order to enable the Authority to make a decision on such application or on conditions to be imposed on a licence in terms of the Act.

(3) The Authority shall not consider any application unless the Authority has received all the prescribed information.

6.—(1) An applicant applying for the issue, amendment or transfer of a licence shall submit an advertisement to that effect to the Authority which shall be advertised by the Authority at the cost of the applicant not more than fourteen (14) days prior to the submission of such application to the Authority. Advertising

(2) An advertisement referred to in paragraph (1) shall be published in at least one daily newspaper circulating in Malawi.

(3) The advertisement shall—

(a) specify the information required in terms of by-law 5 (2) (a), (b), (c) and (d) (i); and

(b) list the information required in terms of by-law 5 (2) (d) (ii) and (iii), (e), (f) and (g) and indicate clearly the physical address where such complete information can be inspected during normal business hours by any interested person.

7.—(1) Any person desiring to object against an application advertised in terms of by-law 6 may, within a period of thirty (30) days after the date of the publication of an advertisement, lodge a written objection against such application with the Authority. Objections

(2) The objection, shall be lodged in Form EA 4 contained in the Second Schedule hereto, and the person objecting shall include the following information in the objection—

(a) his name, nationality, postal and physical address;

(b) a copy of the newspaper in which the advertisement was placed;

(c) the nature of his interest *vis-à-vis* the application; and

(d) his detailed reasons for the objection.

(3) The Authority shall provide the applicant to whom the objection relates, a complete copy of the objection within seven (7) days of such objection being lodged with the Authority.

(4) Where there has been no objection or where the Authority considers that the objections are not serious or that they can be adequately addressed in correspondence with the person objecting and the applicant, the Authority shall not call for public hearing but in all other cases the Authority shall call for a public hearing.

(5) If no public hearing is to be held with regard to an application, the Authority shall give the relevant applicant at least fourteen (14) days to respond to the Authority in writing to an objection lodged in terms of this by-law.

### PART III—INSTALLATION PERMITS

#### *Division 1—The Committee*

Establishment  
of Committee

8.—(1) There is hereby established an Electrical Installation Permits Committee.

(2) The Committee shall consist of the following members—

(a) two (2) persons representing the Authority who shall be Chairperson and Secretary, respectively;

(b) one (1) person representing the holders of a distribution and supply licences;

(c) one (1) qualified and practicing electrical engineer appointed by the Board of Engineers;

(d) one (1) person representing the National Construction Industry; and

(e) a recognized person from the renewable testing and training centre for renewable energies.

Rules and  
procedures

9. The Committee shall, with the approval of the Authority, make such rules and procedures as may, in the opinion of the Committee, be necessary for the performance of the Committee's functions under these By-laws.

Permit  
required

10.—(1) A person shall not practice as an electrical installations person unless he is in possession of a valid permit issued by the Authority.

(2) A permit under these By-laws may be issued to an individual person or to a firm or a company, as the case may be:

Provided that a permit issued to a company or a firm shall be on condition that the firm or company has in its employment a person who possesses a valid permit issued by the Authority.

(3) A Permit issued to a firm or a company on account of an employee who possesses a permit ceases to be valid when that employee ceases to be employed by the firm or company.

(4) No person holding a permit under these By-laws shall be used for purposes of application by a firm or a company unless such person is an employee of that firm or company.



(5) A person employed by a company or firm may obtain a permit issued under these By-laws notwithstanding the fact that such company or firm is in possession of its own valid permit.

11. (1) The Committee shall meet at such times as the Committee may determine. Meetings of the Committee

(2) At any meeting of the Committee, three (3) members shall form a quorum.

12. (1) A person shall not be considered for a permit under these By-laws unless he possesses any of the following technical qualifications— Technical qualifications

(a) a Degree from a recognized university in the relevant field of study;

(b) a Higher Technician's Diploma from a recognized institution;

(c) an Ordinary Technician's Diploma from a recognized institution;

(d) a City and Guilds Certificate;

(e) a Craftsman's Certificate from a recognized institution;

(f) a Degree, Diploma or Certificate in the relevant field of renewable energy technologies from a recognized university or institution or other qualification acceptable by the Committee; or

(g) any other technical qualification recognized by the Committee.

(2) The Committee shall use the qualifications under paragraph (1) and relevant experience to determine the class of permit which the Committee shall issue to each respective applicant.

13. (1) The Committee may, subject to such conditions as it may impose, issue any of the following types of permit Types of permit

(a) CLASS A for carrying out all and any kind of class of electrical installation work;

(b) CLASS B for carrying out electrical installation work of such medium value or complexity, including heavy low-voltage and simple high-voltage connections up to 33 kV;

(c) CLASS C for carrying out electrical installation work of such small value including—

(i) installation in multi-storied building and other big buildings of complex design and commercial buildings; or

(ii) installation of light plants of up to a level of 400 volts;

(d) CLASS D for carrying out work restricted to any specialized class of electrical installation work, including—

(i) installation in residential premises not exceeding five (5) bedrooms; and

(ii) repairs on equipment of up to 240 volts;

(e) CLASS E for carrying out specialized fields such as

(i) centralized cooling and refrigeration;

(ii) installation of generator sets;

(iii) solar systems and other renewable energy technologies;

and

(iv) electrical installation systems and designs.

(2) The Committee shall consider an application for a permit within a period of thirty (30) days from the date of application.

(3) A permit issued under these By-laws may be renewed but shall not be transferable.

(4) Subject to by-law 14, a permit issued under these By-laws shall be renewed annually on 31st December.

*Division 2 —Application for permit*

Application  
for permit

14.—(1) An application for a permit shall be submitted in writing to the Committee and the permit shall be issued in the prescribed form and subject to such conditions as the Committee may determine.

(2) Every person issued with a permit under these By-laws shall exhibit such permit at all times in his usual place of business.

(3) Every person applying for a permit shall pay the permit fees specified in Part E of the First Schedule hereto.

Companies  
and  
organizations

15.—(1) Every company or firm applying for a permit under these By-laws shall have amongst its staff persons qualified to be issued with Class A or B categories of permit and shall pay the permit fees specified in Part F of the First Schedule hereto.

(2) Whenever a company or firm holding a licence under these By-laws does not have amongst its staff persons qualified to be issued with class A or B category of permit, the firm or company's permit shall automatically be cancelled.

Conditions to  
be satisfied

16. Any person who applies to the Committee for a permit shall be required to satisfy the Committee—

(a) that he is at least eighteen (18) years of age and is a fit and proper person to conduct the business of electrical installations;

(b) that he has satisfactory knowledge of the latest edition of the rules and regulations and of all legislation applicable to the type of installation specified in the permit he is applying for;

(c) that he has made adequate provisions for the carrying out of his work and for the supervision of his staff;

(d) that he has suitable premises from which to conduct his business;

(e) that he has suitable instruments to enable him carry out the recognized tests on the type of installation to which his permit applies; and

(f) that in the case of renewal of a licence, the standard of work and the conduct of business have been satisfactory during the period of validity of the previous permit.

Voting

17. In the event of non-consensus among the members of the Committee when deciding whether to grant a permit or not, the matter shall be decided by a majority vote, taken at a meeting at which at least two-thirds ( $\frac{2}{3}$ ) of all the members are present.

(2) The Committee shall consider an application for a permit within a period of thirty (30) days from the date of application.

(3) A permit issued under these By-laws may be renewed but shall not be transferable.

(4) Subject to by-law 14, a permit issued under these By-laws shall be renewed annually on 31st December.

*Division 2—Application for permit*

Application  
for permit

14.—(1) An application for a permit shall be submitted in writing to the Committee and the permit shall be issued in the prescribed form and subject to such conditions as the Committee may determine.

(2) Every person issued with a permit under these By-laws shall exhibit such permit at all times in his usual place of business.

(3) Every person applying for a permit shall pay the permit fees specified in Part E of the First Schedule hereto.

Companies  
and  
organizations

15.—(1) Every company or firm applying for a permit under these By-laws shall have amongst its staff persons qualified to be issued with Class A or B categories of permit and shall pay the permit fees specified in Part F of the First Schedule hereto.

(2) Whenever a company or firm holding a licence under these By-laws does not have amongst its staff persons qualified to be issued with class A or B category of permit, the firm or company's permit shall automatically be cancelled.

Conditions to  
be satisfied

16. Any person who applies to the Committee for a permit shall be required to satisfy the Committee—

(a) that he is at least eighteen (18) years of age and is a fit and proper person to conduct the business of electrical installations;

(b) that he has satisfactory knowledge of the latest edition of the rules and regulations and of all legislation applicable to the type of installation specified in the permit he is applying for.

(c) that he has made adequate provisions for the carrying out of his work and for the supervision of his staff;

(d) that he has suitable premises from which to conduct his business;

(e) that he has suitable instruments to enable him carry out the recognized tests on the type of installation to which his permit applies; and

(f) that in the case of renewal of a licence, the standard of work and the conduct of business have been satisfactory during the period of validity of the previous permit.

Noting

17. In the event of non-consensus among the members of the Committee when deciding whether to grant a permit or not, the matter shall be decided by a majority vote, taken at a meeting at which at least two-thirds ( $\frac{2}{3}$ ) of all the members are present.

18. The Committee shall make recommendation to the Authority which permit to grant to an applicant and the Authority shall issue the said permit to the applicant. Grant of permit

19.—(1) The Committee may, at any time, refuse to grant or renew a permit or cancel a permit if it is satisfied that the person has failed to comply with any conditions contained in these By-laws. Cancellation of permit

(2) In case of refusal to grant a permit or cancellation of a permit, the Committee shall request the applicant concerned in writing, to appear in person or by representation, before the Committee and show cause why the Committee should not exercise its power under paragraph (1) of this by-law.

20. In order to obtain any information and to carry out any inspection as provided under these By-laws, the Committee may, at its direction, request any person to carry out any such inspection or tests as it may require and to furnish a report of such inspection to the licensee. Obtaining information

#### PART IV—SUPPLY AND QUALITY OF SERVICE

##### Division 1—Supply

21.—(1) Subject to paragraph (4), before giving a supply of electricity to a consumer, a licensee shall declare, in writing, to the consumer the standard type of current and number of phases, the standard frequency and the standard voltage at which the licensee proposes to deliver the electricity to the supply terminals. Declared method of supply to consumers

(2) Subject to paragraph (4), for the purposes of paragraph (1)—

(a) the standard type of current and number of phases shall be alternating current, one or three phases;

(b) the standard frequency shall be fifty (50) cycles per second;

(c) the standard voltage shall be—

(i) 230 volts phase to neutral for a single-phase supply; or

(ii) 400 volts phase to phase for three-phase supply.

(3) A licensee shall constantly maintain the standards referred to in paragraph (2) (a), (b) and (c), subject to a permissible variation—

(a) of frequency, between a lower limit of 48.75 cycles per second and an upper limit of 51.25 cycles per second;

(b) of voltage of plus or minus six *per centum* (6%) of the voltage stated in paragraph (2) (c).

(4) A licensee may depart from paragraph (1), (2) or (3), with the approval of the Authority—

(a) by agreement with a consumer to whom it is intended to give an individual supply of electricity from a distributing main to be used solely for the purposes of that one consumer;

(b) by agreement with each consumer, in a group of consumers to whom it is intended to give a supply of electricity from a common distributing main for the group;

(c) in giving a supply of electricity at high-voltage in accordance with a published tariff; or

(d) in giving a special supply of electricity for purposes outside the terms of the licensee's published tariffs:

Provided that a departure made in accordance with this paragraph to a consumer shall not adversely affect any other consumer.

(5) Before giving a supply of electricity to a consumer in accordance with paragraph (4), the licensee shall declare, in writing, to the consumer the type of current and, if alternating current, the number of phases and frequency and the voltage at which he proposes to deliver the electricity to the supply terminals.

(6) Where a supply of electricity is given in accordance with paragraph (4) a licensee shall constantly maintain supply as declared in paragraph (5), subject to a permissible variation—

(a) of frequency, if alternating current, not exceeding two and a half per centum (2½%) above or below the declared frequency;

(b) of voltage, not exceeding six per centum (6%) above or below the declared voltage where the special agreement for the supply stipulates a different permissible voltage variation.

(7) Before giving a bulk supply of electricity to another licensee for redistribution, the licensee supplying the electricity shall declare in writing to the licensee receiving the electricity the type of current and, if alternating current, the number of phases and frequency and the voltage at which it is proposed to deliver the electricity.

Provided that where the bulk supply is alternating current intended for redistribution to consumers to whom paragraphs (1), (2) and (3) apply

(a) the declared frequency shall be fifty (50) cycles per second which shall be constantly maintained subject to the permissible variations set out in paragraph (3) (a);

(b) any limits to voltage variation agreed between the two (2) licensees, with the approval of the Authority, shall be such as will not adversely affect any consumer in respect of paragraph (3) (a).

(8) Except for causes beyond the control of the licensee and subject to paragraph (7)

(a) any permissible variation provided for in this by-law to a declared frequency of fifty (50) cycles per second shall be compensatory adjusted to give a mean frequency of fifty (50) cycles per second as far as practicable in each continuous period of twenty-four (24) hours;

(b) any permissible variation provided for in this by-law to a declared voltage may be exceeded during control operations on the system for a period not longer than ten (10) consecutive minutes.

(9) Subject to the terms and conditions of a contract of supply between a licensee and a consumer, nothing provided under this by-law shall prevent the licensee and the consumer, by agreement, to terminate the contract of supply made in accordance with paragraphs (1), (2) and (3) and substituting therefor a new contract of supply made in accordance with paragraphs (4), (5) and (6), or vice versa provided that no other consumer is adversely affected by such substitution.

22.—(1) Subject to paragraph (2), from the time a licensee begins to supply electricity through a distributing main or service line, he shall maintain a supply of electricity in terms of the agreement, sufficient for the use of each consumer entitled for the time being to be supplied therefrom and that supply shall be constantly maintained to each consumer without change

Licensee to provide constant supply

(a) in the declared method of supply set out in by-law 21 except as provided for therein:

(b) in the relationship between the neutral conductor and earth or between the neutral conductor and any phase conductor:

(c) in the phase rotation, except by agreement in writing between a licensee and a consumer with the approval of the Authority provided that no other consumer is adversely affected thereby.

(2) A licensee shall not lessen or discontinue a supply which is required to be constantly maintained in accordance with paragraph (1) except—

(a) for causes beyond the control of the licensee:

(b) where the consumer has failed to pay charges lawfully due in accordance with the conditions of supply or any written law, as the case may be:

(c) where the consumer has failed to comply with the conditions of supply or any written law and failed to remedy his default within seven (7) days of receiving from the licensee a notice calling upon him to do so; or

(d) where required or permitted by the provisions under these By-laws.

23.—(1) A licensee may temporarily lessen or discontinue a supply of electricity referred to in by-law 22—

Licensee may lessen or discontinue supply

(a) without prior notice to a consumer likely to be affected—

(i) where such action is necessary to prevent danger to life or damage to property;

(ii) in any emergency, arising from whatsoever cause, including any political cause, to ensure the proper working of the licensee or any other undertaking with which it is interconnected:

(iii) by the automatic operation of a protective device installed to disconnect a supply of electricity in faulty conditions;

(iv) by the automatic or hand operation of a device installed to disconnect a supply of electricity in terms of the conditions or agreement to supply;

(b) on giving not less than twenty-four (24) hours notice—

(i) for the purposes of making alterations or additions to a system;

(ii) for normal maintenance work; or

(iii) for testing a device referred to in sub-paragraph (a) (iii) or (iv) above.

(2) A licensee shall resume the normal supply of electricity as soon as it is safe and expedient to do so after the temporary lessening or discontinuance referred to in paragraph (1).

(3) The notice required in accordance with paragraph (1) (b) shall state the period during which the supply may be affected and shall—

- (a) be served on all affected consumers;
- (b) be published in a newspaper circulating in the area affected; or
- (c) be announced on radio operating in the area affected.

(4) In temporarily lessening or discontinuing a supply of electricity in the circumstances set out in paragraph (1) (a) (ii), a licensee, unless all his consumers are affected thereby, may select which consumer or group of consumers shall have lessened or continued supply.

Licensee shall not permanently connect

24.—(1) A licensee shall not permanently connect a consumer's installation or part thereof with his low-voltage or medium-voltage electric lines if he or a person authorized by him is aware that the connection, if made, would cause a dangerous leakage of electricity from such installation or part thereof.

(2) A licensee shall not permanently connect a consumer's installation or part thereof with his high-voltage electric lines unless he or a person authorized by him is satisfied that the high-voltage portion of the consumer's installation is of a standard of construction and safety not less than that required for a licensee's high-voltage works in accordance with these By-laws.

Disconnection of works in certain circumstances

25.—(1) Every section of a licensee's works, including cables and overhead lines, which is in such a faulty condition so as to cause or is likely to cause death or injury to any person or damage to any property and where the condition becomes known to the licensee or to a person authorized by him to operate the section, the licensee or the duly authorized person shall disconnect from the supply of electricity immediately and shall not reconnect it until the faulty condition of the section is remedied.

(2) Every section of a licensee's works, including cables and overhead lines, which because of a faulty condition, is causing interference with the use of a telegraph line and where the faulty condition becomes known to the licensee or to a person authorized by him to operate the section, the licensee or the duly authorized person shall disconnect from the supply of electricity and shall not reconnect it until the faulty part of the section is remedied.

(3) Nothing provided under paragraph (1) or (2) shall prevent a licensee from temporarily reconnecting a section referred to therein to a supply of electricity for testing purposes where such temporary reconnection can be made without risk to life or property.

Protection of telegraph lines  
Cap 68 01

26. A licensee shall comply with the Communications Act in regard to protection of telegraph lines where—

- (a) a cable laid by him crosses or is in close proximity to an underground telegraph line; or

(b) an overhead line installed by him crosses or is in close proximity to an overhead telegraph line.

27.—(1) A consumer shall not be relieved of any liability or responsibility for inspecting, testing or maintaining, in a safe condition, his own installation by virtue of any obligation to inspect or test placed on a licensee. Inspection and testing

(2) For the purposes of by-law 24 (2) or by-law 25, a licensee may, in lieu of an inspection or test by himself or by a person authorized by him, accept from a consumer a certificate in approved form given on behalf of the consumer by an electrical installations person or competent person that the consumer's installation or part thereof has been inspected and tested in a manner approved by, and with results satisfactory to, the licensee.

(3) A consumer shall cause his electrical wiring to be tested every five (5) years and maintain and keep a record thereof until the next installation, testing and the record shall indicate the particulars of the installations person who carried out the inspection and the work or repairs done, if any.

28. A licensee shall keep a copy of these By-laws at each office, depot or service centre attached to his licensed activity. Availability of By-laws

*Division 2—Construction of Licensee's or Private Owner's Works*

29.—(1) The works of a licensee shall— Design and protection of works

(a) be sufficient in size and rating to perform their intended functions;

(b) be designed, constructed, installed and protected, where necessary, with such material and of such quality as to prevent danger;

(c) be specially designed and constructed or additionally protected where exposed to—

(i) the weather;

(ii) wet conditions;

(iii) vermin;

(iv) corrosion;

(v) flammable surroundings;

(vi) dust; or

(vii) explosive atmosphere.

so as to prevent danger from such exposure.

(2) A licensee shall ensure that conductors and live parts, except as otherwise provided for in these By-laws are—

(a) where necessary, fully insulated and mechanically protected; or

(b) placed and safeguarded to prevent danger.



(3) A licensee shall ensure that high-voltage conductors and high-voltage live parts, unless completely surrounded and protected by earthed metal, have the minimum section clearances set out in the Third Schedule hereto or are guarded by a protective barrier in order to prevent inadvertent touching or dangerous approach by a person standing on any floor-level, walkway, stairway or working platform.

Switch gear

30. A licensee shall ensure that a switch, fuse-switch, circuit-breaker or isolating link is—

- (a) accurately adjusted to make and maintain good contact;
- (b) provided with an operating handle which is insulated from the electrical conductors;
- (c) arranged in such a way that it cannot accidentally reclose from the open position;
- (d) arranged so as to make and break all live poles of the supply simultaneously, except in the case of fuses or where an isolating link is intended for use on a circuit not carrying load; and
- (e) designed or constructed so that in breaking a live circuit an arc is not maintained.

Fuse

31. A licensee shall ensure that a fuse is designed, constructed, installed and protected in such a manner that—

- (a) it effectively interrupts the circuit current under fault or abnormal overload conditions; and
- (b) the fusible portion may be readily be removed or replaced without danger.

Automatic circuit-breakers

32. A licensee shall ensure that an automatic circuit-breaker is designed, constructed, installed and protected in such a manner that—

- (a) it effectively interrupts the circuit current under fault or abnormal overload conditions;
- (b) there is no danger from overheating or arcing or the scattering of hot oil when it operates; and
- (c) where arranged for manual closing, the operating mechanism provides trip-free operation.

Joints and connections

33. A licensee shall ensure that an electrical joint or connection is designed, constructed, installed and protected in such a manner that—

- (a) electrical conductivity is maintained satisfactorily;
- (b) its insulation, where insulation is necessary, is suitable for the normal operating voltage; and
- (c) its mechanical strength is suited to its location and environment.

Isolating and protective devices

34.—(1) A licensee shall ensure that isolating and protective devices—

- (a) for disconnecting all voltages from any part of a system; and
  - (b) starting and stopping every motor,
- are provided to prevent danger.

(2) Every part of a system shall be protected from excess current except a control or other circuit where such protection may be undesirable or unnecessary.

35.—(1) A licensee shall ensure that a switchboard is designed, constructed, installed and placed in such a manner that the—

(a) parts which have to be handled or adjusted are readily accessible from the working platform; and

(b) measuring instruments and indicators are observable from such platform:

Provided that where such handling, adjustment or observation is made from another position, such additional precautions as are necessary to prevent danger shall be taken.

(2) A licensee shall ensure that a low-voltage or medium-voltage switchboard which has bare conductors normally exposed that they can be touched—

(a) is located in an area specially provided or be suitably fenced or enclosed; or

(b) has a working platform or passageway that has—

(i) a firm and even floor;

(ii) adequate means of access free from danger;

(iii) a clear head-room of not less than 2.12 metres; and

(iv) a clear width of not less than 1.2 metres measured from any bare conductor or a clear width of 2.43 metres between bare conductors arranged in switchboards on opposite sides of the same passageway.

36.—(1) A building constructed by a licensee for the accommodation of any of his works shall—

Building for  
electrical  
purposes

(a) be substantially constructed and designed for its intended purposes;

(b) be arranged in a such manner to prevent, as far as practicable, access thereto except by a doorway or gateway;

(c) enclose the works in such a manner that they cannot readily be interfered with from outside;

(d) be ventilated, kept dry and made vermin-proof, as far as practicable;

(e) have fixed outside each entrance a notice of durable material inscribed with the word "DANGER" in white letters of at least 3.13 centimetres in height on a red background; and

(f) have fixed inside, printed instructions as to the proper first-aid treatment of persons suffering from electric shock.

(2) Where the building referred to in paragraph (1) is below ground level, the licensee shall ensure that—

(a) it has adequate means of access by a door or trap-door with a staircase or ladder securely fixed and so placed that no live part of a system or conductor shall be within reach of a person thereon; and

(b) where a person is to be regularly employed therein and high-voltage is present, it has access referred to in sub-paragraph (a) by door and staircase only.

Outdoor  
substations

37.—(1) Any part of a licensee's works for the transformation, control, regulation or switching of electricity in the open air shall, except as otherwise provided for in these By-laws—

(a) be completely enclosed in a metal casing connected with earth at all points below a height of 3.0 metres from the ground;

(b) be mounted on the supports of an overhead line; or

(c) be enclosed by a fence not less than 1.8 metres in height fitted with a suitable anti-climbing device for the purpose of preventing access not authorized by the licensee.

(2) A licensee shall ensure that a notice of durable material inscribed with the word "DANGER" in white letters of at least 3 centimetres in height on a red background shall be fixed to the metal casing, supports or fence referred to in paragraph (1) (a), (b) or (c).

Earthing of  
metal-work

38.—(1) A licensee shall ensure that—

(a) metal-work attached to or forming part of a metal or reinforced concrete support and a metal transformer case or metal switch handle mounted thereon is connected with earth;

(b) metal-work attached to or forming part of a wooden support which is liable to become dangerous because of leakage across or failure of the insulation—

(i) is connected with earth if the metal-work is within 3 metres of the ground; or

(ii) where the metal-work is not connected with earth and is more than 3 metres above the ground, it has effective secondary insulation sufficient to withstand the voltage to earth.

(2) Notwithstanding sub-paragraph (b), where a metal-work is mounted on a wooden support, a licensee shall ensure that—

(a) a metal transformer case together with its associated metal-work and a metal switch handle is connected with earth;

(b) a high-voltage switch is inserted in the operating rod between the switch handle and the switch insulator capable of withstanding the normal operating voltage where such switch handle is within 3 metres of the ground.

(3) A licensee shall ensure that metal cradle or a stay-wire is—

(a) connected with earth; or

(b) has inserted insulation capable of withstanding the normal operating voltage.

(4) A licensee shall ensure that a metal armouring or metal sheathing, except sheathing intended for use as a concentric neutral conductor at earth potential—

(a) is connected with earth;

(b) has earth continuity maintained by a separate earth conductor across any joint-box or terminal enclosure associated with the cable; and

(c) where the joint-box or enclosure referred to in sub-paragraph (b) is of metal and bonded thereto.

(5) Save as otherwise provided in these By-laws, the licensee shall ensure that any metal-work associated with or forming part of a licensee's works, unless isolated from and not likely to come into contact with live parts or with earthed metal-work, is connected with earth.

39.— (1) Where a licensee provides protective multiple earthing in accordance with Part V, he shall, before supplying a consumer with electricity therefrom, interconnect with his own earthing arrangements the main earthing conductor of the consumer's installation.

Earthing of  
consumer's  
installation

(2) In any other case other than that set out in paragraph (1), a licensee may, before supplying a consumer with electricity, permit an interconnection between his own earthing arrangements and the main earthing conductor of the consumer's installation, subject to such conditions as the licensee considers necessary.

40. A licensee shall ensure that an earth electrode is installed in a way that no voltage gradient is maintained at ground-level which may cause danger to life.

Earth  
electrodes

41. A licensee shall ensure that where metal-work is earthed, the associated earthing system is designed, constructed and maintained in a way that any leakage resulting from contact of negligible resistance between a live conductor or live part and any metal-work connected with earth is sufficient to operate the protective device which is installed to make that conductor or part dead.

Leakage  
to earth

42. Nothing provided under by-law 41 shall prevent a licensee from using an arc-suppression coil inserted between the transformer or generator neutral and earth in such a manner as to ensure that in the event of a live conductor or live part coming into contact with earth or with any metal-work connected with earth an arc between that conductor or part and earth is immediately suppressed and the voltage of that conductor or part thereof is reduced to prevent, as far as reasonably practicable, the risk of accident therefrom.

Arc-suppress-  
ion coils

43. (1) A licensee shall ensure that a service line has a suitable fusible cut-out or circuit-breaker as a protective device placed, as near as practicable, to the supply terminals on the consumer's premises.

Service lines  
on consumer's  
premises

(2) A protective device referred to in paragraph (1) shall be

(a) supplied and installed by a licensee or, in the event of agreement between him and the consumer, by the consumer;

(h) of adequate rupturing capacity, suitably enclosed and of fire-resisting construction:

(c) placed at a position to be selected by the licensee after consultation with the consumer; and

(d) inserted in each live conductor and not in any neutral conductor permanently connected with earth.

(2) Where supply of electricity is provided at high-voltage, a licensee shall make provision that—

(a) the protective device referred to in paragraph (1) can be isolated from the service line; and

(b) the consumer can cut off all voltage at or after the supply terminals without danger.

Construction and installation of cables

44.—(1) A licensee shall ensure that a cable is fully insulated for the normal operating voltage and is of a type and construction and is laid or installed in a manner suited to its particular environment and shall take into account—

(a) by-law 29 (a), (b) and (c);

(b) the normal usage of the ground in which any part of it is to be laid; and

(c) any foreseeable risk of damage to the cable and danger to persons, property and to other electrical services, water, gas, sewerage and telegraph services, railways and constructional works at or below ground-level.

(2) A licensee shall ensure that a component used with a cable is of a type and construction and is laid or installed in a manner suited to that cable and shall take into account—

(a) paragraph (1); and

(b) by-law 33 where a joint or connection is necessary.

Metallic protection for high-voltage cables

45.—(1) A licensee shall ensure that a high-voltage cable is laid or installed so that it is completely surrounded and protected by earthed metal as provided—

(a) by its own metal sheathing or metal armouring; or

(b) by an extraneous metallic covering.

(2) A licensee shall ensure that a joint, connection or termination of a high-voltage cable is surrounded and protected by earthed metal.

(3) Notwithstanding paragraph (1) or (2), the surrounding and protection by earthed metal referred to therein may be omitted in a power station, substation, switch-room or similar premises designed for electrical purposes:

Provided that where it is omitted, the high-voltage cable, joint, connection and terminal shall—

(a) have the section clearances required in accordance with by-law 29 (3); or

(b) be guarded by a protective barrier to prevent inadvertent touching or dangerous approach by a person standing on a normal floor-level, walkway, stairway or working platform.

46.—(1) A licensee shall ensure that a neutral conductor of a cable can, at its termination, be permanently identified so that it is readily and uniformly distinguishable from other conductors.

Identification of neutral conductor, cable labeling and insulation test

(2) Where two or more cables forming part of different circuits terminate at adjacent positions, a licensee shall ensure that each circuit—

(a) is permanently labeled on its exterior or on its terminating box or component; or

(b) has other means of identification so that it is readily distinguishable from other circuits.

(3) A licensee shall ensure that a cable is subject to an insulation test after being laid or installed before being connected to a supply of electricity and that it is not connected if the connection would result in an electrical leakage which might be a danger to persons or property.

(4) A licensee shall ensure that no cable is permanently connected to a supply of electricity unless tests have been carried out—

(a) to ensure compliance with these By-laws; and

(b) to establish electrical continuity of conductors.

#### *Division 3—Standards of Measurement*

47.—(1) The fundamental electrical units of measurement shall be—

Fundamental electrical units

(a) the ohm;

(b) the ampere; and

(c) the volt,

and the value of each is set out in Part I of the Sixth Schedule hereto.

(2) Denominations of standards for the fundamental electrical units referred to in paragraph (1) are set out in Part II of the Sixth Schedule hereto.

(3) Limits of accuracy attainable in the use of standards denominated in paragraph (2) are set out in Part III of the Sixth Schedule hereto.

48. The electrical unit for the measurement of electricity shall be the kilowatt-hour and the value of such unit shall be derived from the fundamental units referred to in by-law 62 and shall be set out in Part IV of the Sixth Schedule hereto.

Derived electrical units

49.—(1) The amount of electricity supplied by the licensee shall, except where otherwise agreed between the consumer and the licensee, with the approval of the Authority, be ascertained by means of an appropriate meter or meters supplied by the licensee.

Measurement of electricity

(2) In addition to a meter which may be placed upon the premises of a consumer to ascertain the amount of the supply, the licensee may place upon those premises such meter or other apparatus as may be desired for the purpose of ascertaining or regulating the amount of electricity supplied to the consumer, the number of hours during which the supply is taken, the maximum rate of supply taken by the consumer or any other quantity or time connected with the supply.

(3) A meter used by a licensee for measuring a supply to a consumer of electricity in kilowatt/hours shall have permissible limits of error in registration not exceeding two decimal point five *per centum* (2.5%) above nor below a true and precise registration of kilowatt/hours.

*Division 6—Quality of Service and Supply Standards*

Quality of  
service and  
supply  
standards

50.—(1) A holder of a transmission licence and every holder of a distribution licence shall comply with and adhere to the quality of service and supply standards set out in the Tenth Schedule hereto.

(2) Persistent or gross breach of the standards referred to in paragraph (1) by a licensee may lead to suspension, amendment or cancellation of the licence by the Authority.

PART V—SAFETY CODE RULES

*Division 1—Application of Part*

Application  
of this Part

51.—(1) This Part shall apply to electrical systems and to associated plant and apparatus under licensees' or private owners' ownership or control.

(2) Rules, documents or procedures issued by other authorities or licensees may apply in accordance with management instructions, but where no such rules, documents or procedures have been issued, or if there is a conflict between such rules, documents or procedures with these By-laws, these By-laws shall prevail.

*Division 2—General Provisions*

Information  
and instruction

52.—(1) Each licensee shall sufficiently inform and instruct its employees about the system, plant or apparatus affected by a particular operation or work, and the rules, procedures or documents which apply to such licensee's operations.

(2) A licensee shall, in addition to paragraph (1), furnish information to other persons not being its employees who are likely to be exposed to danger by the operations or work of the licensee, to such extent as may, in the licensee's opinion be reasonably practicable.

Variation

53. The Authority may, in exceptional or special circumstances, vary these By-laws and issue additional guidelines to such extent as may, in the opinion of the Authority, be necessary to achieve the objectives of these By-laws.

54. A licensee shall ensure that work on or testing of apparatus, conductors or plant to which these By-laws are for special reasons not applicable, shall be carried out according to a special procedure, which shall adhere to the safety requirements prescribed under these By-laws.

Special procedures

55.—(1) A person who receives instructions regarding the operation of or work upon a licensee's systems and associated plant and apparatus shall, if he has an objection on safety grounds against the carrying out of such instructions, lodge the objection with the person issuing the instructions.

Objections

(2) Where an objection has been raised under paragraph (1), the licensee or other concerned entity shall institute investigations into the merits of the objection and, if necessary, refer the matter to an immediate supervisor for a decision before proceeding with the operation or work.

56. Every electrical accident and dangerous occurrence involving a licensee's system shall be reported immediately to the appropriate control engineer who shall report to the designated engineer.

Accident and dangerous occurrences

57.—(1) A person engaged in the operations or work on electrical systems and associated plant and apparatus shall comply with these By-laws and other related rules and legal procedures relevant to his duties.

Duties

(2) A person shall not neglect his duties on the ground that he is ignorant of the relevant legal requirements and procedures.

(3) A person who has any doubts concerning duties shall report the matter to an immediate supervisor for advice before proceeding with the work.

58.—(1) Every licensee shall obtain and issue to its employees safety equipment and protective clothing which comply with the standards approved by the Authority.

Safety equipment and protective clothing

(2) Each employee working under circumstances requiring safety precautions shall wear appropriate protective clothing and foot wear or such other protective clothing, as may be necessary, having regard to the work that employee may be involved in.

59.—(1) Every licensee shall train each person involved with the operation of or work upon the licensee's system and associated plant and apparatus in the treatment of electric shock.

Electric shock

(2) Every licensee shall provide each employee with a copy of these By-laws.

#### *Division 3—General Safety Precautions*

60.—(1) No person shall, without authority, enter or have access to any operational premises such as a control room, substation, switching station or underground chamber belonging to or under the control of a licensee.

Access to work in operational premises

(2) A barrier, door or gate restricting access to an underground chamber or other confined space, substation or tunnel shall be kept locked and the control of the keys shall be in accordance with approved procedure.



(3) A person shall not enter or work in any indoor substation or confined space such as an underground chamber, tunnel, vessel, tank, pit, culvert or pipeline without the consent of a senior authorized person.

(4) Where it becomes necessary for a person to enter and work in any of the places specified under paragraph (3), adequate safety precautions shall be taken against danger arising from toxic and flammable or abnormal temperature.

(5) Safety precautions under paragraph (4) include—

- (a) use of approved natural or forced ventilation or air conditioning;
- (b) wearing approved breathing apparatus;
- (c) testing the atmosphere using approved specialized equipment;
- (d) prohibition of smoking and use of exposed flame; and
- (e) posting a person outside such place to keep in constant touch with the person engaged in the work with appropriate rescue equipment, ready and capable of assisting in an emergency.

(6) A person using the apparatus under paragraph 5 (b) shall be specially trained in its use.

(7) Before a person enters an area under this by-law, he shall be issued with a limitation-of-access, and the arrangements for access and work and the precautions to be taken shall be in accordance with approved procedures.

Vessel  
containing  
flammable  
substance

61.—(1) A person shall not smoke or expose a flame near any flammable substance.

(2) A person shall not engage in work involving application of heat unless that person has taken all practical precautions to prevent a fire or explosion. The prevention of fire or explosion shall be by removal of the flammable substance and any fumes, or by rendering them non-explosive and non-flammable.

(3) A person shall not enter a vessel that has recently been emptied of oil or other flammable or toxic substance unless a senior authorized person is satisfied that all dangerous vapours have been expelled, and a limitation-of-access has been issued.

Work in fire  
protected areas

62.—(1) Unless alternative approved safety procedures apply because of special circumstances, before access or work is carried out in an enclosure protected by automatic fire-extinguishing equipment—

- (a) the automatic control shall be rendered inoperative and the equipment left on manual control, and a caution notice attached;
- (b) the precautions taken to render the automatic control inoperative and the conditions under which it may be restored shall be noted on a safety document or written instruction issued for such access or work or other activity; and
- (c) the automatic control shall be restored immediately after the persons engaged in the work have withdrawn from the enclosure.

(2) Only approved portable fire-extinguishers shall be made available and shall be the only extinguishers to be used near live apparatus and conductors.

(3) In the handling of fire-extinguishers, the safety distances specified in by-law 87 shall be maintained.

(4) After the discharge of a portable fire-extinguisher in an enclosed space, personnel shall leave the space until the precautions specified in by-law 76 (3) have been taken.

(5) After an explosion, fire or discharge of a fire-extinguisher in an enclosed space, the space shall be adequately ventilated before any person enters it.

63.—(1) A person shall not climb any pole unless that pole has been tested in a manner approved by the Authority and climbing and descending a pole shall be by approved means and methods.

Work on  
poles, towers  
and high  
structures

(2) A person shall not climb a pole which is impaired by decay or damage, or whose stability is in doubt until that pole has been supported by approved means.

(3) Where a pole is supported as provided under paragraph (2), the pole shall be climbed by one person at a time or access to its top may be by other approved means independent of the pole.

(4) A person gaining access to work on a tower, pole or other high structure shall use safety belts, harnesses or other safety equipment of an approved type.

(5) A person working on a tower, pole or other high structure shall be in visual range of another person who shall be fully conversant with approved rescue procedures.

(6) Every gate or device to prevent climbing of towers and gantries supporting high-voltage conductors shall always be kept secured in an approved manner, and access shall be controlled by a senior authorized person or an authorized person in receipt of an appropriate safety document.

64.—(1) Guards to an access ladder, barrier, door or gate on or in an outdoor compound preventing access to a live high-voltage conductor shall be kept secured in an approved manner, and access to them shall be according to approved procedure.

Access to  
high-voltage  
apparatus and  
conductors

(2) Any barrier, door or gate preventing access to a totally enclosed chamber, cubicle or cell containing live high-voltage conductors shall be kept locked and the keys shall be accessible only by a senior authorized person.

(3) Any spout shutter not required for immediate work or operation shall, if the spout is otherwise made accessible, be locked and the key accessible only by a senior authorized person.

High-voltage  
switching

65.—(1) High-voltage switching shall not be carried out by any person other than an authorized person, a senior authorized person or by remote control directed by a control engineer.

(2) Notwithstanding paragraph (1), an authorized person may, for the purpose of training and acting under the personal supervision of a senior authorized person, carry out high-voltage switching.

(3) Except in cases of emergency, high-voltage switching shall not be carried out without the authority of the appropriate control engineer.

(4) When a control engineer gives authority for high-voltage switching to be carried out, he shall communicate directly with the person intending to carry out the switching, and where for special reasons direct communication is not possible, an approved procedure shall be followed.

(5) Before any high-voltage switching is carried out on any system that may affect another system, the control engineer authorizing the switching shall communicate with the control engineer of the other system and the switching shall be agreed between them and recorded in the respective control books of all control engineers concerned.

(6) Where high-voltage switching is to be carried out for issuing a safety document and there are two or more control functions involved, in the absence of a standing agreement for such matter, the control engineers concerned shall—

(a) agree on the person to be in control of the part of the system in the isolated state and to be responsible for giving consent to the issuing of a safety document; and

(b) such agreement between the control engineers shall be recorded in the respective control log books by each control engineer.

(7) Where there are special requirements to be complied with before, during or after high-voltage switching operations, approved procedures shall apply and special provisions shall be made to ensure that the control engineers, the operators and others affected are aware of their responsibilities.

(8) High-voltage switching with the control engineer's authority shall be carried out without undue delay and all such switching or switching in emergency, shall be reported to the control engineer as soon as possible. For emergency switching, the circumstances demanding such switching shall be reported at the same time.

(9) If a switchgear shows any sign of distress, the operator shall report it condition to the control engineer who shall in turn report to a higher authority in order to have it examined before taking a decision about further operation.

(10) An operator shall, while operating a switching gear mounted on pole or other structure from ground level where necessary, wear rubber glove or use other approved equipment.

(11) A person shall not undertake switching or work on high-voltage equipment by signal or pre-arranged understanding after an agreed interval of time.

66. —(1) Every message by telephone or otherwise relating to the operation of a high-voltage system shall be recorded down and shall be read back to the sender to ensure that it has been accurately received. Records

(2) A control engineer shall ensure that a record is made of the time and particulars of all high-voltage switching including that carried out by the control engineer by remote control.

67. (1) A failure of supply to or from any part of a high-voltage system from whatever cause, shall immediately be reported to the control engineer. Failure of supply

(2) During a failure of supply, all apparatus and conductors shall be regarded as live unless they are isolated and proved dead by approved means.

68.—(1) Voltage testing devices shall be of an approved type and shall be used in accordance with approved procedures. Voltage testing devices

(2) Voltage testing devices shall be tested in an approved manner immediately before and after use, and where this is not practically possible, in accordance with other approved procedures.

*Division 4—Safety Precautions for work on or near high-voltage systems*

69. —(1) Subject to the exceptions specified in this by-law and those expressly allowed by individual rules, a person shall not undertake any repair, maintenance, cleaning, alteration or such work, on or within the safety distance of an exposed conductor, part of a high-voltage system distance of an exposed conductor or part of a high-voltage system unless such parts of the system are— General requirements

(a) dead;

(b) isolated and all practicable steps taken to lock off from all points of supply, including voltage and auxiliary transformers, common earthing equipment and other sources from which the apparatus and conductors may become live, with caution notices fixed at all points of isolation;

(c) earthed by approved means at all points of disconnection of high-voltage supply from the system or between such points and the point of work;

(d) screened where necessary to prevent danger, and danger notices are attached to apparatus containing live conductors and attached near other live conductors;

(e) identified at the point of work by approved means; and

(f) released for work by the issue of an appropriate safety document that shall not be issued unless such person is fully conversant with the precise parts of the systems, apparatus and conductors to be worked upon, the nature and extent of the work to be done and the safety precautions to be taken.

(2) It is the duty of the person issuing the appropriate safety documents to ensure compliance with the provisions of paragraph (1).

(3) Notwithstanding the provisions of paragraph (1)—

(a) work such as cleaning and painting of earthed metal enclosures, connections or disconnections of circuits to or from live high-voltage systems, live line testing and live insulator washing may be carried out but only according to approved procedures;

(b) as a safeguard for personnel carrying out cleaning and painting works on substations, the system diagram in the appropriate local office shall be marked to show the work locations;

(c) high-voltage live line on high-voltage overhead lines may be carried out but only according to approved procedures; and

(d) where the design of apparatus does not allow strict compliance with all the requirements in paragraph (1) and if an operational procedure for carrying out the work does not exist, the work shall be carried out—

(i) in accordance with special instructions issued by an authorized person to ensure that safety is achieved; and

(ii) under the personal supervision of the authorized person, with the control engineer kept informed of the circumstances.

Isolation of  
apparatus and  
conductors

70.—(1) Isolation or reconnection of high-voltage apparatus or conductors shall not be initiated except with the sanction of the control engineer.

(2) Safety locks shall be used to lock all switch gears at points where the circuit on which work is to be carried out is likely to be energized and the keys for such locks shall be kept in a key safe, if provided, or in some other safe place under the control of an authorized person.

(3) Safety locks shall be fitted to the switch gear at all points of isolation immediately following the sectionlization of defective apparatus.

(4) Details of the isolation referred to in paragraph (1) and the deposit of safety lock keys associated with the isolation shall be recorded by the Control Centre.

(5) Where the circuit on which work is to be carried out is controlled only by fuses or links, the fuses or links (and carriers) shall—

(a) be removed and kept in a safe place preferably in the possession of the person responsible for issuing the safety documents; or

(b) where such removals are not practicable approved procedures to ensure safety shall be followed.

(6) When the mechanical isolation of a voltage transformer involves physical difficulty in withdrawal to achieve total high-voltage isolation, the withdrawal of the voltage transformer, secondary fuses or links may be accepted as isolation, and fuses or links so withdrawn shall be kept in a safe place in the possession of the person responsible for issuing the safety document and caution notices shall be fixed at all points of isolation.

(2) It is the duty of the person issuing the appropriate safety documents to ensure compliance with the provisions of paragraph (1).

(3) Notwithstanding the provisions of paragraph (1)—

(a) work such as cleaning and painting of earthed metal enclosures, connections or disconnections of circuits to or from live high-voltage systems, live line testing and live insulator washing may be carried out but only according to approved procedures;

(b) as a safeguard for personnel carrying out cleaning and painting works on substations, the system diagram in the appropriate local office shall be marked to show the work locations;

(c) high-voltage live line on high-voltage overhead lines may be carried out but only according to approved procedures; and

(d) where the design of apparatus does not allow strict compliance with all the requirements in paragraph (1) and if an operational procedure for carrying out the work does not exist, the work shall be carried out—

(i) in accordance with special instructions issued by an authorized person to ensure that safety is achieved; and

(ii) under the personal supervision of the authorized person, with the control engineer kept informed of the circumstances.

Isolation of  
apparatus and  
conductors

70.—(1) Isolation or reconnection of high-voltage apparatus or conductors shall not be initiated except with the sanction of the control engineer.

(2) Safety locks shall be used to lock all switch gears at points where the circuit on which work is to be carried out is likely to be energized and the keys for such locks shall be kept in a key safe, if provided, or in some other safe place under the control of an authorized person.

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(4) Details of the isolation referred to in paragraph (1) and the deposit of safety lock keys associated with the isolation shall be recorded by the Control Centre.

(5) Where the circuit on which work is to be carried out is controlled only by fuses or links, the fuses or links (and carriers) shall—

(a) be removed and kept in a safe place preferably in the possession of the person responsible for issuing the safety documents; or

(b) where such removals are not practicable approved procedures to ensure safety shall be followed.

(6) When the mechanical isolation of a voltage transformer involves physical difficulty in withdrawal to achieve total high-voltage isolation, the withdrawal of the voltage transformer, secondary fuses or links may be accepted as isolation, and fuses or links so withdrawn shall be kept in a safe place in the possession of the person responsible for issuing the safety document and caution notices shall be fixed at all points of isolation.

71.—(1) Where high-voltage apparatus or conductors are to be discharged and earthed in accordance with by-law 84 (1), the discharging and earthing shall be done when reasonably practicable, by using a circuit-breaker or earthing switch provided for the purpose of making the earthing connection, and where a circuit-breaker is used, the trip feature shall be rendered inoperative before closing and unless this is not practicable it shall then be done afterwards. After closing, the circuit-breaker or earthing switch shall be locked in the earthed position, so that it remains inoperative while it is in the circuit main earth.

(2) Where circuit-breaker is used to make the earth connection, the operation of closing to earth shall be carried out locally and SCADA shall not be used for this purpose.

(3) Where sub-paragraph (1) is not reasonably practicable or not applicable, the high-voltage apparatus and conductors shall be checked by means of an approved testing device to verify that they are not live, and may then be discharged and earthed by an earthing lead applied by means of an approved earthing appliance.

(4) Where work is carried out on an overhead system to which a consumer remains connected, a circuit main earth shall be provided and maintained between that consumer and the point of work.

(5) Due to the possibility of low-voltage and high-voltage inversions such as those from customers' generation, care shall be taken when using earthing lead following a test with the conductor to verify that the circuit is not live, and one conductor shall be earthed and subsequent tests carried out to verify that the remaining conductors are not live before applying an earth to them.

(6) Earthing leads and associated clamps shall be of an approved type and of adequate capacity for duty at the point of application, and shall be adequately maintained and always examined immediately before use.

(7) Subject to paragraph (1), the general procedure to be followed when using earthing leads shall be as follows—

(a) the circuit shall be verified that it is not live and where practicable, checked by means of an approved voltage testing device or other approved means;

(b) the circuit shall be verified that it is not live and, where practicable, checked by means of an approved earthing pole or other approved appliance and care shall be taken to ensure that good contact is made and that earthing leads are clearly visible;

(c) earthing leads shall be connected to earth before being connected to the phase conductors and shall only be connected to the phases by means of an approved earthing pole or other approved appliance. Care shall be taken to ensure that good contact is made and that earthing leads are clearly visible;

(d) all phases shall be earthed, even if work is to be carried out only on one phase;

(e) earthing leads shall not be applied in any cell or compartment in which there is any exposed metal live at high-voltage that may be a source of danger, and shall be applied so that they remain clearly visible as far as it is reasonably practicable;

(f) when earthing leads are being removed, each lead shall be disconnected from its phase conductor by means of an approved earthing appliance before it is removed from its earth connection; and

(g) for earthing on spout contacts of metal-enclosed switch gear, only approved appliances shall be used and a person shall not insert a hand or tool into contact with spouts for this purpose.

(8) A person shall not operate a high-voltage earthing switch or circuit main earth connected or disconnected, except with the consent of the control engineer, or under the terms of a sanction-for-test, or by an authorized person or by a competent person acting under the personal supervision of a senior authorized person.

(9) Each operation of circuit main earths shall be reported to the control engineer as soon as possible after completion, and when operating to a high-voltage switching schedule, the application or removal of circuit main earths shall be reported to the control engineer at the appropriate control break.

(10) The location of each circuit main earth shall be recorded on the safety document.

(11) Additional earths applied after the issue of a permit-to-work or sanction-for-test may be attached or removed by a competent person.

Approach to  
exposed live  
high-voltage  
conductors or  
insulators  
supporting  
them

72.—(1) The safety distances designated in the Seventh Schedule shall be maintained at the respective system voltages between any part of a person or object and the nearest exposed live high-voltage conductor.

(2) A distance of three hundred (300) millimetres shall be maintained at all system voltages, from the portion of insulators supporting live high-voltage conductors which is outside the appropriate safety distance to the conductors.

(3) Subject to the provisions of paragraph (4), a person shall not allow any part of his body or any other object not provided for within the approved procedures, to approach exposed high-voltage conductors or insulators supporting such conductors within the safety distances specified in paragraph (2)—

(a) unless the conductors have been made safe for work and a safety document issued as required by by-law 84 (1); and

(b) such person's hands shall be kept below shoulder height when in the vicinity of the exposed live high-voltage conductors, unless it is unavoidable.



(4) When a person is applying an approved voltage testing device to high-voltage conductors contained within the open spouts of metal enclosed switch gear, it is allowable for those parts of the body of such person required to do the task to approach within the safety distances specified in paragraph (2), subject to approved procedures.

(5) Where exposed high-voltage conductors are not isolated, the only objects that shall be made to approach them or the insulators supporting them, within the safety distances specified in paragraph (2), shall be insulated devices approved for high-voltage live line work or approved voltage testing devices.

(6) Where exposed conductors are isolated but not proved dead, the only objects that shall be caused to approach them or the insulators supporting them within the safety distances specified in paragraph (2), shall be insulated devices approved for high-voltage live line work or approved voltage testing devices.

(7) Where exposed high-voltage conductors in a substation have been isolated, a circuit main earth may be applied to the apparatus following a visual examination to confirm that adequate isolation has been achieved.

(8) Taking account of the nature and location of the work and the hazards and the presence of persons, an authorized person or the person in charge of the work, shall establish working and access clearances to ensure that the safety distances specified in paragraph (2) are maintained, both in respect of those persons present and the objects being handled.

(9) Where work is to be carried out within a one (1) metre distance of the safety distance specified in paragraph (2), a supervisor shall ascertain if any of the following additional precautions have been taken before work commences—

(a) danger notices or red pennants are attached to the pole or structure at a distance not less than that specified in that paragraph; or

(b) a limitation-of-access has been issued defining the work to be carried out in the vicinity of live conductors and detailing any specified potential hazards to be avoided.

(10) Danger notices or red pennants shall be attached by a senior authorized person or engineer or by a competent person acting under personal supervision of an authorized person or senior competent person.

73.—(1) The following provisions apply to a zone of work—

(a) when work is to be carried out in a substation, or switching station in which there are exposed live high-voltage conductors, the zone of work shall be properly identified by an authorized person, and shall be defined as far as possible by the use of approved barrier roping, yellow demarcation ribbons or by other approved means and shall be arranged so that the specified working and access clearances, from the nearest exposed live conductor or supporting insulator to ground level or platform or access way which may be repaired to be used, are established;

Work in  
substations  
and switching  
stations  
containing  
exposed live  
high-voltage  
conductors

(b) the zone of work to be defined at ground level shall be only that in which the work is to be carried out;

(c) if the work cannot be carried out without leaving the ground level or a platform or access way, the working and access clearances shall be obtained from the nearest exposed live high-voltage conductor to the points from which work is actually carried out, and in such cases, access shall only be by means of an approved ladder or other approved means;

(d) a person shall not climb any structure to gain access, and in the case of terminal poles in substations, access shall be in accordance with approved procedures:

(e) if the work is such that the specified working and access clearances are not sufficient to avoid danger, other suitable arrangements shall be made:

(f) the approved barriers or roping shall be clearly visible, so far as it is reasonably practicable, and shall not be supported by any structure carrying electrical apparatus or conductor and shall not carry any notice; and

(g) at ground level, the section so defined shall be clearly distinguished by green flags by day or, if not otherwise satisfactorily illuminated, by green lights at night, fixed on separate supports and suitably spaced within the safe boundary. Danger notices shall be attached to adjoining apparatus containing live conductors or adjacent conductor supports at the limits of the zone of work.

(2) Where necessary to prevent danger, the means of access to and from the zone of work shall be defined in an approved manner.

(3) The working and access clearance required at the zone of work under paragraph (1) shall be as specified in by-law 87 (8).

(4) The following provisions apply to the use of portable ladders and long objects where there are exposed live conductors—

(a) the type of portable ladders shall be approved and shall be of no greater length than is required for the work involved:

(b) portable ladders and other long objects shall not be used without the permission of an authorized person, who shall define the conditions of use to the senior authorized person in charge of the work, the movement and erection of such ladders and objects shall then be carried out only under the personal supervision of the senior authorized person and shall be carried only in a horizontal position and as near the ground as reasonably practicable:

(c) portable ladders provided for giving access to fixed ladders which terminate above ground level, and to provide access in other approved cases, shall be padlocked in position or otherwise secured by a senior authorized person while work is being carried out; and

(d) all portable ladders within substations, or switching stations shall be securely locked to a suitable anchorage when not in use.

(5) The following provisions apply to the use of cranes, scaffolds and other equipment—

(a) when cranes, scaffolds or other equipment and materials transported by vehicles or otherwise are taken into or out of a substation, the route to be followed shall be agreed by an authorized person, and the cranes, scaffolds or other equipment shall be connected to the substation earthing system as soon as reasonably practicable;

(b) the limits of operation of such equipment shall be defined by an authorized person to a senior authorized person who shall be in charge of the work, and thereafter the equipment shall be erected or moved only within such limits under the personal supervision of the senior competent person.

(6) Danger notices, barriers and screens shall be fixed or moved only by, or under the personal supervision of an authorized person.

(7) In the event of a lightning storm, work on exposed conductors in outdoor substations or outdoor switching stations, or on apparatus directly connected to exposed conductors shall cease immediately where necessary, to prevent danger, and the control engineer shall be informed.

74.—(1) A permit-to-work shall be issued by a senior authorized person before any work is carried out on any apparatus or conductor. Permit-to-work

(2) A permit-to-work shall only be issued with the knowledge of the control engineer, who shall maintain a record of the issue and cancellation of each permit-to-work.

(3) When working on a high-voltage switching schedule, the issue and cancellation of a permit-to-work shall be recorded by the control engineer after its issue as soon as it is practicable.

(4) Where more than one working party is involved in work on apparatus or conductors associated with the same circuit main earths, the authorized person in charge of the high-voltage switching schedule shall record the issue of all safety documents on his copy of the high-voltage switching schedule or danger envelope.

(5) If after agreement with the control engineer, it is found necessary to move any point of isolation located between the zone of work and a live high-voltage system, every outstanding permit-to-work shall be cancelled and new ones issued for any subsequent work on the apparatus.

(6) A permit-to-work shall be explained and issued to the person in direct charge of the work, who after reading its contents and confirming that he understands it and is conversant with the nature and extent of the work to be done, shall sign receipt and its duplicate.

(7) The recipient of a permit-to-work shall be a competent person who shall retain the permit-to-work in his possession at all times while work is being carried out.

(8) Where more than one working party is involved, a permit-to-work shall be issued to the competent persons in direct charge of each working party and they may, where necessary, be cross-referenced with each other.

(9) A permit-to-work shall be cleared and cancelled—

(a) when work on the apparatus or conductor for which it was issued has been completed;

(b) where it is necessary to issue a sanction-for-test, in which case, all permits-to-work that are associated with the apparatus and conductors to be tested shall be cancelled;

(c) where it is necessary to change the person in charge of the work detailed on the permit-to-work; or

(d) at the discretion of an authorized person, when it is necessary to interrupt or suspend the work detailed on the permit-to-work.

(10) The recipient shall sign the clearance and return the permit-to-work to a senior authorized person who shall cancel it and inform the control engineer, and in all cases, the recipient shall indicate in the clearance section whether the work is complete or not, and whether all gears and tools have been removed or not.

(11) Where more than one permit-to-work have been issued for work on high-voltage apparatus or conductors associated with the same circuit main earths, the control engineer shall ensure that all such permits-to-work have been cancelled before the circuit main earths are removed.

(12) Where there is a requirement for a permit-to-work to be temporarily withdrawn or suspended, such withdrawal or suspension shall be in accordance with an approved procedure.

Sanction-for-test

75.—(1) A sanction-for-test shall be issued by a senior authorized person initiating the testing under these By-laws before any testing is carried out on any apparatus or conductor.

(2) Apparatus shall be connected to earth in accordance with by-law 84 (c) prior to the issue of a sanction-for-test.

(3) A sanction-for-test shall only be issued with the knowledge of the control engineer, who shall maintain a record of the issue of each sanction-for-test or its cancellation.

(4) When working on a high-voltage switching schedule, the issue or cancellation of a sanction-for-test shall be recorded by the control engineer after its issue or cancellation as soon as it is practicable.

(5) A sanction-for-test shall be explained and issued to a person in direct charge of the testing, who after reading its contents and confirming that he understands it and is conversant with the nature and extent of the testing to be done, shall sign its receipt and duplicate.

(6) The recipient of a sanction-for-test shall be a senior authorized person who shall retain the sanction-for-test in his possession at all times whilst tests are being done.

(7) When testing on apparatus for which a sanction-for-test has been issued is suspended or completed, the recipient shall sign the clearance and return the sanction-for-test to an authorized person who shall cancel it and inform the control engineer.

76. Where there is a requirement for a sanction-for-test to be temporarily withdrawn or suspended, such withdrawal or suspension shall be in accordance with an approved procedure.

Procedure for temporary withdrawal or suspension

77. (1) A limitation-of-access shall be issued by an authorized person or a senior authorized person specially authorized to do so, when it is considered necessary to have written instructions to avoid danger and when a permit-to-work or a sanction-for-test is not applicable.

Limitation

(2) Where a limitation of access is required for work above ground level in a high-voltage substation, it shall only be issued by an authorized person with the knowledge of the control engineer.

(3) A person issuing a limitation-of-access shall determine from the nature of the work, occasions when the control engineer shall record its issue and cancellation.

(4) A limitation-of-access shall, when there is danger, be issued for the following types of activity

(a) work in proximity to, but outside the working and access clearance from exposed live high-voltage conductors;

(b) when work is to proceed in the vicinity of an overhead line and the line is made dead in accordance with by-law 84;

(c) access to and work in underground chambers and similar confined spaces;

(d) work on plant operated by or containing compressed air or other gases; or

(f) such other access or work as may be specified by a designated engineer.

(5) A limitation-of-access shall be explained and issued to the person in direct charge of the work, who after reading its contents and confirming that he understands it and is conversant with the nature and extent of the work to be done, shall sign its receipt and duplicate.

(6) The recipient of a limitation-of-access shall be an authorized person who shall retain it in his possession at all times whilst work is being carried out.

(8) Where more than one working party is involved, a limitation-of-access shall be issued to the competent persons severally having personal supervision of each working party.

27th April, 2012

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(7) Where more than one working party is involved, a limitation-of-access shall be issued to the competent persons severally having personal supervision of each working party.

(8) A limitation-of-access shall be cancelled by the recipient signing the clearance and returning the limitation-of-access for cancellation to an authorized person or senior authorized person specially authorized to do so.

*Division 5—Safety Precautions and Procedures Applicable to Low-Voltage Systems*

General

78.—(1) Where work or testing is carried out on or near low-voltage apparatus and conductors—

(a) precautions shall be taken to prevent danger of body injury due to electric arc or electric shock;

(b) the conductors shall be covered with insulation and screening, and the adequacy of these materials to prevent danger shall be assessed before work or testing is carried out; and

(c) precautions appropriate to work on or near exposed conductors shall be applied.

(2) Danger may arise in the following circumstances—

(a) where a person confuses apparatus and conductors which have been made dead with those which remain live;

(b) dead apparatus and conductors are accidentally or inadvertently made live;

(c) if a person accidentally or inadvertently makes contact with adjacent live conductors; or

(d) if inadequate precautions are taken during live work or testing.

(3) The term "earthed" when applied to the low-voltage system, comprises the bonding of the phase conductors (including any switch or earth wire) to the neutral conductors by means of an approved device or leads.

(4) Control and operation of low-voltage systems shall be in accordance with an approved procedure, and only persons appointed in accordance with an approved procedure shall carry out activities such as switching and the live testing of low-voltage systems.

(5) Work or testing of low-voltage apparatus and conductors shall be carried out by a competent person, and where working arrangements so require, approved procedures for the control of work, including the issue of a safety document shall apply.

(6) Where work or testing involves the initial connection or the re-arrangement of conductors to a consumer, the electricity supply shall not be provided to the consumer until checks have been made at an appropriate point on the system to ensure correct polarity at the supply terminals and where necessary, in the case of a three-phase supply, the phase rotation shall additionally be checked.

(7) A person shall not erect or dismantle a low-voltage overhead line under a live high-voltage overhead line without the authority of an authorized person, who shall ensure that when necessary, because of insufficient clearance, the high-voltage line is made dead and a permit-to-work issued.

(8) When a low-voltage overhead line conductor is to be raised or lowered or otherwise held on temporary support or connections, approved procedures shall be followed to ensure that no danger is caused at locations such as road or rail crossing where other persons may be present.

79.—(1) When work is to be carried out on dead low-voltage apparatus—

Requirements  
for work  
on dead  
low-voltage  
apparatus

(a) the conductors shall be isolated from all sources of supply from the system;

(b) where the isolating devices are lockable, safety locks shall be applied;

(c) if components such as fuses and links are removable, they shall be removed;

(d) caution notices shall be securely fixed at all points of isolation; and

(e) keys and removed components shall be kept in a secure place in the possession of the person in charge of the work.

(2) Conductors shall be earthed using an earthing device or earthing leads approved for use on the conductors concerned.

(3) Except when work on a low-voltage system is being carried out as part of approved high-voltage live line work, the following requirements apply—

(a) if the work requires a point of isolation to be established on a high-voltage system, an appropriate safety document shall be issued;

(b) if the work requires a high-voltage system to be made dead, isolated and earthed, a permit-to-work shall be issued; and

(c) if the work is being done in conjunction with work on a high-voltage system which has been made dead, isolated and earthed, the work shall be included on the permit-to-work issued for the high-voltage work.

(4) Suitable precaution shall be taken by approved screening or other approved means to avoid danger from inadvertent contact with adjacent live conductors including, where necessary, the fixing of danger notices to apparatus containing live conductors adjacent to other live conductors and at the limits of the zone in which the work may be carried out.

(5) Where conductors are likely to become live due to the operation of a consumer's generator, the following precautions shall be taken to prevent danger—

- (a) the conductors shall be isolated from the consumer's system; or  
 (b) the conductors shall be earthed on an earth provided between the point of work and the consumer's system.

(6) Before work is connected, the apparatus and conductors shall be identified and proved dead at the point of work by means of an approved voltage testing device, and whilst work is in progress, any live working method that can reasonably be applied to minimize the risk of danger from the conductors being accidentally or inadvertently made live shall be used.

Precautions  
for work  
on live  
low-voltage  
cables

80.—(1) A cable to be worked on shall be identified in accordance with the following—

(a) unless the point of work can be visually traced from a point where the conductors are accessible and have been proved dead at that point, it will be necessary to open the cable as if it is live and test each conductor with an approved voltage testing device; and

(b) if the cable has been damaged or is faulty, it shall not be presumed dead, and consequently, the test shall be made at a safe distance from the suspected point of damage on fault and the cable shall be visually traced from the point of test to the suspect point of damage or fault. Appropriate precautions shall be taken to avoid danger from electric arcing until the point of damage or fault is located.

(2) Where work is to be carried out on an auxiliary cable which may be subject to induced voltage from a high-voltage circuit, additional precautions to prevent danger from these voltages shall be taken in accordance with approved procedures.

Precautions  
for work  
on dead  
low-voltage  
overhead  
lines

81.—(1) Bare open-wire low-voltage conductors shall be earthed using approved earthing leads, and where insulated but unscreened conductors are present, the requirements for live working shall be observed until the conductors have been proved dead.

(2) Any unearthed steelwork such as an offset racket or the upper portion of a stay above the insulator shall be treated as live until it is or the conductors have been proved dead.

Work on live  
low-voltage  
apparatus and  
conductors

82.—(1) A person shall not carry out low-voltage live work except in accordance with an approved procedure, which shall ensure adequate protection from danger from electric shock and inadvertent short-circuiting of the conductors.

(2) Where low-voltage live work is to be carried out, the authorized person in charge of the working party shall make an assessment of the site conductors, and the work shall only commence where site conditions enable work to be done safely.

(3) If the site conditions become unsafe, low-voltage live working shall be suspended and the following requirements shall be followed—



(a) the apparatus to be worked on shall be visually inspected to ascertain if it is in a satisfactory condition;

(b) there shall be adequate working space and safe means of escape;

(c) the working space and the apparatus to be worked on shall be adequately illuminated; and

(d) if the work is to be done outdoors, it shall only be done if weather conditions are not unduly adverse.

(4) Every person who carries out live working shall be an authorized person and shall have received appropriate training in the particular low-voltage live working procedure, and adequately instructed by the senior authorized person in charge of the working party.

(5) Tools and equipment approved for that purpose shall be the only tools used for work on, or the testing of low-voltage apparatus and conductors.

(6) A person shall not carry out work which involves, or is equivalent to a manipulation of bare live conductors unless accompanied by another person who shall be available to render or obtain assistance in an emergency.

83.—(1) A cable to be worked on shall be identified by approved means, and all metal-work adjacent to the point of work shall be adequately shrouded with approved insulating material to prevent inadvertent contact. The metallic sheaths of cables shall be bonded to each other with an approved insulated conductor before jointing and cutting to ensure continuity of the electrical circuit through the sheath.

Precautions  
for work  
on live  
low-voltage  
cables

(2) Unless alternative approved procedures allow, during all work including the change of cut-outs, only one conductor shall be bared at a time and insulating gloves and an insulating mat shall be used.

84.—(1) Where work is carried out on live overhead lines, any unearthed steelwork such as an offset bracket shall be proved dead using an approved voltage testing device.

Precautions  
for work  
on live  
low-voltage  
overhead lines

(2) When work is carried out on insulated but un-screened low-voltage conductors, a person working on such conductors shall wear insulated gloves and use insulated tools to prevent danger that may arise if the insulation has deteriorated or is damaged.

85. Safety rules applicable to work on high-voltage systems, apparatus and conductors may, with the necessary modifications, be applied to work on low-voltage systems, apparatus and conductors in accordance with approved procedures.

Application of  
high-voltage  
rules to work  
on low-  
voltage  
apparatus and  
conductors

86.—(1) Testing and adjustment including functional testing may be made with low-voltage apparatus live if a person making such testing and adjustment uses approved insulated tools and instruments.

Testing and  
adjustment of  
low-voltage  
apparatus

(2) If the testing or adjustment requires covers to be removed so that terminals or connections that are live or can be made live are exposed or temporarily disconnected, precautions shall be taken to prevent unauthorized access to or interference with the apparatus. Such precautions shall include, where necessary, personal supervision or erection of suitable barriers or screening and the display of danger notices.

(3) If the conductors are to be made dead in order to avoid danger, appropriate requirements under by-laws 94 and 95 shall be applied.

(4) In this Part, "low-voltage" applies to a licensee's 400/240V distributing mains and services.

#### PART VI—WIRING

##### *Division 1—General*

Administration  
of by-laws

87.—(1) The Authority or any of its authorized members or officers or other person authorized by it shall, subject to any special or general directions of the Authority, be responsible for the administration and the proper execution of these By-laws, and shall have such powers of entry and inspection for such purposes as the Authority may specifically or generally direct.

(2) Any member or officer of the Authority or any other authorized person referred to in paragraph (1) shall be deemed to have been appointed as an electrical inspector.

Application  
of by-laws

88.—(1) Subject to paragraphs (2) and (3) and by-law 151, these By-laws shall apply to every consumer and every private owner.

(2) Divisions 2, 3 and 4 shall not apply to—

(a) the construction, installation, quality, alteration, operation, control, protection, inspection and testing of parts of a consumer's or private owner's installation which are used exclusively for mining or factory purposes at a mine or factory where such parts comply with the electrical provisions of any written law relating to such construction, installation, quality, alteration, operation, control, protection, inspection and testing at a mine or factory.

(3) By-law 125 shall not apply to the construction of a substation by a consumer or private owner for the accommodation of a high-voltage part of his installation where such substation complies with any written law relating to its construction.

Inspection of  
installations

89.—(1) All installations made prior to the coming into force of these Regulations shall be required to be inspected by an electrical installations person and be issued with a Certificate of Installation by the electrical installations person within two (2) years of the coming into force of these Regulations.

(2) All electrical installations shall be inspected by an electrical installations person and issued with a Certificate of Compliance every five (5) years from the date of their previous Inspection Certificate.

90. Where a difference arises between a consumer and a licensee, such dispute shall be resolved in accordance with the Energy Regulation Act.

Procedure  
for settling  
disputes

91.—(1) Before any work is commenced on a new installation or on any alteration or extension to an existing installation, an electrical installations person or a competent person, authorized by a consumer or prospective consumer, as the case may be, to carry out the work, shall, for and on behalf of the said consumer or prospective consumer—

Prior  
notification  
to undertaker

(a) advise the licensee in writing with reference to—

(i) the purpose, type and extent of the proposed work;

(ii) the electrical loading of equipment for which the supply or additional supply, as the case may be, is required;

(b) obtain from the licensee in writing details of—

(i) the type of current, number of phases and frequency if alternating current, and voltage at which the licensee proposes to deliver electricity to the supply terminals;

(ii) the licensee's property which is to be accommodated in accordance with by-law 107;

(iii) the meter panel and connections required in accordance with by-law 107;

(iv) earthing requirements; and

(v) proposed tariff.

(2) Where the work referred to in paragraph (1) is commenced it shall—

(a) not thereafter be changed in relation to its purpose, type, extent and electrical loading except as may be agreed with the licensee; and

(b) be executed to suit the licensee's stated specification details referred to in paragraph (1) (b).

92.—(1) A consumer requiring a supply of electricity, or a consumer receiving a supply of electricity who requires an alteration in the terms of his original electricity supply agreement involving a change in the licensee's metering arrangements, shall unless otherwise agreed in writing with the licensee, provide all necessary accommodation on his premises for the undertaker's property as is necessary to provide the said supply or change in metering arrangements, as the case may be.

Accommoda-  
tion to be  
provided

(2) Accommodation referred to in paragraph (1) shall be located at a position to be agreed between the consumer and the licensee and be of a type, design and size required by the licensee.

(3) Where the accommodation referred to in paragraph (1) is outside a building, it shall be fully weatherproofed and have no means of access other than by a lockable door.

(4) Where the accommodation referred to in paragraph (1) is located in a substation, switch room, or similar compartment designed solely for electrical purpose, such place shall have a lockable door and shall not be used for purposes other than accommodation of the licensee's property.

(5) Where a group of shops, offices, flats, tenements, or workshops is to be erected for occupation by separate tenants or a building is to be converted for such use and it is intended that each tenant shall have an individually metered supply of electricity, the owner of the building shall—

(a) provide such accommodation at one or more places as may be required by the licensee for his meters and other property; and

(b) ensure that each tenant has—

(i) free access to the meter registering the tenant's supply of electricity for checking and inspecting purposes; and

(ii) a main switch and fuses or a circuit-breaker necessary for controlling the tenant's supply of electricity situated in that part of the building occupied by the tenant.

Meter panels  
and  
connections

93.—(1) A consumer who has provided accommodation in accordance with by-law 107 shall supply two copies of a plan to a scale of not less than 1:500 on which it shall be agreed between him and the licensee the route of the service mains and entry point to the premises.

(2) The consumer shall further unless otherwise agreed in writing with the licensee—

(a) supply and fix in a manner and at a position to be agreed between the consumer and licensee, a meter panel of the size, type, design and construction required by the licensee;

(b) supply and fix such additional component parts as may be required for the operation of transformer metering where such metering is to be used,

(c) supply all necessary meter loops, line and load connections; and

(d) where the service line to be used is an overhead line, supply and fix, at a position to be agreed between the consumer and licensee, internal service mains and roof shackles.

Custody of  
licensee's  
property

94.—(1) A consumer shall take all reasonable steps necessary to ensure the safe custody of the licensee's property installed on the consumer's premises for or incidental to the supply of electricity.

(2) Accommodation provided by a consumer under the provisions of these By-laws for the licensee's property shall be maintained by the consumer, his servants and agents in a fit and proper state.

(3) A consumer, his servants and agents on whose premises property belonging to a licensee is accommodated for or incidental to the supply of electricity shall not, in relation to the said property—

- (a) permit access thereto by a person other than—
  - (i) the licensee;
  - (ii) a person authorized by the licensee; or
  - (iii) an electrical inspector;
- (b) unless permitted by the licensee—
  - (i) remove or attempt to remove the property from its position;
  - (ii) remove or attempt to remove any lock or seal attached to the property;
  - (iii) connect thereto or disconnect therefrom, a consumer's installation or other electrical circuit; or
  - (iv) alter, adjust, handle, operate, tamper or interfere with the property in any way.

95.—(1) Any part of a consumer's installation which is in a faulty condition as to have caused or is likely to cause death or injury to any person or damage to any property shall, on the faulty condition becoming known— Disconnection in certain circumstances

(a) subject to by-law 34 (2), immediately be disconnected by that consumer or person from the supply of electricity; and

(b) subject to paragraph (3), not be reconnected until the faulty condition of the said part has been remedied.

(2) Any part of a consumer's installation, which, due to a faulty condition, is causing interference with the use of a telecommunication line, shall, on the faulty condition becoming known to the consumer or to a person authorized by him to operate the installation—

(a) subject to regulation 34 (2), be disconnected by that consumer or person from the supply of electricity; and

(b) subject to subregulation (3), not be reconnected until the faulty condition of the said part has been remedied.

(3) Any part of an installation disconnected in accordance with paragraph (1) or (2) may be reconnected to a supply of electricity for testing purposes where such temporary reconnection can be made without risk to life or property.

96. (1) On a single-phase two-wire or three-phase four-wire consumer's installation operating at low-voltage or medium-voltage supplied from the consumer's own generator or transformer, one generator or transformer winding directly supplying that voltage shall have Connection of neutral with earth

(a) if single-phase, one pole or its neutral point earthed; and

(b) if three-phase, its neutral point earthed.

(2) Where a consumer's installation operates at a high-voltage and is designed for operating with an earthed neutral, the neutral of the generator or transformer winding shall be earthed at the point of generation or transformation:

Provided that where the generator or transformer feeds a remote transformer, via a transmission line, the neutral of the generator or transformer shall be required to be earthed if the neutral of the transformer is earthed at the point of the remote transformation.

(3) On a consumer's installation which is high-voltage and designed for operating with an insulated neutral—

- (a) provision shall be made to indicate a displaced neutral; and
- (b) precautions shall be taken against a breakdown of insulation.

(4) Save for operational purposes on a consumer's high-voltage installation, a conductor which is connected to earth in accordance with this regulation shall be interrupted by a fuse, switch, circuit-breaker, link or other means whilst any phase conductor of the installation remains live.

Protection of  
telecommunica-  
tion

97. A consumer shall comply with the standards for telecommunication lines protection where—

- (a) a cable by him crosses or is in close proximity to an underground telecommunication line; or
- (b) an overhead line installed by him crosses or is in close proximity to an overhead telecommunication line.

Guidance and  
instructions

98.—(1) For the guidance of a person authorized by the consumer to operate, control or work on or near the consumer's installation, whether under supervision or otherwise, where high-voltage may be present, the consumer shall issue instructions regarding the working procedure to be followed to ensure maximum safety.

(2) The instructions referred to in paragraph (1) shall, where the person is engaged in inspection, testing, cleaning, repairs, painting or constructional or general maintenance work in proximity to live high-voltage conductors, require that person to observe the minimum section clearance set out in the Seventh Schedule hereto.

Certificate of  
inspection  
and testing

99. A consumer who wishes to supply a certificate for the purposes of by-law 27 (2), as read with by-law 35 (2), that his installation or part thereof has been inspected and tested shall furnish a certificate which shall be executed by either an electrical installations person or a competent person.

#### *Division 2—Construction of Consumer's Installations*

Design and  
mechanical  
protection

100.—(1) A consumer's installation shall have conductors—

- (a) sufficient in size and power rating for purposes for which the supply of electricity is to be used; and
- (b) constructed, installed and protected so as to prevent, as reasonably practicable, danger to person or property;

(2) The consumer's installations shall not be temporarily or permanently added to unless—

(a) it has been ascertained that the current rating and condition of the existing installation, which will have to carry the additional load and the earthing arrangements, are adequate for the increased loading; and

(b) by-law 106 has been complied with.

(3) Where the consumer's installation or any part thereof is exposed to adverse weather, corrosive atmosphere or other adverse conditions, the installation or that part shall be constructed and, additionally or alternatively, protected to prevent danger to any person or property arising from such exposure:

Provided that where the conditions comprise exposure to flammable surroundings or an explosive atmosphere, the consumer's installation shall—

(a) be protected by a flameproof enclosure of an appropriate standard of construction; and

(b) be of such construction as to prevent danger or have intrinsically safe characteristics so as to prevent danger to any person or property.

(4) Conductors and live parts of a consumer's installation shall be—

(a) insulated and further effectively protected where necessary; or

(b) so placed and safeguarded as to prevent, so far as is reasonably practicable, danger to any person or property.

(5) Medium-voltage conductors and medium-voltage live parts of a consumer's installation shall be—

(a) completely enclosed in earthed metal which is electrically continuous and adequately protected against mechanical damage; or

(b) so constructed, installed and protected as to prevent, is reasonably practicable, danger to any person or property.

(6) Subject to by-law 129, high-voltage conductors and high-voltage live parts of a consumer's installation shall—

(a) be completely surrounded and protected by earthed metal;

(b) have the minimum section clearance set out in the Seventh Schedule; or

(c) be guarded by a protective barrier to prevent inadvertent touching or approach by a person standing at floor level or on a walkway, stair or working platform.

101.—(1) Every distinct circuit of a consumer's installation shall be protected against excess current by means of a suitable fuse or automatic circuit-breaker— Electrical protection

(a) of adequate breaking capacity; and

(b) suitably located and of such construction as to—

(i) prevent danger from overheating, arcing or the scattering of hotmetal when it comes into operation; and

(ii) permit the ready renewal of the fusible metal without danger to any person or property.

(2) No fuse, non-linked switch or non-linked circuit-breaker shall be inserted in a conductor connected with earth.

(3) A single-pole switch may only be inserted in a live conductor.

Isolation and  
control  
position

102.—(1) Except in the case of an unmetred service line, effective means suitably placed for ready operation shall be provided so that all voltage may be cut off from every part of a customer installation as may be necessary to prevent danger, and such means shall include a fireman's emergency switch on the exterior of a building, where necessary, to disconnect a high-voltage discharge-lamp installation or an electrified barrier.

(2) An electricity consuming device which requires operation or attention in normal use shall be installed so that adequate means of access and working space are afforded for such operation or attention.

(3) An electric motor shall be controlled by an efficient switch or switches for starting and stopping and the switch or switches shall be placed so as to be readily accessible to and easily operated by the person in charge of the motor.

Earthing of  
metal-work

103.—(1) Metal-work of a consumer's installation enclosing, supporting or otherwise associated with conductors operating at a voltage in excess of extra-low-voltage shall, where necessary to prevent danger, be connected with earth.

(2) Metal-work attached to or forming part of a metal or reinforced concrete support and any metal transformer-case or metal switch handle mounted thereon shall be connected with earth.

(3) Subject to paragraph (4), metal-work attached to or forming part of a wooden support which is liable to become dangerous of leakage across or failure of the insulation shall—

(a) if the metal-work is not more than 3 metres above the ground, be connected with earth; and

(b) where the metal-work is more than 3 metres above the ground, be connected with earth or have effective secondary insulation sufficient to withstand the voltage to earth.

(4)—(a) A metal transformer-case together with its associated metal-work and any metal switch handle shall be connected with earth if it is mounted on a wooden support; and

(b) a high-voltage switch with a switch handle not more than 3 metres above the ground shall have inserted in the operating rod between the switch handle and the switch, an insulator capable of withstanding the normal operating voltage if it is mounted on a wooden support.



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(2) Save as is provided in paragraph (1), where there is an interconnection between the earthing arrangements of the licensee and the main earthing conductor of the consumer's installation, the consumer shall comply with the conditions considered necessary by the licensee in accordance with the Part IV—Supply and Quality Service of these By-laws.

(3) Where there is no interconnection between the earthing arrangements of the licensee and the main earthing conductor of the consumer's installation, the consumer shall provide and install his own earthing arrangements to ensure compliance with these By-laws.

(4) An earth electrode of a consumer shall be installed so that no voltage gradient is maintained at ground level which may cause danger to life and property.

Electrode  
boilers

107.—(1) In this by-law—“electrode boiler” includes an electrode type of water heater.

(2) An electrode boiler shall—

- (a) be used only on alternating current; and
- (b) have an isolating and protecting circuit-breaker.

(3) The circuit-breaker referred to in paragraph (3) (b) shall—

- (a) be of the multi-pole linked type arranged to disconnect the supply from all electrodes simultaneously;
- (b) have an over-current protective device for each electrode;
- (c) have a locking-off device to prevent the electrode boiler inadvertently being made live whilst a person is working thereon;
- (d) is arranged for direct hand operation from a position near the boiler, and be readily accessible and visible to a person using the boiler;
- (e) if not arranged for direct hand operation from a position near the boiler, have remote control by a hand-operated switch or push-button—
  - (i) with a lamp or other instrument to provide visual indication of the “ON” and “OFF” condition of the electricity supply fixed at or near the boiler; and
  - (ii) readily accessible and visible to a person using the boiler.
- (f) where the boiler is to be operated at high-voltage, have automatic tripping in the event of phase currents becoming unbalanced to the extent of ten *per centum* of the full load current of the boiler:

Provided that—

- (i) the margin may be increased to fifteen *per centum* (15%) where the higher setting is essential to ensure operational stability; and
- (ii) an inverse time-element device may be associated with the automatic tripping to prevent unnecessary tripping where the imbalance is momentary or of short duration.

(4) The earthing system of electrode boiler shall, in addition to complying with by-laws 117 and 118, include—

(a) the bond together of—

(i) the metallic shell and other metal-work of the boiler;

(ii) any water pipes or steam pipes of metal in metallic contact with the said shell or other metal-work; and

(iii) any metal armouring or metal sheathing of a cable providing a supply of electricity to the said boiler;

(b) the connection of bonded metal-work referred to in sub-paragraph (a) to the neutral conductor and to the main earthing terminal of the consumer's installation.

(5) In the case of electrode boiler, the neutral conductor, main earthing conductor and bonding and the connections to such bonding shall have a current-carrying capacity not less than that of any live or phase conductor at all points except in a subsidiary tripping-circuit where the current-carrying capacity shall be in accordance with the designed tripping-circuit current.

(6) An electrode boiler of a type other than a three-phase three-electrode balanced-load type shall not be connected to a supply of electricity otherwise than by means of a double-wound transformer situated within the same building as the said boiler or as close as is practicable and on the same premises.

108.—(1) An auto-transformer shall not be fed from a circuit operating at a voltage exceeding low-voltage unless such auto-transformer is used— Auto-transformers

(a) in motor starting or control-gear;

(b) in conjunction with and installed adjacent to a capacitor which is employed for improving the power factor; or

(c) in a high-voltage discharge-lighting circuit.

(2) An auto-transformer shall not be used to supply—

(a) a socket-outlet;

(b) a portable appliance unless the auto-transformer is contained therein;

(c) an electric toy or model;

(d) earthed concentric wiring; or

(e) an extra-low-voltage circuit.

(3) An auto-transformer shall—

(a) if used for step-up purposes—

(i) be supplied only from a system in which the neutral conductor is earthed; and

(ii) have the neutral conductor connected to the common pole of the primary and secondary windings;

(h) if used for step-down purposes, have the secondary winding insulated for the maximum voltage likely to be applied to the primary winding.

(4) Where an auto-transformer is used for step-up purposes, means of isolation required in accordance with by-law 116 shall be arranged to disconnect all primary supply conductors simultaneously.

## Capacitors

109.—(1) Save in the case of a capacitor incorporated in apparatus for the sole purpose of radio interference suppression; or where the capacitor is so small that no risk of electric shock can arise therefrom, a capacitor shall have a high resistance leak or other means for the prompt and automatic discharge of electricity immediately the supply thereto is disconnected.

## Indoor substations

110.—(1). Subject to by-law 103 (3), a substation constructed by a consumer for the accommodation of a high-voltage part of his installation shall—

(a) be substantially constructed and designed specifically for its intended purposes; and

(b) be arranged so—

(i) as to prevent, as far as practicable, access thereto except by a doorway or gateway; and

(ii) that no hinged door opens inwards;

(c) enclose the said part of the installation, as far as practicable;

(d) be ventilated, kept dry and made vermin-proof, as far as practicable;

(e) have fixed outside each entrance a danger notice; and

(f) have prominently displayed inside, printed instructions as to the proper first-aid treatment of persons suffering from electric shock.

(2) Subject to by-law 103, a substation referred to in paragraph (1) constructed below ground level shall—

(a) have adequate means of access by a door or trap door with a staircase or ladders securely fixed and placed so that no live part of the system or conductor is within reach of a person thereon; or

(b) where a person is to be regularly employed therein, have the access referred to in paragraph (a) by door and stair case only.

## Outdoor substations

111.—(1) Any part of the consumer's installation for the transformation, control, regulation or switching of electricity in the open air shall, save as is otherwise provided for in Division 3 or 4—

(a) be mounted on the supports of an overhead line;

(b) be enclosed by a fence not less than 1.8 metres in height, fitted with a suitable anti-climbing device for the purpose of preventing access not authorized by the consumer; or

(c) where subparagraph (a) or (b) is not complied with, have all parts below the height of 3 metres from the ground completely enclosed in a metal casing.

(2) A danger notice referred to in paragraph (1) (a), (b) or (c), shall be fixed to the supporters, fence or metal casing, as the case may be.

### *Division 3—Underground Cables*

112.—(1) An underground cable shall be fully insulated for the normal operating voltage and shall be of a type and construction and be laid or installed in a manner suited to its particular environment and having regard to—

Construction and installation

(a) by-law 116;

(b) the normal usage of the ground in which any part of it is to be laid; and

(c) foreseeable risk of damage to the cable and danger to persons, property and to other electrical services, railways and constructional works at or below ground level.

(2) A component used with an underground cable shall be of a type and construction and shall be laid or installed in a manner suited to that cable and having regard to the provisions of—

(a) paragraph (1); and

(b) by-law 127 in circumstances where a cable joint or connection is necessary.

113. An electrical joint or connection associated with an underground cable shall be designed, constructed, installed and protected in a manner that—

Joints and connections

(a) electrical conductivity is maintained satisfactorily;

(b) its insulation, where insulation is necessary, is suitable for the normal operating voltage; and

(c) its mechanical strength is suited to its location and environment.

114.—(1) Subject to paragraph (3), a high-voltage underground cable shall be laid or installed so that it is completely surrounded and protected by earthed metal as provided by—

Metallic protection of high-voltage cables

(a) its own metal sheathing or metal armouring; or

(b) an outer metallic covering.

(2) Subject to paragraph (3), a joint, connection or termination of a high-voltage underground cable shall be completely surrounded and protected by earthed metal.

(3) In a power station, substation, switch-room or similar premises designed for electrical purposes, it shall not be necessary for a high-voltage cable, joint, connection or termination to be completely surrounded and protected by earthed metal where the cable, joint, connection or termination has the minimum section clearance, or is guarded by the protective barrier required in accordance with by-law 115 (5).

Identification  
and insulation  
test

115.—(1) A neutral conductor of an underground cable shall, at its termination, be permanently identified so that it is readily and uniformly distinguishable from other conductors.

(2) Where two or more underground cables forming part of different circuits terminate at adjacent positions, each circuit shall—

(a) be permanently labelled on its exterior or on its terminating box or component; or

(b) have other means of identification, so that it is readily distinguished from other circuits.

(3) An underground cable shall not be subject to an insulation test after being laid or installed and before being connected to a supply of electricity, and it shall not be so connected if the connection would result in an electrical leakage which might be a danger to persons or property.

(4) No underground cable shall be permanently connected to a supply of electricity unless tests have been made—

(a) to ensure compliance with these By-laws, and in particular by-law 118 (1) and (2); and

(b) to establish that there is electrical continuity of conductors.

#### *Division 4—Overhead Lines*

Overhead lines

116. This Division shall apply to overhead lines other than—

(a) an overhead crane wire or trolley wire;

(b) an overhead line consisting entirely of insulated conductors enclosed in earthed metal sheathing or earthed metal armouring;

(c) a conductor used above ground and in the open air as a fence specially designed for the control of the movement of animals;

(d) an overhead telecommunication line;

(e) an overhead line and substation within a fenced enclosure specially erected by the consumer operating such line and substation for the purpose of prohibiting entry not authorized by him where such fence is not less than 1.8 m in height and is fitted with a suitable anti-climbing device.

Constructional  
materials  
requirements

117.—(1) Line conductors shall be of acceptable conductor materials—

(a) line conductors and earth conductors are of copper, cadmium copper, steel-cored copper, aluminium, steel-cored aluminium, aluminium alloy, copper-clad steel, galvanized steel, stainless steel or any compatible combination of these materials;

(b) cradle supporting wires and stay-wires are of stranded galvanized steel or of material of not less than equivalent strength and durability:

(c) a support is made from wood, metal or reinforced concrete or a combination of these materials and where wood or metal is used in the construction of a support, such wood or metal is protected against decay or corrosion as far as is reasonably practicable:

(d) supports and the foundations thereof are constructed and placed, taking into account the characteristics of the ground in which they are embedded and to the load which they are to carry; and

(e) insulators are—

(i) of durable materials; and

(ii) designed to withstand the mechanical loading and electrical stresses of normal operating conditions.

(2) Cradle supporting wires and stay-wires shall be of stranded galvanized steel or a material of a strength and durability not less than that of stranded galvanized steel.

(3) A support shall be of wood, metal or reinforced concrete or a combination of these materials and any other acceptable materials, and where wood or metal is used in the construction of a support, such wood or metal shall be protected, as far as is reasonably practicable, against decay or corrosion.

(4) Supports and the foundations hereof shall be constructed and placed having regard to the characteristics of the ground in which they are embedded and to the load, which they are to carry.

(5) Insulators shall—

(a) be of durable materials; and

(b) be designed to withstand the mechanical loading and electrical stress of normal operating conditions.

118.—(1) A line conductor near a building or other permanently raised position existing at the time of erection of the line shall—

Minimum heights and insulation

(a) if operating at extra-low-voltage, low-voltage or medium-voltage, be insulated at all places within a distance of 1.83 m from any part of such building or raised position; and

(b) if operating at high-voltage, be completely surrounded and protected by earthed metal or have the minimum section clearance or protective barrier required in accordance with by-law 115 (5) between it and any part of such building or raised position.

(2) Service lines in the terminal span of a connection between an overhead line and a building, or in a span between one building and another building, shall be insulated conductors.

(3) The point of attachment of a service line shall—

(a) where connection is to an overhead line, be at a support:

Provided that a vertical service connection may be made elsewhere if it does not exceed 3.1 metres in length; and

(b) where connected to a building, be at a terminating device securely fixed to the building.

(4) A conductor, other than an earth conductor, leading to or from a transformer or other apparatus as a pole-mounted substation shall, at all points below a height of 3.7 m from the ground, be insulated and, in the case of a high-voltage conductor, shall have earthed metal sheathing or earthed screening.

(5) The height above ground of a line conductor, other than an extra-low-voltage, low-voltage or medium-voltage insulated line conductor, shall be not less than the appropriate height specified in the Third Schedule or such greater height as may be required either for compliance with by-law 112 or 115 in accordance with by-law 135.

(6) Subject to by-law 135, the height above ground of an extra-low-voltage, low-voltage or medium-voltage insulated line conductor shall not be less than—

(a) where the line is above a road normally accessible to vehicular traffic, 5.5 metres;

(b) save as is provided in sub-paragraph (c), where the line is not above a road normally accessible to vehicular traffic, 4.3 metres; and

(c) in the case of a service line in the terminal span of a connection between an overhead line and a building or in a span between one building and another building, 3.1 metres at any point where the line is not above a road normally accessible to vehicular traffic.

(7) Where an earth conductor, stay-wire or cradle fitted between supports crosses a road normally accessible to vehicular traffic, the height thereof above the road surface shall not be less than 5.5 metres.

(8) Any minimum height or clearance required by these By-laws shall be maintained under any conditions of loading and temperature likely to occur in the area concerned.

In metered  
service lines

119.—(1) A consumer shall comply with the directions of a licensee in relation to the design and construction of a line or part of a line—

(a) where a consumer installs an unmetered service line on his premises;

(b) or where a part of the consumer's installation is to be solely operated and controlled by the licensee; and

(c) where the licensee in accordance with the Supply Regulations is required to ensure that such service line or such part of the installation is suitable for its intended purpose and is installed to prevent, as far as practicable, leakage of electricity to adjacent metal.



(2) Where the consumer has no effective means of cutting off the voltage to a line or part of a line referred to in paragraph (1) he shall, if a disconnection is required, immediately notify the licensee that it is required.

(3) Where a licensee has advised the consumer of any remedial measures necessary to correct any defect, deficiency or faulty condition which may exist in a line or part of a line referred to in paragraph (1), the consumer shall effect such remedial measures to the satisfaction of the licensee, after the said line or part of the line has been disconnected from the supply of electricity for that purpose.

120. Where an overhead line crosses a permanent railway track having a gauge of not less than 1.1 metres, the following conditions shall apply—

Overhead  
lines crossing  
railway tracks

(a) the height above the rail of—

(i) a line conductor, shall not be less than the appropriate height specified in the Fifth Schedule; and

(ii) an earth conductor, stay-wire or cradle between supports, shall not be less than 7 metres;

(b) there shall be no joints in the crossing span;

(c) the crossing shall be made at right angles or as near thereto as practicable and shall be not less than 70 degrees, unless permission in writing therefore has been obtained from the authority responsible for the operation of the railway; and

(d) the length of span at the crossing shall be as short as is reasonably practicable, and notwithstanding by-law 136 (6), line conductors used at the crossing shall be stranded with not less than 0.42 square centimetres cross-section area copper or its equivalent conductivity.

121.—(1) Where a high-voltage overhead line crosses an extra-low-voltage, low-voltage or medium-voltage overhead line or where line conductors forming part of such differing systems are erected on the same supports, provision shall be made to guard against the extra-low-voltage, low-voltage or medium-voltage system being charged above its normal voltage.

Different  
voltages in  
proximity

(2) Where a pilot circuit is installed and operated as part of an overhead line system, paragraph (1) shall apply thereto and such pilot circuit shall be installed and operated with due regard to any dangers which may arise from its use.

122.—(1) In calculating the strength of the various constituent parts, including supports of an overhead line, the following basic conditions shall be assumed—

Loading  
conditions  
and factors  
of safety

(a) a minimum temperature of zero (0°) degrees Celsius;

(b) the wind pressure acting on the projected area of line conductors and supports not exceeding 12.2 metres in height shall not be less than 1 kilogram per square centimetre, and of those exceeding 12.2 metres but not exceeding 36.6 metres in height shall be not less than 1.1 kilogram per square centimetre; and

(c) in the case of conductors, earth wires and round, elliptical or hexagonal poles used as supports, the area on which the pressure acts shall be taken as sixty *per centum* (60%) of the projected area, and in the case of lattice or composition structures, as one and one-half times the projected area of the constituent parts of one side.

(2) In the design of spans of over 122 metres the assumed wind load on conductors and earth wires may be reduced to seventy *per centum* (70%) of the calculated load.

(3) In the design of spans, due regard shall be given to the possibility of injurious conductor vibration by wind effects.

(4) A support shall be designed so that the failing load operating conditions shall be not less than the resultant of simultaneous horizontal and vertical loads calculated in accordance with the provisions of this by-law multiplied by the following factors—

(a) where the support is of metal or concrete, 2.5; and

(b) where the support is of wood, 3.5.

(5) Subject to paragraph (6) and load in a line conductor, earth conductor, insulator, joint or cradle component or an associated fitting, under operating conditions shall not exceed 50 *per centum* of its ultimate breaking load.

(6) The minimum permissible size for a single line conductor shall be such as to have an ultimate breaking load of not less than 360 kg and shall not be less in gauge than No. 10 British Standard Wire Gauge.

Periodic  
testing and  
inspecting

123.—(1) Where metal-work is required to be earthed in accordance with by-law 117, the earthing system of the overhead line with which it is associated, shall be tested at least one point by the consumer or by a person authorized by him—

(a) before commissioning such overhead line; and

(b) thereafter, at intervals of not more than five (5) years; and repaired if necessary.

(2) The purpose of a test made in accordance with paragraph (1) shall be to ensure that the leakage result from contact of negligible resistance between a line conductor and any metal-work connected with earth is sufficient to operate the protective device installed in accordance with by-law 118 to make that line conductor dead.

(3) An overhead line and its supports and any outdoor substation shall be inspected from ground level or above, by the consumer or by a person authorized by him—

(a) an earthing connection is taken from the metal-core or metal-work closely associated with the higher voltage winding to an earth electrode; and

(b) another earthing connection is taken from the neutral point of the low-voltage or medium-voltage winding to the same earth electrode or to another earth electrode with its own resistance area.

Use of cables

130.—(1) Where a cable is used as an electric line provided with protective multiple earthing and is laid underground such cable shall—

(a) have a neutral conductor of the same material as, and be of a cross-sectional area not less than, any phase conductor; and

(b) have metal sheathing or metal armouring.

(2) The metal sheathing or metal armouring or, if the cable had both metal sheathing and metal armouring, the metal sheathing and metal armouring and the neutral conductor referred to in paragraph (1) shall be bonded together and also bonded to—

(a) the earthing connection referred to in by-law 143 (b) at the transformer position; and

(b) an earth electrode or electrodes installed at points at or near the end of each line.

Use of overhead lines

131.—(1) Where an overhead line is used as an electric line provided with protective multiple earthing, such line shall—

(a) have a neutral conductor of the same material as, and of a cross-sectional area not less than, any phase conductor; or

(b) have two neutral conductors of the same material as, and each of a cross-sectional area not less than one-half that of any phase conductor.

(2) The neutral conductor or the two neutral conductors referred to in paragraph (1) (a) or (b) shall be bonded to—

(a) the earthing connection referred to in by-law 143 (b) at the transformer position; and

(b) earth electrodes installed at regular intervals as far as practicable, along the route of the line at branching points and at the final pole of each line.

Use of cables and overhead lines

132.—(1) Where an underground cable and an overhead line are used in association with each other, an electric line provided with protective earthing, by-law 145 or 146, shall apply respectively, to the cable and the overhead line, except that bonding to the earth connection at the transformer position referred to in by-law 145 (2) (a) or 146, as the case may be, may be omitted in the case of—

(a) an underground cable which starts at a position remote from the transformer if that cable is fed from an overhead line which has such bonding to the earth connection at the transformer position; and

(b) an overhead line which starts at a position remote from the transformer if that line is fed from an underground cable which has such bonding to the earth connection at the transformer position.

(2) At every point where an underground cable and an overhead line referred to in paragraph (1) are connected with each other, each neutral conductor of the said cable and line and the metal sheathing or metal armouring of the cable shall be bonded together.

133. By-laws 144, 145 and 147 shall not have been complied with until it has been established that the overall resistance to earth of a neutral conductor—

Overall  
resistance

(a) is such that the fuse, circuit-breaker or other protective device of the high-voltage side of the transformer will operate safely in the event of a breakdown between the transformer windings;

(b) does not exceed ten ohms; and

(c) is such that by-laws 119 and 120 where applicable, can be complied with efficiently.

134. No fuse switch, circuit-breaker, link or device, other than a bolted link, for interrupting continuity, shall be inserted in a neutral or earth conductor used for protective multiple earthing purposes.

Neutral  
and earth  
conductor

135. Where a supply of electricity is delivered from an electric line provided with protective multiple earthing to a separate installation, and whether such installation is to be operated and used by the consumer or by another person, the consumer, before providing an earth connection thereto, shall satisfy himself in regard to the separate installation that—

Separate  
installations

(a) metal-work enclosing, supporting or in proximity to, or likely to come into contact with any live conductor or live part is bonded together by one or more earth-continuity conductors;

(b) the overall resistance to earth of the system is such that by-law 119 can be complied with efficiently; and

(c) by-law 149 has been complied with.

#### Division 6—Private Generation and Supply

136.—(1) Subject to by-law 103 (2), this Part shall apply to every private owner.

Application  
to private  
owner

(2) Divisions 1, 2, 3, 4 and 8 shall, *mutatis mutandis*, apply to a private owner and to his electrical installation as they apply to a consumer and a consumer's installation.

137.—(1) A private owner shall erect and maintain a switchboard for each generator to control supply therefrom and shall fit to each switchboard, as a minimum requirement—

Consumer  
and private  
owner

(a) the appropriate supply contract controls and protective apparatus specified in Part I of the Eight Schedule hereto; and

(h) where two or more private generators are to be operated, in parallel—

(i) if it is two-wire system, a reverse-current trip in series with the live conductor of each generator;

(ii) if it is a three-wire system, a reverse-current trip in series with each out conductor of each generator; and

(iii) if they are compounded generators, an equalizer connection by means of—

(A) a single-pole switch from each generator to an equalizer bus-bar so arranged that each switch is interlocked so that it shall be closed before the main switch is closed and opened after the main switch is opened;

(B) a multi-pole linked-switch arranged and interlocked to perform the same sequence of operations as described for single-pole switches, with operating coil of a circuit-breaker connected to a pole other than that to which the equalizer connection is made;

(C) where a direct-current generator is connected in parallel with a secondary battery—

(aa) a reverse-current trip, which may be of the cut-out type, connected between the generator and the battery;

(bb) safe means for isolating the battery from the generator;

(cc) protection of the battery by means of a fuse or circuit-breaker against excessive charge or discharge currents;

(dd) an ammeter to measure the current supplied by the generator;

(ee) an ammeter with a mid-point zero or so, switched so as to measure separately the charge and discharge currents of the battery; and

(ff) a voltmeter arranged to measure separately the voltage of the generator and of the battery;

(D) where compounded generators are operated in parallel, an ammeter connected to the pole other than to which the equalizer connection is made;

(E) where a direct-current generator operates a three-wire system, an arrangement to prevent the balance being disconnected whilst the outer conductors are live;

(F) the appropriate instrument specified in Part II of the Eighth Schedule hereto; or

(G) where an altering-current generator is operated—

(aa) a speed indicator for the prime-mover or a frequency indicator; or

(bb) if two or more generators are to be operated in parallel, a synchronizing device.

(2) Where an instrument fitted to the switchboard in accordance with paragraph (1) is required to make more than one measurement, provision for this shall be made by a suitable switch or plug.

(3) If the generator of a private owner is arranged for automatic starting or for remote control, the prime-mover shall have local overriding control for stopping the prime-mover and for preventing automatic starting—

(a) fixed nearby; and

(b) labelled with clear operating instructions.

138. A private owner shall—

Liquid and  
gaseous fuel

(a) where liquid or gaseous fuel for the generating plant is piped from outside the plant room, provide a quick-acting valve to cut off the supply of fuel with the valve—

(i) fixed near the door to the plant room in a conspicuous position; and

(ii) labelled with clear operating instructions; and

(b) arrange to trap or drain and disperse safely any leaking or surplus fuel and ensure that none is permitted to enter any sewer.

139.—(1) A private owner shall ensure that any room in which his generating plant is to be erected and maintained—

Plant rooms

(a) is of such size that the plant can be easily and adequately serviced and maintained;

(b) is adequately ventilated; and

(c) is provided with the exhaust pipes or ducts necessary to discharge exhaust fumes from the rooms to the outside air and clear of any window, door or fresh-air intake of any building.

(2) A plant room described in paragraph (1) shall have adequate artificial lighting, in addition to any natural lighting and discharge-lighting shall not be used in a position where it may cause rotating machines to appear to be stationary.

140. A private owner whose generator is connected with a secondary battery installation shall erect and maintain a switchboard for that installation and shall fit to the switchboard, as a minimum requirement—

Protection of  
batteries

(a) safe means—

(i) for isolating the battery from the load or from the charging circuit or simultaneously from both; and

- (ii) where the charging circuit is arranged to share the load, for isolating the charging circuit from the battery and from the load;
- (b) a suitable fuse or circuit-breaker with overhead trip to protect—
  - (i) the battery from excess charge and discharge currents; and
  - (ii) the charge circuit from excess charge currents;
- (c) where the circuit is not a rectifier circuit which prevents a reversal of current, a reverse-current trip, which may be of the cut-out type;
- (d) an ammeter with a mid-point zero or so, switched so as to measure separately the charge and discharge currents;
- (e) a voltmeter with an "off" position to prevent continuous discharge and to indicate—
  - (i) battery terminal voltage; and
  - (ii) where the charging circuit has no cut-out, the voltage of the charging circuit separately from the battery terminal voltage;
- (f) where the charging circuit shares the load with the battery, an ammeter to measure the current output of the charging circuit.

Installation  
of batteries

141.—(1) A battery in a battery installation connected with the generator of a private owner shall—

- (a) have insulated supports for each cell of glass or vitreous porcelain which is part of the container;
- (b) have insulated battery stands;
- (c) have connected bolts—
  - (i) of a non-corrosive type; or
  - (ii) coated with petroleum jelly;
- (d) have spray arrestors on open cells;
- (e) if not portable, contain no celluloid in its construction; and
- (f) if portable, and with celluloid in its construction, have suitable safeguards at the charging location to prevent ignition of the celluloid and the spread of fire.

(2) A room containing a battery installation connected with the generator of a private owner shall—

- (a) be adequately ventilated to the outside air; and
- (b) where sulphuric acid is used as an electrolyte, ensure its construction is—
  - (i) of non-corrosive material; or
  - (ii) painted with acid-resisting paint.

142. All machinery, switch gear and instruments associated with the generation and supply of electricity of a private owner shall be indelibly labelled so as to indicate their functions and ratings. Labeling

143. A plant of a private owner shall not be interconnected, either directly or indirectly, with the electrical works lines or cables of a licensee or other person unless— Connecting private plant

(a) there is an agreement in writing for such interconnection between the private owner and the owner of the said works, lines or cables; and

(b) adequate safeguards are installed to prevent accidental or uncontrolled interconnection.

144. Every private owner shall ensure that technical standards prescribed by these By-laws are complied with whenever applicable and shall, where appropriate, have the same obligations as a licensee or consumer, as the case may be. Private owner to comply with relevant by-laws

#### *Division 7—Offences*

145. Subject to by-law 103 (2) and (3), a consumer or a private owner who erects or operates an electrical installation for or in connection with the generation, transmission, distribution, connection, installation and use of electricity, whether on his premises or elsewhere, and whether such installation is constructed, operated, maintained, repaired, tested or inspected otherwise than in accordance with the provisions of these By-laws commits an offence. Offences and penalties

### PART VII—CUSTOMER SERVICE

#### *Division 1—Objectives*

146. The objectives of this Part are to ensure that customers— Objectives

(a) receive safe and reliable electricity from service providers;

(b) have access to information about an electricity service; and

(c) have a mechanism for redress for complaints against service providers.

#### *Division 2—Customer Information and Education*

147. A service provider shall, on request from an applicant or a customer— Information and obtaining service

(a) provide to the applicant or customer any information or assistance necessary to enable the applicant or customer become aware of the service provided by the service provider; and

(b) facilitate the provision of the service on application by the applicant or customer.

148. A service provider shall, on the request by a customer, provide to the customer information regarding the service provider's— Billing and metering information

(a) method of reading meters;



- (b) method of preparing bills; and
- (c) meter reading and billing cycle.

Modifications to tariffs, terms and conditions of service

149.—(1) A service provider shall, within seven (7) days of the Authority's approval of—

- (a) its tariffs or terms and conditions of service;
- (b) any material change to its tariff, or terms and conditions of service; or
- (c) adjustment of its tariff under the automatic Tariff Adjustment Formula;

publish a notice informing its customers of the approval and any material effects the changes will have on the customers.

(2) The service provider shall publish the information referred to in paragraph (1) once in any two daily newspapers in general circulation in Malawi.

Information on tariffs, terms and conditions of service

150.—(1) A service provider shall keep a complete copy of its tariffs and terms and conditions of service at each of its business offices.

(2) Upon request from an applicant or a customer, the service provider shall provide to the applicant or customer, at a reasonable price, a copy, and explanation of the tariff and terms and conditions of service applicable to the service that the service provider may provide to the applicant or is providing to the customer.

Information on customer usage

151. Upon request from any of its customers, a service provider shall provide a concise statement of the actual consumption and billing of electricity by that customer for each billing period during the previous twelve (12) months:

Provided, however, that this obligation shall not apply if the service provider has, during the same period, provided such information to the customer making the request.

Information on service provider performance

152. Upon request from any of its customers, a service provider shall either—

- (a) provide, at a reasonable cost, a copy of any annual report that it has provided to the Authority during the past twelve (12) months; or
- (b) direct the customer to an easily accessible establishment where the reports may be obtained or inspected.

Customer information programmes

153. A service provider shall establish a reasonable programme to inform its customers of the following information, and shall, in any event, provide the following information at each of its customer service centres, and if requested by a customer, to that customer by mail—

- (a) information on the rights and responsibilities of customers, including—

- (i) an explanation of a customer's right to file a complaint with the service provider and to request that the Authority mediate or arbitrate any dispute between the customer and the service provider; and
  - (ii) any materials related to the rights and responsibilities of customers published by the Authority;
- (b) a postage prepaid envelop addressed to the Authority's dispute resolution centre together with any forms needed by its customers to—
- (i) make a request to the Authority that it mediate or arbitrate any dispute between the customer and the service provider, or
  - (ii) appeal against a decision by the service provider not to provide service to an applicant;
- (c) information about the consequences of unauthorized use and theft of electricity;
- (d) information about safety issues associated with the use of electricity; and
- (e) statistical and other information concerning the service provider's sales, number of customers, sources of electricity supply and contact information for the service provider's customer service centres.

*Division 3—Customer Service Centres and Customer Complaints*

154.—(1) A service provider shall maintain at least one customer service centre for the purpose of addressing and resolving applicant and customer service matters in each city, town or district served by the service provider.

Operation of a customer service centre

(2) All customer service centres shall operate during normal business hours on each business day.

155.—(1) A service provider shall display the telephone number and mailing address of its customer service centres on its customer's bills.

Information about customer service centres

(2) A service provider shall provide information concerning its customer service centres in announcements run on national radios and in local newspapers at least once every three (3) months.

156.—(1) An applicant or customer may make a verbal or written complaint to a service provider by communicating the complaint to the service provider's customer service centres.

Filing a complaint with a service provider

(2) Upon communication of a complaint, the service provider shall—

- (a) immediately assign the complaint a registration number and provide this number to the applicant or customer;
- (b) immediately inform the applicant or customer of the service provider's procedures for handling complaints and the applicant's or customer's rights with regard to the complaint, including the customer's right to request that the Authority mediate or arbitrate any dispute between the customer and the service provider if the customer remains unsatisfied after the service provider has responded to the complaint; and

(c) investigate the inquiry and provide a written response to the applicant or customer within fourteen (14) days.

*Division 4—Establishing a Service*

Application  
process

157.—(1) All service providers shall prepare and maintain a standardized application form to be completed by applicants seeking service from the service provider.

(2) The application form shall be simple and easily understood, shall incorporate the applicable tariffs and terms and conditions of service by reference, and shall make no substantive changes to the applicable tariffs and terms and conditions of service:

Provided that the service provider may request such additional reasonable information as may be required in each case.

(3) A service provider shall require all applicants to complete and sign the standard application form in order to become a customer.

Effect of  
application

158.—(1) A service provider shall respond to an application for service to an applicant within fourteen (14) days and indicate the cost required for such service.

(2) An application form submitted to a service provider shall upon being accepted form a binding contract between the applicant and the service provider, which binding contract shall remain in effect until the service has been discontinued and all other obligations of the parties thereto have been satisfied.

Confidentiality

159.—All information provided by an applicant shall be considered confidential by the service provider, and no service provider shall release such information without the prior written consent of the applicant.

Obligation  
to provide  
service and  
grounds for  
refusal

160. A service provider shall provide electricity to any applicant located within its service area:

Provided that the service provider may refuse to serve an applicant if—

(a) the applicant fails to comply with any regulation issued by the Authority related to the provision of the service requested by the applicant;

(b) the applicant's electrical equipment is known to be of such character that satisfactory service cannot be given, or the applicant's equipment does not comply with—

(i) any written law, or

(ii) technical standards approved by the Authority or technical standards contained in the terms and conditions of customer service;

(c) the applicant applies for service at a location where a customer receives, or continues to receive service where there are unpaid charges arising from services provided to that location remain outstanding if the service provider can prove that the applicant intends to assist the customer in avoiding payment;

(d) the applicant owes an undisputed debt to any service provider for the same kind of service being requested;

(e) the applicant owes a disputed debt to any service provider for the same kind of service being requested and the applicant has not paid a cash deposit pursuant to Division 5 of this Part;

(f) the applicant fails to provide collateral to the service provider, when collateral may be required pursuant to Division 5 of this Part; or

(g) the applicant applies for the service at a location which is within the restricted servitude.

161. If a service provider refuses to provide service to an applicant, the service provider shall provide the applicant with a written notice of such refusal to provide service within fourteen (14) days of the request, and the notice shall contain—

Notice of Refusal of service

(a) the grounds for refusal to provide service, or an explanation of how to remedy the cause for refusal; and

(c) the applicant's options for recourse to the Authority pursuant to by-law 177.

162.—(1) An applicant who is refused service for any reason may appeal, using the forms promulgated by the Authority, within fourteen (14) days of the applicant's receipt of the service provider's decision refusing to provide service.

Applicant's recourse to the Authority

(2) If the Authority finds the service provider to have inappropriately denied service to the applicant—

(a) the applicant shall be deemed to have submitted an application form to the service provider on the date of the Authority's decision; and

(b) the service provider shall provide the requested service to the applicant in accordance with these By-laws and the applicable terms and conditions of service.

163. Subject to by-law 180, a service provider shall connect service to an applicant within thirty (30) days of the applicant's delivery of a completed installation form to the service provider and the required payment.

Commencement of service

164.—(1) Where a service provider needs to make a system extension or a system expansion in order to provide an applicant with electricity, then the service provider may not refuse to provide the services requested by the applicant unless—

System extensions

(a) the system extension or system expansion is not technically feasible; and

(b) the applicant agrees to pay the service provider for the costs to be incurred by the service provider in constructing and installing the system extension (the "System Extension Cost") or expanding the capacity of the existing system in the area already serviced.

(2) In the event that the applicant agrees to pay the applicant's portion, then the service provider may refuse to begin making the system extension or system expansion until the applicant has deposited the estimated system extension cost or system expansion cost, as the case may be, with the service provider.

(3) Under no circumstances shall a service provider charge a system extension cost or a system expansion cost to an applicant that exceeds the estimated system extension cost or system expansion cost by more than twenty per cent (20%).

System  
extension or  
extension  
cost refunds

165.—(1) When charging applicants, for new connections, consideration for future connections shall be taken into account by the service provider in areas with low potential for connections as long as this fact is made clear in writing to the applicant.

(2) In the event that an applicant, has paid for a system extension cost or system expansion cost in areas of low potential for connections and additional customers connect, within five (5) years of the completion of the system improvement to which the applicant's portion related, to the distribution system of the service provider using any part of the system extension or system expansion paid for by the applicant, then the service provider shall—

(a) charge a portion of the system extension cost or system expansion cost paid by the applicant to each such customer; and

(b) refund the amount charged to such customers to the applicant that paid for the system extension cost or system expansion cost.

#### *Division 5—Treatment of Capital Contributions*

Service  
provider  
to treat  
contribution  
as trust funds

166.—(1) All monies paid to a service provider as contribution to a system extension cost or system expansion cost shall be placed in a separate bank account operated by the service provider for such purposes.

(2) Monies placed in the system extension or system expansion bank account shall be regarded by the service provider as trust funds until they are actually used for the purpose of system expansion or system extension they were paid for.

(3) Monies paid in the system extension or system expansion bank account shall begin to attract interest at the ruling bank rate on the expiry of the period prescribed for connection of the customer as specified in the Standard of the Quality of Service and Supply Standards contained in the Ninth Schedule hereto.

Requirement  
to provide  
acceptable  
collateral

167. A service provider may, when acting pursuant to a pre-established and non-discriminatory policy approved by the Authority, require an applicant to provide, and a customer to maintain, collateral in an amount not greater than the service provider's reasonable estimate of the amount of charges the applicant will incur over any two months' period.

168. A service provider may require an applicant who was previously a customer of the service provider and whose service was disconnected for non-payment of bills or theft of service to pay all amounts due to the service provider before connecting or reconnecting the service.

Payment  
before  
reconnection

*Division 6—Metering and Control Equipment*

169. A service provider shall, prior to providing electricity to an applicant or location that has not yet received electricity from the service provider—

Installation

(a) provide a meter appropriate for the services the applicant has requested and arrange for its installation in a location that is easily accessible for reading of the meter, and agreeable to both the service provider and the applicant; and

(b) certify the accuracy of the meter before providing service to the customer.

170. The following terms shall govern service provider access to metering equipment installed in accordance with by-law 184 at the customer or applicant's premises—

Access to  
metering  
equipment

(a) service provider personnel shall carry a valid identification card with a photograph when entering places where customers metering devices are kept;

(b) customers shall be required to provide access only to service provider's personnel that are able to provide valid identification pursuant to sub-paragraph (a); and

(c) service provider personnel working on customer meters and measuring devices including reading, maintenance and installation, shall do so during normal business hours except in the case of service termination due to unauthorized use of electricity, or if the service provider and the customer agree otherwise.

171.—(1) Where a customer requests a service provider to test the accuracy of a meter and the customer pays for the meter test, the service provider shall test the meter within thirty (30) days of receiving the payment thereof.

Meter testing  
and accuracy

(2) The service provider shall notify the customer at least five (5) days prior to performing the test so that the customer may observe the testing if the customer wishes to do so.

(3) If the test reveals that the meter has a margin of error of two decimal point five per cent (2.5%) or less, then the customer shall not be refunded the meter testing cost paid.

(4) In the event that the test reveals the meter to have a margin of error of more than two decimal point five per cent (2.5%), and to have resulted in the overcharging of the customer, then the service provider shall adjust the customer's bill for the previous twelve (12) months, or back to the date of which the service provider last tested the meter, whichever occurred later, and credit the overcharges charged to the customer within such period to the customer's account and refund to the customer the meter testing cost paid.

Obtaining  
meter data

172.—(1) The service provider shall read meters at least once every month.

(2) If the service provider is unable to obtain a customer's meter readings during the service provider's normal business hours, having exercised due diligence pursuant to the service provider's established policy, then the service provider may estimate the amount of electricity consumed by the customer and make any necessary adjustments on subsequent bills.

*Division 7—Service Quality and Continuity*

Continuous  
service

173.—(1) All service providers shall use their reasonable efforts to ensure that they can provide electricity to their customers at all times.

(2) When interruption does occur, a service provider shall re-establish service within the shortest possible time consistent with prudent operation principles, so that the smallest number of customers are affected.

(3) Each service provider 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.

Records of  
interruptions

174.—(1) Except for momentary interruptions lasting not more than two minutes each and which do not cause a major disruption of service, each service provider shall keep a complete record of all emergency and scheduled interruptions.

(2) The Authority shall be notified in writing of any interruption in service affecting the entire system or any of its major divisions that lasts more than two minutes.

(3) The record under paragraph (1) shall show the cause of interruption, the date, time, duration, approximate number of customers affected, and in cases of emergency interruptions, the remedy and steps taken to prevent recurrence.

(4) Every service provider shall issue quarterly and annual reports to the Authority containing the aggregate version of the record provided under paragraph (1).

(5) The Authority may further prescribe the contents of any record under paragraph (1).

Minimum  
service  
standards

175.—(1) Minimum service standards or customer service charter developed by the service provider and approved by the Authority shall be adhered to by the service provider at all times.

(2) The minimum service standards or customer service charter shall provide for—

(a) continuity of service;

- (b) maintenance of proper customer relations;
- (c) the right of a service provider to refuse service in exceptional circumstances;
- (d) the right of the service provider to demand a deposit from customers against future service;
- (e) the adoption of proper billing procedures;
- (f) the establishment of principles governing new construction; and
- (g) the procedure for abandonment or discontinuance of service.

*Division 8—Customer Obligations and Rights*

176. The customers shall—

Obligations of  
the customer

- (a) use electricity in a manner that pays due regard to its scarcity and value as a resource;
- (b) protect service provider meters and similar equipment from vandalism and damage;
- (c) use electricity in a manner that does not endanger peoples lives and property;
- (d) use electricity equipment conforming to the service provider's supply agreement and the Act; and
- (e) not trespass onto or tamper with the service provider's equipment.

177. A service provider shall not disconnect electricity supply to a customer except for the following reasons—

Disconnection  
of service

- (a) non-payment of bills more than sixty (60) days in arrears:
 

Provided that the service provider delivers a disconnection notice to the customer's address five days before service is disconnected:
- (b) un authorized use or theft of electricity;
- (c) refusal to grant access at reasonable times to equipment installed upon the premises of the customer for the purpose of inspection, meter reading or maintenance;
- (d) failure to reimburse the service provider for repairs to, or replacement of the service provider's property used to supply service, when such repairs or replacements are necessitated by negligence on the part of the customer;
- (e) misrepresentation of identity for the purpose of obtaining service;
- (f) actions adversely affecting the safety of any customer or the integrity of the service provider's distribution system;
- (g) failure to comply with the credit requirements set in Division 5; and



(h) any other reasons identified in the applicable terms and conditions of service.

Situations in which disconnection is prohibited

178. A service provider shall not disconnect service to a customer solely for the following reasons—

(a) delinquency in payment for service by a previous occupant of the premises; or

(b) failure to pay charges not properly reflected on a service provider's bill.

Disconnection of service during dispute over a bill

179. Where a customer has disputed a bill and has filed a complaint with its service provider related to such bill or requested that the Authority mediate or arbitrate the dispute, then the service provider shall not discontinue service to a customer because of failure to pay the disputed portion of a bill:

Provided that the service provider may require the customer to pay that part of a bill that is not in dispute and if the customer fails to pay the undisputed portion of the bill, the service provider may discontinue service to the customer subject to all applicable provisions of these By-laws.

Diagram and specifications

180. If, at any time after the date of commencement of these By-laws, an initial connection is made to any customer premises, the customer shall, if a service provider so requires, provide the service provider with a diagram of the circuits on the customer premises, starting from the point of supply and the specifications of the electrical installation to be installed on the customer premises.

Electrical installation

181.—(1) A customer shall be responsible for the installation and maintenance, at its own expenses, of the electrical installation on the customer premises from the point of supply in accordance with the requirements of these Regulations and the standards applicable to the wiring of premises.

(2) No electrical installation may extend from one customer premises to another or if the customer premises comprises more than one building, from one building to another without prior approval of the service provider.

Fault on electrical installation

182.—(1) If any fault develops on the electrical installation on any customer premises, the customer shall—

(a) immediately switch off the supply by means of the switch provided for that purpose on the distribution board and, where considered necessary, request the service provider to disconnect the supply to the customer premises; and

(b) cause the necessary steps to be taken to remedy the fault on the electrical installation.

(2) The service provider is not obliged to effect any repair to the electrical installation on the customer's premises, but shall repair any damage which may have been caused to the service apparatus as a result of the fault on the electrical installation.

(3) Where, owing to a fault as envisaged in paragraph (1) a service provider repairs the damage caused to the service apparatus in accordance with paragraph (2), the customer shall—

(a) reimburse the service provider for any expenses which the service provider incurs in connection with the repair; and

(b) pay to the service provider the fee determined by the service provider in its schedule of tariffs for the disconnection of the supply of electricity and for the subsequent restoration of the supply.

183.—(1) A customer shall, at his own cost, erect, connect, operate and maintain in good order—

(a) all circuits from the point of supply, referred to in the contract of supply, to the electrical installation;

(b) all apparatus necessary for controlling the said circuits, including efficient apparatus for automatically isolating any circuit which may break down; and

(c) other equipment which the service provider requires the customer to install.

(2) The said circuits, electrical installation, apparatus and equipment and the adjustment thereof shall be accepted to the service provider.

(3) The service provider shall be entitled to recover from the customer, any loss or expense which the service provider incurs for damage to the service provider's plant and equipment or otherwise because of failure by the customer to comply with this by-law.

(4) The electrical installation and all other electrical equipment belonging to the service provider shall be accommodated separately on the customer premises in a manner which distinguishes clearly between the electrical equipment which is the property of the customer and the electrical equipment which is the property of the service provider.

(5) The electrical equipment of the customer shall be of a design and construction in line with good industry practices, properly installed and maintained by the customer, and shall in all respects comply with the standards applicable to the wiring of premises.

(6) The customer shall at all reasonable times grant to the service provider unhindered access to the electrical installation for the purposes of inspection and, where necessary, approval.

(7) The customer shall provide adequate equipment for the protection of the electrical installation after ascertaining the nature of the protection equipment which the service provider installed at the point of supply.

(8) It shall be the responsibility of the customer to take the necessary measures to protect itself where its business is of such a nature that a voluntary or involuntary outage may cause a cessation of, or damage to, its plant or operations.

Equipment to  
be provided  
by the  
customer

187.—(1) A service provider shall maintain monthly billing records for each customer account for at least two (2) years after the date the bill is mailed. Records retention

(2) Billing records shall contain sufficient data to reconstruct a customer's billing for a given month.

(3) Copies of a customer's billing records may be obtained by that customer on request at a reasonable cost.

188. If a billing error is discovered, a service provider shall account for the billing error in the next month's bill as follows— Adjustments for billing error

(a) if charges are found to be higher than the correct amount, an adjustment shall be made for the entire period of the over billing, and the service provider shall pay interest on the amount of the overcharge at a rate set by the Authority;

Provided, however that the service provider shall not pay interest on the amount of the correction if the service provider corrects the over billing within one (1) month of making the error.

(b) if charges are found to be lower than the correct amount, then the service provider may retroactively bill the customer for any under-billed amount that would have been payable by the customer no more than three months prior to the date the under-billed amount is billed to the customer, and the service provider shall not charge interest on under-billed amounts; and

(c) where it is established that the under-billed amount was due to fraud or illegal transaction by the customer, the service provider shall be entitled to recover the full amount with interest at a rate to be approved by the Authority.

## PART VIII—TARIFFS AND CHARGES

### Division 1—Applications

189. This Part shall apply to applicants or holders of licences for— Application

- (a) generation;
- (b) distribution;
- (c) transmission or export or import; and
- (d) any other licensed activity.

190. The objectives of this Part are to— Objectives

(a) provide customers with fair and reasonable price structures consistent with the maintenance of a financially and operationally secure electricity supply system;

(b) structure the costs reflected in the tariff in such a way as to encourage customers to make efficient use of generation, transmission and distribution assets;

(c) encourage licensees towards efficient use of and electrical plant and increased operational effectiveness based on financial benefits and penalties;

(d) provide all licensees in the electricity supply industry with a fair and reasonable return for their service and production, including a reasonable profit;

(e) encourage customers towards efficient and economical use of energy based on price signals;

(f) provide a structure for the formulation of the incentive based tariffs, taking into account the limited scope of competition in the current market system configuration;

(g) provide for a tariff structure that accommodates future progress towards a commercially competitive market system;

(h) provide for a tariff structure and regulatory environment that gives confidence to current and prospective investors in the Malawi electricity industry;

(i) provide for tariff structure and a regulatory environment that promotes public safety, health and environmental protection; and

(j) provide for a tariff structure and a regulatory environment that promotes a social responsibility without sacrificing the need for cost recovery and financial sustainability on the part of the service provider.

#### *Division 2—Tariff Principles*

General duties  
of licensee

191.—(1) A licensee shall—

(a) carry out its licensed activities in an effective and efficient manner;

(b) work towards the long-term and sustainable provision of electricity and the development of electricity services;

(c) where applicable, to develop a fair and transparent electricity pricing methodology;

(d) avoid the making of exorbitant profits with regard to its licensed undertaking to the detriment of customers; and

(e) endeavour to facilitate national economic and social objectives in the electricity industry.

(2) The Authority shall endeavour to ensure that licensees comply with paragraph (1).

Ring-fence  
accounting

192.—(1) A licensee shall, within the period stipulated in its licence conditions, fully ring-fence every Licensed Activity in accordance with this by-law.

(2) In order to give effect to paragraph (1), a licensee shall, in respect of the Licensed Activity—

(a) maintain ring-fence accounting records; and

(b) in respect of each financial year, prepare consistent and uniform financial statements comprising of the following—

- (i) an income statement;
- (ii) a balance sheet;
- (iii) a cash-flow statement;
- (iv) an asset register; and
- (v) a statement showing the amounts paid as Energy Regulation Levy and Rural Electrification Levy.

(3) The statements referred to in paragraph 2 (b) shall be accompanied by notes showing separately for each Licensed Activity and in appropriate detail—

- (a) the amounts of any revenue, cost, asset, liability, reserve or provision which has either been charged from or to any other activity;
- (b) business or operations of the licensee, whether licensed or not; and
- (c) a description of that charge.

(4) A licensee who has commenced ring-fence accounting of its Licensed Activity as provided in paragraph (1) shall—

- (a) submit to the Authority a report by its auditor stating whether, in the auditor's opinion, the statements referred to in paragraph (2) (b)—
  - (i) have been prepared in accordance with these By-laws; and
  - (ii) give a true and fair reflection of the financial affairs of the licensed activity;
- (b) the submission referred to in paragraph (a) shall be made—
  - (i) not later than six (6) months or any longer period as the Authority may determine after the end of the licensee's first full financial year; and
  - (ii) after the date on which the licensee would have commenced the ring-fence accounting; and
  - (iii) thereafter, annually.

193.—(1) The Authority may, with regard to the ring-fence accounting of a Licensed Activity for different categories of licensees, issue guidelines in accordance with the Act pertaining to the following—

- (a) revenue, costs, assets, liabilities, reserves and provisions which the Authority deems allowable as forming part of or emanating from the licensed activity;
- (b) any method or formula for allocating overhead expenses; and
- (c) a standardized asset valuation schedule for all licensees.

(2) Any guidelines issued under this by-law may—

- (a) distinguish the different types of licensed activities; and
- (b) be specific for the category of licensees to which such rules or guidelines relate.

Allowable  
assets,  
revenue  
and costs

## Principles

194. In implementing these By-laws and furthering their objectives, regard shall be given to the following underlying and guiding principles—

(a) tariffs shall be based on accurate cost information provided by licensees and on a transparent formulation and review process;

(b) tariffs shall be structured and developed in a way that will reflect variations in costs imposed on the system at the time of use, and seasonal factors, consumer load profile, voltage levels and similar factors; and

(c) tariffs shall reflect a true cost of service and provide clear price signals to customers on the economic and efficient use of energy.

## Regulation of costs and investments

195.—(1) A licensee shall be responsible for justifying that costs or investments included in the formulation of tariffs are reasonable in the circumstances, and the Authority may reject the costs if it considers them to be unreasonable or imprudent.

(2) To clarify a regulatory situation and allow for eventual differentiation in regulatory control, there shall be a clear separation of activities and costs between potentially competitive activities and naturally monopolistic activities.

## Licence conditions

196. The following licence conditions are particularly relevant to the tariffs setting process and shall consequently be taken into account by every licensee—

(a) accounting records shall be maintained and financial statements produced in accordance with the regulatory accounting standards determined by the Authority;

(b) a reasonable apportionment of common costs into tariff cost categories shall be carried out in accordance with accepted business practices, and the Authority shall be informed of the allocation methods used;

(c) there shall be no cross-subsidies between customers or groups of customers for different activities undertaken by the licensee, except with a prior approval of the Authority;

(d) the licensee shall ensure that any activity, including tariff setting, does not impede competition in the industry;

(e) the licensee's tariffs shall be consistent with maintaining an acceptable level of quality and reliability;

(f) the structure of the tariff shall encourage the improvement of operational and economic efficiency; and

(g) tariffs shall be developed in accordance with these by-laws.

## Components of tariff computation

197.—(1) The components of base tariff computation for each licensee shall be in accordance with the Tariff Methodology approved by the Authority in respect of each particular licence and may include the following general categories of costs—

(a) power acquisition related costs;

(b) operation and maintenance costs;

(c) investment related costs;

(d) return on investment;

(e) adjustment factors for system losses, inflation and foreign exchange; and

(f) other costs as approved by the Authority.

(2) A licensee shall structure its tariffs in the schedule of tariffs according to this by-law and include tariff components in a way that the schedule of tariffs appropriately reflects the following main types of costs—

(a) demand related costs;

(b) energy related costs;

(c) shared customer's related costs; and

(d) customer specific costs.

(3) The manner in which the structuring referred to in paragraph (2) shall be effected, shall be determined by the Authority.

(4) In the interests of economic and rational use and consumption of electricity, and whenever feasible, a licensee shall—

(a) provide customers with an option of time of use of tariffs for the variable energy component of the tariff that reflects the difference in the cost of supply in off-peak periods, and

(b) ensure that the option and its structure is authorized in its schedule of tariffs prior to offering the option to its customers.

(5) Only the specific costs allowable by the Authority and associated with the activities of each licence shall be included in the tariff computation.

198.—(1) A licensee may adjust his tariffs in accordance with the tariff adjustment formula specified in the Tenth Schedule hereto.

Automatic  
tariff  
adjustment  
formula

(2) A licensee shall not adjust tariffs without verification and approval by the Authority.

(3) A licensee may publish and implement new tariffs if the Authority does not respond to the licensee's application for tariff adjustment after thirty (30) days of receiving the application.

199.—(1) A licensee that distributes electricity may include special pricing agreements in its schedule of approved tariffs.

Special  
pricing  
agreements

(2) The licensee may only conclude a special pricing agreement with a customer if the customer complies with any of the following—

(a) the electricity costs of the customer represent a percentage that equals to or exceeds the percentage of the total electricity costs of that customer as determined by the Authority; and for this purpose the Authority shall decide the manner of determining the costs and also which costs may be taken into consideration;

(b) the electricity load factor of the customer equals or exceeds the percentage for the continuous period which the Authority determines; or

(c) any other criteria which the Authority may determine.

(3) When considering whether or not to approve charges or tariffs relating to a special pricing agreement, the Authority may request the licensee to submit to the Authority any information which the Authority deems necessary.

(4) Once the Authority is satisfied with the requirements outlined in paragraph (1) it shall not be necessary for the concerned licensee to send to the Authority for approval any particular special pricing arrangement with a customer, but the licensee shall be required to send a copy of that agreement to the Authority for information and monitoring.

PART IX—MISCELLANEOUS

Surcharges  
and levies

200. A licensee collecting surcharges and levies shall—

(a) distinguish the surcharges and levies in its billing and receipts issued from the electricity tariffs it charges;

(b) indicate the surcharges and levies in its billing and receipts issued in a transparent and understandable manner; and

(c) recover the surcharges and levies from customers in accordance with the applicable laws.

License fees

201. (1) If an application for the issue, renewal, amendment or transfer of a licence, has in terms of the Act been granted by the Authority, the applicant must, prior to the issue, renewal, amendment or transfer of such licence, pay the appropriate fee prescribed in Schedule B.

(2) The above fees shall be paid for any additional generation capacity and distribution load above the original load.

Register of  
licences

202. (1) The Authority must keep and maintain a register, in such form as may be determined by the Authority, in respect of every licence issued under the Act, and in which register shall be recorded—

(a) the name of every holder and joint holder of the licence;

(b) the type of licence issued and the area in respect of which the licence has been issued;

(c) the conditions imposed on the licence;

(d) the names of the persons, if any, to whom any interest in any licence has been granted, ceded, transferred or assigned and the nature of such interest;

(e) revocations, amendments and cancellations of licences; and

(f) such other particulars as may, from time to time, be determined by the Authority.

(2) The register shall, during normal office hours, be open for inspection by any interested person at the place of business of the Authority, and any such person may request copies or extracts of any entry in the register and the Authority shall provide the person with such copies or extracts on payment of the cost thereof.

Information  
about  
installation

203. Any electrical installations person who completes or directs the completion of any electrical installation work which is to be connected to a supply system shall—

(a) when such supply is to be delivered by the licensee, submit to the licensee a "Completion of Installation" report in such form as the Committee shall require; and



(b) in all other cases give information to a licensee or private owner under the Act, including the completion date and a summary of the work carried out.

204.—(1) Every person issued with a permit under these By-laws shall exhibit a high degree of discipline in the performance of his work. Discipline

(2) The licensee shall monitor the professional performance of a permit holder under these By-laws and shall report any case of malpractices to the Authority.

(3) The Committee may, at any of its sittings consider any case reported under sub-regulation (2) and may, depending upon the gravity of the case, recommend to the Authority which may suspend a permit holder from practising for a period determined by the Authority or cancel the permit.

205. A person aggrieved by any decision of the Authority concerning the refusal or cancellation of a permit may apply in writing within fourteen (14) days of the date of such refusal or cancellation for mediation or arbitration under the Energy Act. Appeals

206.—(1) Any licensee or person who contravenes any provision of these By-laws commits an offence and shall, on conviction, be liable to a fine of two thousand Kwacha (K2,000) and to imprisonment for six (6) months. General offences and penalties

(2) In addition to the penalties provide for the offences under these By-laws, a court may also order that the guilty person repay any expenses incurred by the Authority or any other person as a consequence of the offence.

207. Every permit holder shall pay the annual permit renewal fees specified in the First Schedule hereto. Annual fees

208. All permits issued under any previous subsidiary legislation by licensees shall be deemed to have been issued under these By-laws by the Committee but shall be subject to renewal at the end of December every year. Transitional arrangement

## FIRST SCHEDULE

### PART A

#### APPLICATION FEES

<i>Nature of Fee</i>							<i>Fee</i>
							K      t
Application fee for—							
(a) issue of licence .. .. .	..	..	..	..	..	..	5,000 00
(b) renewal of licence .. .. .	..	..	..	..	..	..	50,000 00
(c) amendment of licence .. .. .	..	..	..	..	..	..	25,000 00
(d) transfer of licence .. .. .	..	..	..	..	..	..	50,000 00

(by-law 3)

## PART B

FEES FOR ISSUING, RENEWAL OR TRANSFER OF LICENCE  
INTERCONNECTED SYSTEM

(by-law 5)

<i>Matter</i>	<i>Amount Payable</i>
<b>B. 1 GENERATION RELATED LICENCES:</b>	
CAT. I Larger Generators, 50 MVA or above	USD40,000 per 50 MVA or part thereof payable in Malawi Kwacha equivalent.
CAT. II Medium Generators, 10 MVA and above but less than 50 MVA	USD20,000 fixed, plus USD10,000 per 25 MVA or part thereof payable in Malawi Kwacha equivalent.
CAT. III Small Generators, 0.5 MVA and above but less than 10 MVA	USD10,000 payable in Malawi Kwacha equivalent.
CAT. IV Very Small Generators, less than 0.5 MVA	USD5,000 payable in Malawi Kwacha equivalent.
<b>B. 2 TRANSMISSION, IMPORT OR EXPORT RELATED LICENCES:</b>	
Transmission, import or export	USD60,000 payable in Malawi Kwacha equivalent.
<b>B. 3 DISTRIBUTION RELATED LICENCES:</b>	
CAT. I Larger Distributors; 50 MVA or above	USD40,000 payable in Malawi Kwacha equivalent.
CAT. II Medium Distributors, 10 MVA and above but less than 50 MVA	USD15,000 fixed plus USD5,000 per 10 MVA or part thereof.
CAT. III Small Distributors, 2 MVA and above but less than 10 MVA	USD5,000.
CAT. IV Very Small Distributors—	
(a) 0.5 MW and above but less than 2 MVA	USD2,500;
(b) less than 0.5 MVA	USD1,250.

## PART C

ISOLATED GRID SYSTEMS COMBINED GENERATION AND  
DISTRIBUTION

(by-law 152)

<i>Matter</i>	<i>Amount Payable</i>
CAT. I Medium Generators, 10 MVA and above but less than 50 MVA	USD25,000 plus USD10,000 per 25 MVA or part thereof payable in Malawi Kwacha equivalent.

<i>Matter</i>	<i>Amount Payable</i>
CAT. II Small Generators, 2 MVA and above but less than 10 MVA .. .. .	USD15,000 payable in Malawi Kwacha equivalent.
CAT. III Very Small Generators, less than 2 MVA	USD10,000 payable in Malawi Kwacha equivalent.

## PART D

## LICENCE FEES FOR IMPORT OR EXPORT OF ELECTRICITY (by-law 5)

CAT. I Export or Import of Electricity at 33 kV or below .. .. .	USD10,000 payable in Malawi Kwacha equivalent.
--	--

## PART E

## INSTALLATION PERMIT FEES FOR INDIVIDUAL APPLICANTS (by-law 14)

<i>Class of Permit</i>	<i>Application Fees</i>	<i>Annual Renewal Fees</i>
A	K10,000	K5,000
B	K9,000	K4,500
C	K8,000	K4,000
D	K7,000	K3,500
E	K8,000	K4,000

## PART F

## INSTALLATION PERMIT FEES FOR COMPANY OR FIRM AS APPLICANTS (by-law 14)

<i>Class of Permit</i>	<i>Application Fees</i>	<i>Annual Renewal Fees</i>
A	K20,000	K10,000
B	K18,000	K9,000

## PART G

The fees for amendment of any licence specified under this First Schedule shall be ten per cent (10%) of the above fees.

**SECOND SCHEDULE**  
**REPUBLIC OF MALAWI**  
**ELECTRICITY ACT**  
 (CAP. 73:01)  
**ELECTRICITY BY-LAWS, 2012**  
**APPLICATION FOR LICENCE TO GENERATE ELECTRICITY**  
**FOR SALE** (by-laws 5 and 7)  
 FORM EA I

**SECTION A**  
**PARTICULARS OF APPLICANT**

- A. 1 Full name of Applicant: .....
- A. 2 Address of Applicant, or in the case of a body corporate, the registered office:  
.....
- A. 3 Telephone Number of Applicant: .....
- A. 4 Fax Number: .....
- A. 5 E-mail Address: .....
- A. 6 Details of Contact Person:  
 Full Name: .....  
 Telephone Number: .....  
 Fax Number: .....  
 E-mail Address: .....
- A. 7 Legal form of applicant: .....
- A. 8 If the applicant is a company provide the following details —
  - (a) full names of shareholders (holding more than 5% of shares) and their holding percentages:
  - (b) full names and occupation of Directors:
  - (c) Certificate of Incorporation: and
  - (d) Memorandum and Articles of Association.

**SECTION B**  
**COMMENCEMENT DATE, PURPOSE AND DURATION OF LICENCE**

- B. 1 Desired date from which the licence (if granted) is to take effect:  
.....
- B. 2 Duration of the licence from commencement date: .....
- B. 3 Purpose for which electricity is to be generated: .....
- B. 4 Type of application (issue, transfer, amendment or renewal):  
.....

**SECTION C**

*PARTICULARS OF GENERATING STATION*  
(To be provided for each generating station separately)

- C. 1 Name of generating station: .....
- C. 2 Location of generating station: .....
- C. 3 Address of generating station: .....
- C. 4 Details of Contact Person:
  - Full Name: .....
  - Telephone Number: .....
  - Fax Number: .....
  - E-mail Address: .....
- C. 5 Type and age of generating station (thermal, nuclear, hydro, pumped storage, gas turbine, diesel generator, solar, wind or other including equipment description):  
.....  
.....
- C. 6 Date on which the generating station was commissioned for an existing station or the expected commissioning date for a proposed station:  
.....
- C. 7 The installed capacity of each unit within the generating station (MW):  
.....
- C. 8 Life span of each generation station: .....
- C. 9 Maximum generating capacity (MW) expected to be available from the generating station and energy to be produced (kWh):

	Max. MW	Total Energy (kWh)	Own Use kWh	For sale kWh
YEAR 1				
YEAR 2				
YEAR 3				
YEAR 4				
YEAR 5				
YEAR 6				
YEAR 7				

C. 9 Estimate of the energy conversion efficiency of—

- (a) Turbine: .....
- (b) Generator: .....
- (c) Estimated overall station: .....

**SECTION D**

*PARTICULARS OF ANY LONG-TERM ARRANGEMENTS WITH ENERGY SUPPLIERS*

(To be provided for each generating station separately)

- D. 1 Name of Transmission company: .....
- D. 2 Particulars of the contractual arrangements (attach draft contract if in place):  
.....  
.....  
.....

**SECTION E**

*GENERATION BUSINESS*

(To be provided for each generating station separately)

- E. 1 Details of proposed major maintenance programmes, including the expected cost and duration thereof, covering the next five (5) years:  
.....  
.....  
.....
- E. 2 Details of major generating station rehabilitation and modifications dates, cost and description for the next five (5) years:  
.....  
.....  
.....
- E. 3 Details of generating station expansion, dates, cost and description:  
.....  
.....  
.....

E. 4 Particulars of power sales agreements and tariffs therein:

.....  
.....  
.....  
.....

E. 5 Particulars of anticipated outages and duration thereof as a result of E1 and E2 above:

.....  
.....  
.....  
.....

**SECTION F**

*FINANCIAL INFORMATION*

F. 1 Income Statement:

Provide statements and annual forecasts of sales, revenues and costs. Attach copies of the current and/or budgeted balance sheet, rate of return, profit and loss account and source and application of funds for current and next two (2) years. Indicate major cost items such as staff costs, maintenance.

F. 2 Investment Programme:

Investment Programme for current and the next five (5) years. Attach copies of the detailed scheme or schemes prepared by a competent engineer and mode and cost of financing such a scheme.

F. 3 Fixed Assets:

Summary of total assets of all generating plant.

F. 4 Audited Accounts:

Provide copies of the latest audited accounts of the applicant.

F. 5 Letters of Reference from Banks:

Provide one letter of recommendation as to credit worthiness from a local commercial bank and one from a reputable international bank.

**SECTION G**

*INFORMATION ON HUMAN RESOURCES*

G. Personnel:

(a) Submit details of the number of staff and employees and their categories and grades in the service of or to be recruited by the applicant, showing their qualifications and number of years of experience in similar jobs.

(b) Provide *curriculum vitae* of top management personnel of the applicant.

**SECTION H**

*ENVIRONMENTAL CONSIDERATION*

H. (a) Provide a brief description of the likely negative impact of the generation facility on natural resources and the environment and mitigation measures proposed.

(b) Provide a copy of the approved environmental mitigation plan (if any) by the relevant authority.

**SECTION I**

*PERMITS FROM OTHER GOVERNMENT DEPARTMENTS OR REGULATORY AUTHORITIES*

I. Permits:

Submit copies of permits or approvals issued by public or local authority or other regulatory agencies necessary for the operation of the generating plant.

**SECTION J**

*ADVERTISING NOTICE*

Attach draft copy of the notice of advertisement as to representations or objections.

**SECTION K**

*TARIFFS*

Provide a schedule of the proposed tariffs.

**SECTION L**

*ADDITIONAL INFORMATIONAL*

Provide any other relevant information which the applicant wishes to include with this application:

.....  
.....  
.....  
.....

Signed: ..... Date: .....

Receipt acknowledged by: ..... Date: .....





REPUBLIC OF MALAWI

ELECTRICITY ACT

(CAP. 73:01)

ELECTRICITY BY-LAWS, 2009

APPLICATION FOR LICENCE TO TRANSMIT OR TO IMPORT OR TO EXPORT ELECTRICITY

(by-law 5)

FORM EA 2

SECTION A

PARTICULARS OF APPLICANT

- A. 1 Full name of applicant: .....
- A. 2 Address of applicant, or in the case of a body corporate, the registered office:  
.....
- A. 3 Telephone Number of Applicant: .....
- A. 4 Fax Number: .....
- A. 5 E-mail Address: .....
- A. 6 Details of Contact Person:  
Full Name: .....  
Telephone Number: .....  
Fax Number: .....  
E-mail Address: .....
- A. 7 Legal form of applicant: .....
- A. 8 If the applicant is a company provide the following details—  
(a) Full names of shareholders (holding more than 5% of shares) and their holding percentages;  
(b) Full names and occupation of Directors;  
(c) Certificate of Incorporation; and  
(d) Memorandum and Articles of Association.

SECTION B

COMMENCEMENT DATE, PURPOSE AND DURATION OF LICENCE

- B. 1 Desired date from which the licence (if granted) is to take effect:  
.....
- B. 2 Duration of the licence from commencement date:  
.....
- B. 3 Description of the purpose for the licence:  
.....  
.....

- B. 4 Type of application ( issue, transfer, amendment or renewal):  
 .....

### SECTION C

#### *AREA TO WHICH THE APPLICATION RELATES*

- C. 1 Provide a sufficient description of the area to which the application relates (attach map showing routes of the transmission lines):  
 .....  
 .....
- C. 2 Provide a list of local authorities covered by the area of transmission:  
 .....  
 .....
- C. 3 Electricity will be imported from or exported to:  
 .....

### SECTION D

#### *DETAILS OF THE TRANSMISSION SYSTEM*

- D. 1 Provide an overview of the existing system and plan for the next five (5) years, which includes—
- D. 1.1 The Physical system:
- (a) telecommunication and telecontrol plant schedule and ages thereof;
  - (b) large-scale map showing geographical location of plant and facilities;
  - (c) single line diagram of the transmission system;
  - (d) supply and delivery points, metering arrangements and policies, location, type, reading, calculating charges and billing systems; and
  - (e) list, description and age of transformers, switchgear and associated equipment.
- D. 1.2 System Characteristics:
- (a) energy entering the system at supply points;
  - (b) energy leaving the system at delivery points;
  - (c) electrical losses;
  - (d) maximum power transfer capability (lines - transformers); and
  - (e) maximum fault levels at all interfaces.
- D. 2 Provide similar information for works to be purchased as well as location thereof.

### SECTION E

#### *TRANSMISSION BUSINESS*

- E. 1 Provide your proposed policy and practice in respect of charging for the usage of the transmission system:  
 .....  
 .....

E. 2 Analyse total purchases: (kWh; Kwacha) from your suppliers of electricity (generators and your customers distributors) for current year and the next five (5) years:

.....  
.....  
.....  
.....

E. 3 Provide your pricing policy for electrical energy trading:

.....  
.....

E. 4 Attach a schedule of the proposed tariffs and prices for bulk supply.

E. 5 Attach a copy (if any) of the power purchase agreement with a generator or other supplier.

E. 6 Attach a copy of the power sales agreement with distributors.

E. 7 Details of proposed major maintenance programmes including expected costs and duration thereof for the next five (5) years:

.....  
.....  
.....  
.....

E. 8 Details of major rehabilitation and modifications or upgrading, dates, costs and description for the next five (5) years:

.....  
.....  
.....  
.....

**SECTION F**

*FINANCIAL INFORMATION*

F. 1 Income Statement:

Provide statements and annual forecasts of sales, revenues and costs. Attach copies of the current and/or budgeted balance sheet, rate of return, profit and loss account and source and application of funds for current and the next two (2) years. Indicate major cost items such as staff costs, maintenance.

F. 2 Investment Programme:

Investment Programme for current and the next five (5) years. Attach copies of the detailed scheme or schemes prepared by a competent engineer and mode and cost of financing such a scheme.

- F. 3 Fixed Assets:  
Summary of total assets of all transmission plant.
- F. 4 Audited Accounts:  
Provide copies of the latest audited accounts of the applicant.
- F. 5 Letters of Reference from Banks:  
Provide one letter of recommendation as to credit worthiness from a local commercial bank and one from a reputable international bank.

**SECTION G**

*INFORMATION ON HUMAN RESOURCES*

- G. Personnel:
  - (a) Submit details of the number of staff and employees and their categories and grades in the service of or to be recruited by the applicant, showing their qualifications and number of years of experience in similar jobs.
  - (b) Provide *curriculum vitae* of top management personnel of the applicant.

**SECTION H**

*ENVIRONMENTAL CONSIDERATION*

- H.1 Provide a brief description of the likely negative impact of the transmission facility on natural resources and the environment and mitigation measures proposed:  
.....  
.....  
.....
- H.2 Provide a copy of the approved environment mitigation plan (if any) by the relevant authority.

**SECTION I**

*PERMITS FROM OTHER GOVERNMENT DEPARTMENTS OR REGULATORY AUTHORITIES*

- I. Permits:  
Submit copies of permits or approvals issued by public or local authority or other regulatory agencies necessary for the operation of the transmission system.

**SECTION J**

*ADVERTISING NOTICE*

Attach draft copy of the notice of advertisement as to representations or objections.

**SECTION K**

*TARIFFS*

Provide a schedule of the proposed tariffs.

**SECTION L**

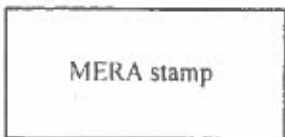
*ADDITIONAL INFORMATION*

Provide any other relevant information which the applicant wishes to include with this application:

.....  
.....  
.....  
.....

Signed: ..... Date: .....

Receipt acknowledged by: ..... Date: .....



**REPUBLIC OF MALAWI**

**ELECTRICITY ACT**

(CAP. 73:01)

**ELECTRICITY BY-LAWS, 2012**

**LICENCE APPLICATION FORM**

APPLICATION FOR LICENCE TO DISTRIBUTE ELECTRICITY (by-law 5)

FORM EA 3

**SECTION A**

*PARTICULARS OF APPLICANT*

A. 1 Full Name of Applicant: .....

.....

A. 2 Address of applicant, or in the case of a body corporate, the registered office:

.....  
.....

A. 3 Telephone Number of Applicant: .....

A. 4 Fax Number: .....

A. 5 E-mail Address: .....

A. 6 Details of Contact Person:

Full Name: .....

Telephone Number: .....

Fax Number: .....

E-mail Address: .....

A. 7 Legal form of applicant: .....

A. 8 If the applicant is a company provide the following details—

- (a) Full names of shareholders (holding more than 5% of shares) and their holding percentages;
- (b) Full names and occupation of Directors;
- (c) Certificate of Incorporation; and
- (d) Memorandum and Articles of Association.

**SECTION B**

*COMMENCEMENT DATE, PURPOSE AND DURATION OF LICENCE*

B. 1 Desired date from which the licence (if granted) is to take effect: .....

B. 2 Duration of the licence from commencement date: .....

B. 3 Description of the purpose for which a supply is to be distributed: .....

B. 4 Type of application (issue, transfer, amendment or renewal): .....

**SECTION C**

*AREA TO WHICH THE APPLICATION RELATES*

C. 1 Provide sufficient information (maps, etc.) of the area or areas to which the application relates: .....

C. 2 Provide a list of local authorities covered by the area of distribution: .....

## SECTION D

## TECHNICAL INFORMATION

Submit single line diagram(s) of the system by means of which the applicant intends to supply electricity. Identify any parts of that system which will not be in possession or control of the applicant. The diagram should show the applicant's points of supply (input).

## D. 1 Domestic metering details:

Number of customers on— .. .. . Prepayment metering;  
Convectional credit metering;  
Ripple control/load limiting devices;  
AMR metering system.

## D. 2 Commercial metering details:

Number of customers on— .. .. . Conventional credit metering;  
Prepayment metering;  
Maximum demand metering;  
AMR metering.

## D.3 Industrial metering:

Number of customers on— .. .. . Maximum demand metering;  
Time of day metering;  
Remote metering.

## D. 4 Special Agreements:

Number of customers on— .. .. . Maximum demand metering;  
Time of day metering.

## D. 5 Transformer Capacity:

	<i>Number</i>	<i>Ages</i>	<i>(kVA) Capacity</i>
D. 5.1 Power transformers (kV)			
D. 5.2 Distribution transformers (kV)			

## D. 6 Lines:

Total Circuit length (Km) when commissioned

D. 6.1 Distribution Lines 66 kV (if not part of Transmission)			
D. 6.2 Distribution Lines 33 kV			
D. 6.3 Distribution Lines 11 kV			
D. 6.4 400/230 Volts			

## D. 7 Cables:

Total Circuit length (Km) when commissioned

D. 7.1	Distribution 33 kV			
D. 7.2	Distribution Cables 11 kV			
D. 7.3	Distribution Cables LV/MV			

## SECTION E

*DISTRIBUTION BUSINESS*

## E. 1 General:

Provide projected details of the following—

	Year 1	Year 2	Year 3	Year 4	Year 5
Number of consumers					
Total kWh Sales					
Total energy (kWh) purchased					
Percentage (kWh) losses					





E. 4 Provide details of long-term power purchase agreements:

.....  
.....  
.....  
.....

E. 5 Attach details of proposed tariff structure for each category of consumers:

.....  
.....  
.....  
.....

E. 6 Provide details of your policy regarding capital contribution, connection and reconnection charges, inspection charges, etc.:

.....  
.....  
.....  
.....

E. 7 Provide details of proposed major maintenance programmes including expected cost and duration thereof covering the next five (5) years:

.....  
.....  
.....  
.....

E. 8 Provide details of major rehabilitations and modifications and dates, costs and description thereof for the next five (5) years:

.....  
.....  
.....  
.....

E. 9 Details of distribution expansion programme including dates, description and how much of it will be for rural electrification for the next five (5) years:

.....  
.....  
.....  
.....

**SECTION F***FINANCIAL INFORMATION*

- F. 1 **Income Statement:**  
Provide statements and annual forecasts of sales, revenues and costs. Attach copies of the current and/or budgeted balance sheet, rate of return, profit and loss account and source and application of funds for current and next two (2) years. Indicate major cost items such as staff (as staff) costs, maintenance.
- F. 2 **Investment Programme:**  
Investment Programme for current and the next five (5) years. Attach copies of the detailed scheme or schemes prepared by a competent engineer and mode and cost of financing such a scheme.
- F. 3 **Fixed Assets:**  
Summary of total assets of all distribution plant.
- F. 4 **Audited Accounts:**  
Provide copies of the latest audited accounts of the applicant.
- F. 5 **Letters of Reference from Banks:**  
Provide one letter of recommendation as to credit worthiness from a local commercial bank and one from a reputable international bank.

**SECTION G***INFORMATION ON HUMAN RESOURCES*

- G. 1 **Personnel:**
- (a) Submit details of the number of staff and employees and their categories and grades in the service of or to be recruited by the applicant, showing their qualifications and number of years of experience in similar jobs.
  - (b) Provide *curriculum vitae* of top management personnel of the applicant.

**SECTION H***ENVIRONMENTAL CONSIDERATION*

Provide a brief description of the likely negative impact of the distribution facility on natural resources and the environment and mitigation measures proposed.

**SECTION I***PERMITS FROM OTHER GOVERNMENT DEPARTMENTS OR REGULATORY AUTHORITIES*

Submit copies of permits or approvals issued by public or local authority or other regulatory agencies necessary for the operation of the distribution system.

**SECTION J***ADVERTISING NOTICE*

Attach a draft copy of the notice of advertisement as to representations or objections.

**SECTION K**

*TARIFFS*

Provide a schedule of the proposed tariffs.

**SECTION L**

*ADDITIONAL INFORMATION*

Please provide any other information which the applicant wishes to include with this application:

.....  
.....  
.....  
.....

REPUBLIC OF MALAWI

ELECTRICITY ACT

(CAP. 73:01)

ELECTRICITY BY-LAWS, 2012

OBJECTION TO THE ISSUING OF A LICENCE

(by-law 7)

FORM EA 4

Full name: .....  
Nationality: .....  
Address (postal and physical) of Objector, or in the case of a body corporate, the registered office: .....

Telephone Number of Objector: .....

Fax Number: .....

E-mail Address: .....

Details of Contact Person:

Full Name: .....

Telephone Number: .....

Fax Number: .....

E-mail Address: .....

Legal form of Objector: .....

Reason for the objection: .....

Attach or refer to copy of the advertisement.

Nature of interest entertained by the Objector in the application: .....

Signed: ..... Date: .....

Receipt acknowledged by: ..... Date: .....



REPUBLIC OF MALAWI

ELECTRICITY ACT

(CAP. 73:01)

ELECTRICITY BY-LAWS, 2012

APPLICATION FORMS

(by-law 43)

APPLICATION FOR ELECTRICAL INSTALLATION PERMIT

To: The Chief Executive Officer  
Malawi Energy Regulatory Authority (MERA)  
Private Bag B496  
Lilongwe 3

SECTION A

A. 1 Full Name of Contractor: .....



A. 2 Address of Applicant, the registered head office:

.....  
 .....

A. 3 Name of company for which Registration is required:

.....  
 .....

A. 4 Telephone Number:

.....

A. 5 Fax Number:

.....

A. 6 E-mail Address of Contractor:

.....

A. 7 Nationality:

.....

Passport Number:

.....

Where/when issued:

.....

A. 8 Company Registered? (if yes attach copy of certificate).

A. 9 Company affiliated to Electrical Contractors Association?

A. 10 Attach copy of old Registration Certificate (if upgrading):

A. 11 Category in which registration is sought:

A. 12 If application is on behalf of a limited liability company, state the following—

(a) Foreign/Local Malawian:

(b) Paid-up capital K:

(c) Date of incorporation:

(d) Place of incorporation:

(e) Name of Managing Director:

Address:

.....  
 .....

### SECTION B

B.1 Give details of the technical qualifications of your staff indicating which members of your staff will be in actual control of the work and attach copy of their professional certificates.

Name	Position in Organization	Qualifications

B. 2 Give, below, details of what tools, equipment and transport facilities you own and which are in sound working order and have valid certificates and are currently licensed where required:

.....  
 .....  
 .....

B. 3 For those applying for upgrading only—

Give details of works completed during past three (3) years:

Value of Contract	Class of work	Location of Project	Client

B. 4 Have you ever failed to complete any work awarded to you? If so why?

.....  
 .....  
 .....

Present number of staff employed:

Craftsmen	Supervisors (state where trained)	Labourers

B. 5 Give two names and full addresses of referees (Electrical Engineers/consultants or other relevant competent professionals) who know you or under whom you have recently carried out work (Reference letters to be attached).

.....  
 .....  
 .....

SECTION C

C. 1 Are you familiar with the Laws of Malawi relating to your trade. If so, please list them down. Do you hold copies of these relevant legislations?

.....  
.....  
.....  
.....

C. 2 Remarks: .....

.....  
.....  
.....

C. 3 A council appointed official might be required to make a physical verification of the information given herein. Do you have any objections?

.....

C. 4 Declaration:

I, the above mentioned applicant, hereby solemnly and sincerely declare that the information I have given above is true in every respect to the best of my knowledge and belief and that I have read the Act and the regulations made under the Act and understanding that, if registered, I shall be bound thereby and by any amendments thereto, for as long as my name shall remain on the register.

Declared at: ..... *Signature of Applicant*

Before me on this ..... day of ..... 20.....

.....  
*Commissioner for Oaths*

This declaration must be signed, in the case of an application by a limited liability company, by the Managing Director or Secretary, and in the case of a partnership, by the principal partner or where none is resident in Malawi, by the local representative.

C. 5 FOR OFFICIAL USE ONLY—

(a) Date Received: .....

(b) Date sent to the Installations Permits Committee: .....

(c) Date of approval of application: .....

(d) Allocated Contractor Identification Number: .....



- (e) Registration Certificate Number: .....
- (f) Receipt Number of Registration fees: .....
- (g) Allocated MERA Working Licence Number: .....
- (h) Remarks: .....

Dated this ..... day of ....., 20.....

.....  
*Chief Executive Officer*  
*Malawi Energy Regulatory Authority (MERA)*

### THIRD SCHEDULE

#### MINIMUM SECTION CLEARANCE (by-laws 29, 113 and 115)

Normal operating voltage between bare line conductors— Minimum clearance from any point on or about the permanent equipment where a man may be required to stand (measures from the position of the feet).

	To the nearest part not at earth potential of an insulator supporting a live conductor	
	To the nearest unscreened live Conduct in air	Metres
1. Not exceeding 15,000 volts .. .. .	2.5	2.4
2. Exceeding 15,000 volts but not exceeding 33,000 volts ..	2.7	2.4
3. Exceeding 33,000 volts but not exceeding 44,000 volts ..	2.9	2.4
4. Exceeding 44,000 volts but not exceeding 66,000 volts ..	3.0	2.4
5. Exceeding 66,000 volts but not exceeding 88,000 volts ..	3.2	2.4
6. Exceeding 88,000 volts but not exceeding 110,000 volts ..	3.4	2.4
7. Exceeding 110,000 volts but not exceeding 132,000 volts ..	3.6	2.4
8. Exceeding 132,000 volts but not exceeding 165,000 volts ..	3.8	2.4
9. Exceeding 165,000 volts but not exceeding 220,000 volts ..	4.3	2.4
10. Exceeding 220,000 volts but not exceeding 275,000 volts ..	4.6	2.4
11. Exceeding 275,000 volts but not exceeding 330,000 volts ..	5.2	2.4

## NOTES—

- (a) The above provisions concern the means of access for works which are permanently available, such as fixed ladders or platforms attached to structures. The means of access shall also comprise the structures themselves and the tops of circuit-breakers or transformers if a man is required to stand on them to carry out work. The provisions do not apply to portable ladders, cradles or similar equipment, the use of which is governed by the general instructions issued by the consumer in accordance with by-law 13.
- (b) Portable ladders and platforms specially designed for specific maintenance work and so arranged that they cannot readily be employed in any way other than that intended, shall be considered as permanent means of access for the purpose of safety clearance.

FOURTH SCHEDULE  
REPUBLIC OF MALAWI  
ELECTRICITY ACT

(CAP. 73:01)

## ELECTRICITY BY-LAWS, 2009

## MINIMUM HEIGHTS OF OVERHEAD LINES

(by-law 48)

Normal operations voltage between line conductors—	Over roads normally accessible to vehicular traffic	In any position except where otherwise specified in these By-laws
(a) not exceeding 650 volts	5.5 metres	4.9 metres
(b) exceeding 650 volts but not exceeding 33,000 volts	5.8 metres	5.2 metres
(c) exceeding 33,000 volts but not exceeding 88,000 volts	6.1 metres	6.1 metres
(d) exceeding 88,000 volts but not exceeding 132,000 volts	6.7 metres	6.7 metres
(e) exceeding 132,000 volts but not exceeding 275,000 volts	7.0 metres	7.0 metres
(f) exceeding 275,000 volts	7.3 metres	7.3 metres

## FIFTH SCHEDULE

## MINIMUM HEIGHTS OF OVERHEAD LINES CROSSING RAILWAY TRACKS

(by-laws 49 and 135)

Normal operating voltage between line conductors height—	Minimum above rail
1. Not exceeding 33,000 volts	7.6 metres
2. Exceeding 33,000 volts but not exceeding 88,000 volts	7.9 metres
3. Exceeding 88,000 volts but not exceeding 132,000 volts	8.5 metres
4. Exceeding 132,000 volts but not exceeding 275,000 volts	8.8 metres
5. Exceeding 275,000 volts but not exceeding 330,000 volts	9.1 metres

## SIXTH SCHEDULE

## PART I—FUNDAMENTAL UNITS (by-laws 62 and 63)

The fundamental electrical units are the units agreed as such at an international conference on electrical units and standards held in London in October, 1908 (the magnitude thereof being determined on the electro-magnetic system of measurement, with reference to the centimetre as the unit of length, the gram as the unit of mass and the second as the unit of time), and comprising—

- (a) the ohm, the unit of electrical resistance, the value thereof being one thousand million in terms of the centimetre and the second;
- (b) the ampere, the unit of electrical current, the value thereof being one tenth in terms of the centimetre, the gram and the second;
- (c) the volt, the unit of electro-motive force, the value thereof being one hundred million in terms of centimetre, the gram and the second.

## PART II—DENOMINATIONS OF STANDARDS

## 1. Electrical Resistance:

A standard of electrical resistance denominated one ohm, agreeing in value within the limits of accuracy specified in Part III with that of the fundamental unit in paragraph (a) of Part I, and being the resistance between the copper terminals of the instrument marked "Board of Trade Ohm Standard Verified 1894 and 1909" to the passage of an unvarying electrical current, when the coil of insulated wire forming part of the instrument aforesaid is in all parts at a temperature of fourteen point decimal nine degrees centigrade.

## 2. Electrical Current:

A standard of electrical current denominated one ampere, agreeing in value within the limits aforesaid with that of the fundamental unit in paragraph (b) of Part I, and being the current which is passing in and through the coils of wire forming part of the instrument marked "Board of Trade Ampere Standard Verified 1894 and 1909" when, on reversing the current in the fixed coils, the change in the forces acting on the suspended coil in its sighted position is exactly balanced by the force exerted by gravity in Teddington in the United Kingdom upon the iridioplatinum weight marked A and forming part of the said instrument.

## 3. Electrical Pressure:

A standard of electrical pressure denominated one volt, agreeing in value within the limits aforesaid with that of the fundamental unit in paragraph (c) of Part I, and being one-hundredth part of the pressure which, when applied between the terminals forming part of the instrument marked "Board of Trade Volt Standard Verified 1894 and 1909 and 1948", causes that rotation of the suspended portion of the instrument which is exactly measured by the coincidence of the sighting wire with the image of the fiducial mark A before and after the application of the pressure, and with that of the fiducial mark B during the application of the pressure, these images being produced by the suspended mirror and observed by means of the eye-piece.

## 4. The coils and instruments referred to herein are deposited at the National Physical Laboratory at Teddington, Middlesex, in the United Kingdom.

PART III—LIMITS OF ACCURACY

The limits of accuracy attainable in the use of the standards denominated in Part II are—

- (a) for the ohm, within one-hundredth part of one per centum;
- (b) for the ampere, within one-tenth part of one per centum; and
- (c) for the volt, within one-tenth part of one per centum.

PART IV—DERIVED ELECTRICAL UNIT OF ENERGY

The derivation of the kilowatt-hour as the lawful electrical unit for the measurement of electricity shall be from the fundamental units described in Part I of this Schedule. Thus one watt (the practical unit of power) shall be equal to the amount of energy expended per second by an unvarying current of one ampere with a steady applied voltage of one volt. For the purpose of expressing watts in terms of voltage and resistance, or current and resistance, the steady voltage applied to a constant resistance shall be equal to the unvarying current in amperes multiplied by the value of the resistance in ohms.

In an alternating-current circuit the product of the instantaneous value of the amperes and the volts represents the instantaneous value of the power and the algebraic mean value of the instantaneous values over one second shall be the power in watts provided that the frequency is fifty cycles per second. One watt-hour shall be equal to the energy expended in one hour when the power is one watt, and a kilowatt-hour shall be equal to one thousand watt-hours.

SEVENTH SCHEDULE

MINIMUM SECTION CLEARANCE (by-laws 87, 113 and 115)

Normal operating voltage between bareline conductors— Minimum clearance from any point on or about the permanent equipment where a man may be required to stand (measures from the position of the feet).

	To the nearest part not at earth potential of an insulator supporting a live conductor	
	To the nearest unscreened live Conduct in air	To the nearest part not at earth potential of an insulator supporting a live conductor
	Metres	Metres
1. Not exceeding 15,000 volts	2.5	2.4
2. Exceeding 15,000 volts but not exceeding 33,000 volts	2.7	2.4
3. Exceeding 33,000 volts but not exceeding 44,000 volts	2.9	2.4
4. Exceeding 44,000 volts but not exceeding 66,000 volts	3.0	2.4
5. Exceeding 66,000 volts but not exceeding 88,000 volts	3.2	2.4

	<i>Metres</i>	<i>Metres</i>
6. Exceeding 88,000 volts but not exceeding 110,000 volts . . .	3.4	2.4
7. Exceeding 110,000 volts but not exceeding 132,000 volts . . .	3.6	2.4
8. Exceeding 132,000 volts but not exceeding 165,000 volts . . .	3.8	2.4
9. Exceeding 165,000 volts but not exceeding 220,000 volts . . .	4.3	2.4
10. Exceeding 220,000 volts but not exceeding 275,000 volts . . .	4.6	2.4
11. Exceeding 275,000 volts but not exceeding 330,000 volts . . .	5.2	2.4

## NOTES—

- (a) The above provisions concern the means of access for works which are permanently available, such as fixed ladders or platforms attached to structures. The means of access shall also comprise the structures themselves and the tops of circuit-breakers or transformers if a person is required to stand on them to carry out work. The provisions do not apply to portable ladders, cradles or similar equipment, the use of which is governed by the general instructions issued by the consumer in accordance with by-law 13.
- (b) Portable ladders and platforms specially designed for specific maintenance work and so arranged that they cannot readily be deployed in any way other than that intended, shall be considered as permanent means of access for the purpose of safety clearance.

## EIGHTH SCHEDULE

MINIMUM REQUIREMENTS FOR PROTECTION OF  
PRIVATE GENERATION(by-laws 152  
and 159)

## PART I—SWITCHBOARD SUPPLY CONTROLS AND PROTECTIVE APPARATUS

<i>System of Supply</i>	<i>Number of poles to be broken by circuit-breaker or Switch</i>	<i>Position of circuit-breaker of fuse</i>
1. Two-wire, alternating current or direct current, earthed at either pole . . . . .	1	In non-earthed conductor
2. Two-wire, alternating current or direct current, not earthed at either pole . . . . .	2	In each conductor
3. Three-wire, single-phase, alternating current or direct current . . . . .	2	In each outer conductor
4. Three-wire, three-phase, alternating current or four-wire, three-phase alternating current . . . . .	3	In each non-earthed conductor

## PART II—INSTRUMENTATION FOR A SWITCHBOARD

<i>Type of System</i>	<i>One Generator Only</i>	<i>More than One Generator</i>
1. Two-wire, alternating or direct current	(a) an ammeter; and (b) a voltmeter.	(i) an ammeter for each generator (ii) a voltmeter to measure the voltage of any generator; and (iii) if generators are paralleled, a voltmeter to measure the busbar voltage.
2. Three-wire, single-phase, alternating current or direct current	(a) an ammeter to measure the current in each outer conductor; and (b) two voltmeters, each connected between an outer conductor and neutral.	(i) an ammeter for each generator to measure the current in each outer conductor; (ii) two voltmeters, each connected between an outer conductor and neutral of the busbars; and (iii) if generators are paralleled, two voltmeters, each connected between an outer conductor and neutral, to measure the voltage of any of the two generators.
3. Three-wire, three-phase, alternating current or four-wire, three-phase, alternating current	(a) an ammeter to measure the current in each phase; and (b) a voltmeter to measure the line voltage.	(i) an ammeter for each generator to measure the current in each phase; (ii) a voltmeter to measure the line voltage of each generator; and (iii) if generators are paralleled, a voltmeter to measure the busbar voltage.

**NINTH SCHEDULE**  
**MINIMUM DISTANCES BETWEEN POWER LINES AND**  
**WAYLEAVES** (by-law 175)

	<i>Power Line Voltage</i>	<i>Length between parallel power lines (metres)</i>	<i>Wayleave (metres)</i>
1.	Not exceeding 11,000 volts (11 kV)	5	10
2.	Exceeding 11,000 volts but not exceeding 22,000 volts (22 kV)	12	15
3.	Exceeding 22,000 volts but not exceeding 33,000 volts (33 kV)	14	20
4.	Exceeding 22,000 volts but not exceeding 33,000 volts (33 kV) (H-pole)	14	30
5.	Exceeding 66,000 volts but not exceeding 88,000 volts (88 kV)	15	30
6.	Exceeding 88,000 volts but not exceeding 132,000 volts (132 kV)	25	30
7.	Exceeding 132,000 volts but not exceeding 275,000 volts (275 kV)	32	47
8.	Exceeding 275,000 volts but not exceeding 330,000 volts (330 kV)	35	50
9.	Exceeding 330,000 volts but not exceeding 400,000 volts (400 kV)	35	55
10.	Exceeding 400,000 volts but not exceeding 420,000 volts (420 kV)	35	55
11.	Exceeding 420,000 volts but not exceeding 500,000 volts (500 kV)	40	60
12.	Exceeding 500,000 volts but not exceeding 533,000 volts (533 kV)	40	60
13.	Exceeding 533,000 volts but not exceeding 765,000 volts (765 kV)	40	60
14.	765,000 volts and above (765 kV)	60	80

**TENTH SCHEDULE**  
**QUALITY OF SERVICE AND SUPPLY STANDARDS** (by-laws 65  
and 180)

**1.0 BACKGROUND**

The Minimum Standards for Electricity Supply Industry (ESI) shall provide the industry in Malawi the basis for checking to ensure that the quality of electricity supplied conforms to the acceptable minimum standards for normal operation of electricity dependent processes of customers.

Based on these standards, quality of supplies in the country shall be checked on a continuous basis. Compliance with the standards shall be checked using measurement and reporting procedures specified herein for both licensees and consumers.

## 2.0 MINIMUM QUALITY STANDARDS

### 2.1 Quality of Service Parameters:

Quality of Service Standards specifies requirements for monitoring and reinforcing reliability of electricity supply. This includes minimum times for clearing various faults on the network and monitoring frequency of forced and planned interruptions on the system.

### 2.2 Quality of Service and Reliability Objectives:

- (a) Each licensee shall maintain procedures to meet service levels established herein.
- (b) In the event that service must be interrupted for purposes of working on the lines or equipment, the licensee's work procedure shall provide that an attempt be made to—
  - (i) do the work at a time which will cause minimal inconvenience to customers; and
  - (ii) where reasonable and practicable, provide notice to customers in advance about the interruption.
- (c) The licensee shall keep a record of those instances where it is not reasonable or practical to provide advance notice.

### 2.3 Quality of Supply Parameters:

Qualities of Supply (QOS) parameters have been defined for both licensees responsible for generation, transmission and distribution in order for them to co-ordinate their contractual relationships with each other and between distributors and end customers. The characteristics of electric power that detract from its quality include momentary interruptions, waveform irregularities and voltage variations, which are either prolonged or transient.

Minimum standards for each one of the parameters have been developed. This minimum level shall represent the lower threshold of adequate service below which further review analysis and corrective action may be required by the licensee. The measured and assessed levels of these QOS parameters will then be compared to these minimum standards. The immunity levels of licensee and customers equipment are set at a percentage above the defined minimum or maximum nominal standards.

### 2.4 Quality of Power Supply Objectives:

Each licensee shall consider power quality in the design of power delivery system. It shall also strive to avoid and to mitigate to the extent feasible and cost effective, power quality disturbances under its control that adversely affect customers properly designed processes and equipment.

Each licensee shall, as a minimum, maintain a power quality programme that includes its performance objectives and procedures. The programme should be designed to respond promptly to customer reports of power quality problems.



### 3.0 CUSTOMER COMPLAINTS

Each licensee will receive customer service complaints and that licensees and their customers will be expected to resolve the problem between themselves first. Only those issues, which have not been successfully resolved between the licensees and their customers, as well as those between licensees, can be referred to the Authority for arbitration.

### 4.0 REPORTING PROCEDURES

In cases where the licensee has already been collecting the required information for a number of years, it is relatively easy to use the same information for the performance review plan. The performance requirements, reporting formats and the definition of the data will have to be agreed upon between the Authority and the licensee concerned.

#### 4.1 Annual Report:

Each licensee shall file a report with the Authority by the end of each calendar year that includes the following information—

- (a) An overall assessment of the reliability performance cooperate wide in each of the licensee's operating area in relation to the minimum standards set for interruption frequency and duration.
- (b) A status report on the power quality programme including data on the number of power quality complaints received during the year and the number of power quality investigations conducted during the year. Copies of monthly and quarterly circuit analysis reports by the company can be used.
- (c) A list of circuits' performance by operating area based on applicable forced outage performance indicators (AFIk, TITk, CAIDI, SAIFI, SAIDI, FIU and TIU) for the calendar year.

#### 4.2 Under Achievements of Base line Target:

When a licensee data for a given operating area does show that performance has gone down, the licensee will prepare a report to the Authority. This report should analyze the interruption patterns and trend as well as the maintenance history of the affected operating area and describe the problem causing the unacceptable performance and the action the licensee is taking to resolve them. The report shall contain target dates for completion of corrective action.

#### 4.3 Assessment Method:

Faults centers as well as consumers shall keep record of the date, time and duration of all reported interruptions. As far as practicable, the reported interruptions shall be corrected and related with the known disturbances on the network. Samples of fault-reporting format for operators are appended with these standards as attachment.

Operators shall submit to the Authority annual reports based on these recordings in order for the Authority to analyze licensee service quality performance. The Authority may request interim reports from licensees if required.

The Authority shall monitor continuously the reliability of the supply on a network sample basis using specialized equipment and data that shall be recorded and compiled annually. A report will be published based on the findings indicating the extent of compliance to these standards and the comparative performance of the concerned network.

If a consumer complains of non-compliance with quality of service standards by the operator, the issue shall first be settled between the operator and the consumer. If the issue is not resolved and has been referred to the Authority for resolution, the Authority shall put specialized equipment on a section of the network to verify and resolve the complaint.

#### 5.0 COST OF INVESTIGATIONS

The cost of investigations carried out by the Authority to determine non-compliance with standards during disagreements between licensees, and between licensees and consumers, will be borne by the Authority. After determination, the cost will be charged to the party found guilty.

### QUALITY OF SERVICE STANDARDS

#### 1.0 PURPOSE

The Authority sets the minimum standards for the quality of electricity services supplied by Malawian utilities to end customers. They are intended to provide the Authority with means of evaluating and monitoring reliability of electricity supply in Malawi. This include minimum fault clearing time on the distribution network and maximum number of forced and planned interruptions for each category of the MV and LV distribution networks. While some key parameters of quality of service are measurable, overall quality of service includes many aspects that cannot be readily measured. Target standards for these have been established, which should be achieved under normal circumstances.

#### 2.0 DEFINITIONS

- 2.1 "interruptions" refer to an occurrence when one or more phases of supply to a customer or a group of customers are disconnected for a defined period exceeding 3 minutes.
- 2.2 "planned interruptions" refer to an occurrence when a component is deliberately taken out of service by a utility or its agent at a selected time, usually for the purpose of a construction or for preventive maintenance or repair.
- 2.3 "forced interruptions" refer to an occurrence when a component is taken out of service immediately, either automatically or as soon as switching operations are performed as a direct result of emergency conditions, or an interruption caused by improper operation of equipment or human error.
- 2.4 "equipment failure" refers to interruptions that result from electric breakdown or mechanical failure of any plant.
- 2.5 "operational causes" refer to interruptions from operational action or from the operation of protection control equipment including interruption caused by lack of preventive maintenance.
- 2.6 "third party causes" refer to interruptions that result from damage to licensee's equipment by another party, such as theft of conductors, vandalism, motor vehicle accidents, customers protection device failure;
- 2.7 "natural events" refer to interruptions that result from lightning, windstorms, fire and other natural events, including those caused by birds or animals directly;
- 2.8 "low-voltage (LV)" means normal operating voltage exceeding 30 volts AC and or 50 volts direct current but not exceeding 250 volts;

2.9 "medium-voltage (MV)" means normal operating voltage exceeding 250 volts but not exceeding 650 volts.

2.10 "high-voltage (HV)" means normal operating voltage exceeding 650 volts.

### 3.0 SERVICE QUALITY AND RELIABILITY STANDARDS

The following performance indices for measuring frequency and duration of interruptions have been developed and comply with the International Electrotechnical Commission (IEC) standards. These are universally recognized standard definitions and shall be applied to the entire distribution system, operating areas, sub-operating areas or individual circuits.

#### 3.1 Frequency and Duration of Forced Interruptions Per Year:

Interruptions of duration less than 3 minutes or due to *force majeure* are not considered. Major events shall be considered separately.

The standards are implemented in phases. Improving gradually towards internationally acceptable standards. The AFIk and TITk indices (described below) are applied in the transition stage. After the transition stage (year 2) more detailed (SAIFI, SAIDI and CAIDI indices) are used as specified below. In this period DisCos are expected to carry out necessary improvements and adjust their information system to comply with SAIFI, SAIDI and FAIDI indices.

#### Stage I, Phase I

In Phase I of Stage I global values shall be used as follows—

##### (a) System Average Interruption Index:

$$\begin{aligned} \text{AFIk} &= (\text{Average Frequency of Interruptions per kVA}) \\ &= \text{Sum [kVA disconnected during outage/Total installed kVA]} \end{aligned}$$

Average frequency of interruptions per unit (kVA) of distribution transformation capacity installed. AFIk specifies the number of times a unit of installed distribution transformation capacity is interrupted.

##### (b) Customer Average Interruption Duration Index:

$$\begin{aligned} \text{TITk} &= (\text{Total Interruption Time per installed kVA}) \\ &= \text{Sum [(kVA disconnected during outage) \times (\text{Duration of outage}) /} \\ &\quad \text{Total installed kVA]}. \end{aligned}$$

Total interruption time per unit of installed capacity. TITk specifies the average amount of time a unit of installed distribution transformation capacity is disconnected.

#### Stage I, Phase II

Phase II of Stage I shall use more detailed indicators and DisCos shall be required to improve carry-out improvements and adjust their information system to comply with the standards specified below: Global values shall be used as follows—

##### (c) System Average Interruption Index:

The average number of times that a customer is interrupted in a year.

$$\begin{aligned} \text{SAIFI} &= (\text{System Average Interruption Frequency Index}) \\ &= \text{Sum [Customers disconnected by outage/Total customers in system]} \end{aligned}$$

(d) Customer Average Interruption Duration Index:

This index defines an average interruption duration time for those customers that experience an interruption during the year. This index provides a basis of estimating the average length of time required to complete service restoration.

SAIDI = (System Average Interruption Duration Index)

=  $\frac{\text{Sum } \{(\text{Customers disconnected by outage}) \times (\text{Duration of outage})\}}{\text{Total customers in system}}$ .

CAIDI = (Customer Average Interruption Duration Index) it specifies the average outage duration experienced by a customer defined by the following formula—

= SAIDI/SAIFI

Compatibility levels shall be as specified in Tables 4-6 below.

Table 4-6

Yearly Values Excluding External Events

	Stage I						Stage II					
	Year 1			Year 2			Year 3 Use SAIDI and SAIFI			Objective		
	Urban Service	Rural Service	System Equivalent	Urban Service	Rural Service	System Equivalent	Urban Service	Rural Service	System Equivalent	Urban Service	Rural Service	System Equivalent
AFIk/ SAIFI (events)	8.0	10.0	9.4	7.0	9.0	8.4	7.0	8.0	7.7	6.0	7.0	6.7
TITk/ SAIDI (hours)	16.0	30.0	25.8	14.0	27.0	23.1	12.0	20.0	17.6	9.0	17.5	15.0
CAIDI (hours)	2.0	3.0	2.7	2.0	3.0	2.7	1.7	2.5	2.3	1.5	2.5	2.2

## Stage II:

The final stage moves DisCos to International Standards where individual customer indices (FIU and TIU), as defined below, are used. The DisCos are expected to have implemented necessary improvements and adjusted their information system to provide all necessary data.

(e) Customer Average Interruption Index:

FIU = (Frequency of Interruptions experienced by individual customer within a fiscal year).

(f) Customer Average Interruption Duration Index:

TIU = (Total duration, cumulative, of Interruptions experienced by individual customer within a fiscal year).

Compatibility levels shall be as specified in Table 4-7 below.

Table 4-7

Yearly Values Excluding External Events					
Stage II					
	Low-Voltage Customers		Medium-Voltage Customers		High-Voltage Customers
	Urban Service	Rural Service	Urban Service	Rural Service	All Service
TIU (hours)	6.0	8.0	4.0	6.0	3.0
TIU/FIU (hours)	12.0	24.0	8.0	12.0	6.0
FIU (events)	2.0	3.0	2.0	2.0	2.0

NOTE: The numbers and durations are for overhead distribution lines and assume bare conductor. These figures shall also apply where aerial bundled conductor (ABC) is used. Generally better performance is expected from ABC.

### 3.2 Establishment of Service Level Performance Values:

The Authority shall verify the actual numerical values for the service quality and reliability indices provided in tables 4-6 and 4-7 above before using them. Minimum levels shall be assigned to each operating area of the licensee. Factors to be considered to guide the establishment of the indices shall include physiographic, demographic and load characteristics of an operating area and relative performance of an operating area in relation to other operating areas within a given licensee franchise area.

### 3.3 Penalty:

Non-compliance to the service quality standards by a Licensee shall attract a penalty charge equal to the cost of energy not supplied. The cost of the unsupplied energy shall be calculated based on the tariffs (measured in Malawi Kwacha/kWh) applicable to affected customer(s). The penalty shall be used to compensate affected customers. Each in proportion to its annual consumption.

Global indemnification (INIG) shall be used to compensate all customers where customers are affected in general and is defined as follows—

INIG = Maximum of {ENS system\_t, ENS system\_f} × VENS.

Where ENS system\_t = Estimated Energy not supplied to the customers in terms of TITk

$$= E_{\text{system}} \cdot (TITk - TIT \text{ limit}) / 8760.$$

ENS system\_f = Estimated Energy not supplied to the customers in terms of AFIk.

$$= E_{\text{system}} \cdot \{(AFIk - AFIk \text{ limit}) \times (TITk/AFIk) / 8760\}.$$

E system = Energy billed during the monitoring period (year) in kWh.

VENS = Value of energy not served (used in computation of electricity rates in K/kWh).

After information system is fully established, three (3) years later INIG shall be calculated in terms of SAIFI and SAIDI and in terms of TIU and FIU in the final phase as determined by the Authority and agreed by the Licensee.

### 3.4 Tariff Implications:

A Licensee shall be allowed to increase the level of investment to enable supply of services consistent to these standards. Tariff restructuring shall therefore be recommended to enable the Licensee collect adequate revenue to make such investments.

## 4.0 STANDARD GUIDELINES FOR THE QUALITY OF OTHER SERVICE PARAMETERS

### (a) General:

The following service standards shall be applied and achieved by a licensee.

### (b) Processing of Request for Service:

A licensee is required to connect its customers within the time frame (number of days) specified in Table 4-4 below, which is based on whether network extensions are required and the size of the new demand to be connected. The last two columns specify time frames where network extension within 100 m is required. A response to a customer shall indicate expected date for the provision of the service.

Table 4-4

Time frame for Compliance (Days from receipt of payment)

	Where extension is not required		Where extension of less than 100 m is required	
	Stage I	Stage II	Stage I	Stage II
Urban/sub-urban demarcated areas . . . . .	6	3	15	7
Urban/sub-urban un-demarcated areas . . . . .	10	5	20	10
Isolated Rural Areas . . . . .	20	10	30	15

Where works are required to extend the existing network beyond the 100 m limit, a Licensee shall conduct a study to work out a budget and time frame for the works. The study shall be provided within thirty (30) days. Upon agreement with the customer the Licensee shall proceed with the works after payment of a contribution by the customer. After works are completed the Licensee shall complete the connection in five (5) days.

(c) Customer Commercial Complaints:

- (i) The number of complaints received by a licensee shall not exceed an average of 10% of the total customers connected in a system within the first stage and reducing to 5% in the final stage.
- (ii) The time in days taken to process customers' commercial complaints shall not exceed seven (7) calendar days if the complaint is related to the supply of electricity and thirty (30) calendar days if it is of public liability in nature during Stage I. The period shall be reduced to three (3) days in Stage II.

The Licensee shall endeavor to resolve ninety per cent (90%) of general complaints without further referral.

(d) Telephone response times at emergency/fault Reporting Centers:

Ninety per cent (90%) of telephone requests for information shall be dealt with within five minutes.

(e) Replacement of Electric Consumption Meter:

Meters shall be replaced if when tested are found to have errors of more than 3% for low consumption measurements (MD < 10 kW), 2% for medium consumption measurements (MD > 10 kW) and 1% for higher consumption measurements where a customer is connected at voltages higher than 11 kV.

All meters shall be checked at least every six (6) years or at the request of the customer. In the latter case, if the meter is found within specifications, the licensee shall charge a reasonable fee to the customer. If the meter is found with an error the last measurement that was deemed correct shall be used for the estimation of the current consumption.



(f) Disconnection of Supply and Penalties for non-Payment—

(i) Disconnections:

A licensee shall send written notices of termination of service before disconnecting a customer from the service. The notice shall be tendered fourteen (14) days after the due date indicated on the bill. A minimum of forty-eight (48) hours notice shall be given to all consumers before disconnection. An exemption to this rule shall include the following—

- If an immediate condition dangerous or hazardous to life exists.
- If order to terminate has been issued by any Court or any duly authorized public authority.
- Illegal use of electricity for instance, in cases where such service is obtained diverted or used without the authority or knowledge of the licensee.

Dealing with non-payment:

- No disconnection shall be effected until after fourteen (14) days after the due date written on a bill.
- Commercial and industrial customers shall be given at least forty-eight (48) hours notice of an impending disconnection using major circulation newspapers or other means. The Authority shall monitor failure to give notification of scheduled disconnections.
- Disconnections shall be carried out in the morning hours only and during normal working days.
- Disconnections shall not be carried out over the weekend and public holidays.

(ii) Reconnection (After paying penalties):

Where a service is discontinued and the cause has been remedied and the penalty paid by the customer, the customer shall be reconnected by the first working day after settling the account and paying the reconnection fee and within 24 hours.

(iii) Penalties:

A licensee shall be charged a fine determined by the Authority for repeated non-compliance based on records.

- **Planned Interruptions without Proper Warning:**  
All planned interruptions without proper warning shall be deemed as forced interruptions and their duration shall be counted towards the calculation of the reliability statistics and compensation for poor quality.
- **Billing Errors:**  
A licensee shall charge an uncontested amount only and later if proven correct, shall correct the difference with interest.
- **Connection Delays:**  
The Authority shall determine a fine for repeated offences.

## QUALITY OF SUPPLY STANDARDS FOR DISTRIBUTION NETWORK

### 1.0 PURPOSE

This standard specifies the minimum acceptable limits for voltage dips, voltage harmonics, voltage imbalance, voltage regulation and voltage flicker. The standard recommends network planning levels and Power Quality (PQ) process parameters for use by Licensees and Customers in planning to achieve the required compatibility at points of common coupling.

The minimum standards are intended to be used by licensees, customers and the Authority as criteria for compliance or non-compliance with acceptable PQ standards.

Where specific network conditions make it difficult to meet the minimum acceptable limits for declared reasons, for example where the electrical infrastructure is under development, a licensee may deliver levels of specified PQ parameters below the minimum requirement as agreed between the licensee and the customer, with the exception of voltage regulation and frequency.

Where measured PQ parameters indicate that the minimum standards have not been achieved at a particular site, or where a PQ sensitive customer requires an enhanced PQ, countermeasures can be considered. Such countermeasures might include the installation of compensation equipment within the customer's network by mutual agreement between the licensee and the customer, including the relative allocation of costs where such an installation is found to be more practical or cost effective than an installation on the licensee's networks.

The licensee shall be deemed to have supplied the required PQ, even if the standards are not achieved at the point of common coupling, if the countermeasures installed within the customer's network have resulted in an acceptable PQ being provided to sensitive loads.

### 2.0 DEFINITIONS AND ABBREVIATIONS

"customer" means a person or legal entity that has entered into an electricity supply agreement with a licensee;

"declared voltage" means the voltage declared by the licensee as the voltage at the of supply;

"developing network" means a network, the construction of which has not yet reached the initially planned configuration, and from which temporary or early supply is made available to customers by agreement, in order to avoid delayed service availability;

"extra-high-voltage (EHV)" means the set of nominal voltage levels that are used in power systems for bulk transmission of electricity in the range  $U_n > 220$  kV;

"frequency" means the frequency of alternating voltage generated by power system generators;

"high-voltage (HV)" means the set of nominal voltage levels that are used in power systems for bulk transmission of electricity in the range  $650$  V  $< U_n < 220$  kV;

"interruption" means a phenomenon that occurs when one or more phases of a supply to a customer or group of customers are disconnected for a period exceeding 3 minutes;

"licensee" means a body licensed to generate, transmit or distribute electricity.

"low-voltage (LV)" means normal operating voltage exceeding 30 volts AC and/or 50 volts direct current but not exceeding 250 volts;

"medium-voltage (MV)" means normal operating voltage exceeding 250 volts but not exceeding 650 volts;

"measurement period" means the minimum period of time for taking a measurement. Normally, a full week (5 working days and a week-end); and

"measurement interval (k)" means the minimum period of time for recording instantaneous values of each parameter. Normally 15 minutes and 10 minutes intervals are specified.

"monitoring period" monthly periods during which several areas in the network shall be covered.

"planning level" means the level to which a licensee designs its networks when it evaluates the impact on the supply system of all loads connected to the system. These levels might change from network to network, depending on network structure and circumstances, and are typically lower than the compatibility level;

"point of common coupling (PCC)" means the point of a public supply network electrically nearest to a particular consumer's installation, and at which other consumer installations are, or may be connected;

"power quality (PQ)" means technical parameters to describe the electricity supplied to customers, and that are used to determine the extent to which the needs of customers are met in the utilization of electricity;

"physical points" means the points in the electricity supply network which have been categorized for the purpose of monitoring PQ;

"rural" means clustered or scattered structures, usually of low-density, not served by a well-established infrastructure (roads, telecommunication, etc.). Usually supplied with power through radial overhead lines emanating from one distribution station;

"standard voltage" means a phase voltage of 230 V measured between a phase conductor and a neutral conductor, or a line voltage of  $\sqrt{3} \times 230$  V measured between phase conductors;

"ten (10) minute r.m.s. value" means the average (root mean square) value of all the samples taken during a 10-minute period;

"urban" means formally or informally built structures, usually of high-density, served by a well-established infrastructure (roads, telecommunication, etc.). The power network is usually supplied by more than one distribution station;

"voltage dip" means a sudden reduction in the r.m.s. voltage on any or all of the phase voltages of a single-phase or a poly-phase supply;

"voltage flicker" means the modulation of the amplitude of the supply voltage, perceived by the observer as a fluctuation of light intensity in electric lighting;

"voltage harmonics" means the sinusoidal components of the fundamental waveform (i.e. 50 Hz) that have a frequency that is an integral multiple of the fundamental frequency;

"voltage regulation" means the ability of the steady-state r.m.s. voltage remain between the upper and lower limits:

"voltage imbalance" means the voltage imbalance that arises in a poly-phase system when the magnitudes of the phase voltages or the relative phase displacements of the phases (or both) are not equal.

### 3.0 THE SUPPLY STANDARDS

#### Standard 3-1—

##### Voltage Regulation (%):

Voltage regulation refers to the absolute value of the difference between the average of the effective instantaneous values (RMS) of the voltage measured at the point of delivery, and the value of the nominal voltage at the same point expressed as a percentage of the nominal value at that point where:

Voltage Regulation (% V<sub>k</sub>) is defined below as .

Ave. RMS measured voltage (V<sub>k</sub>) - Nominal voltage (V<sub>n</sub>) / V<sub>n</sub> × 100.

Voltage regulation shall be limited to a maximum value of ±6%. Measurements shall be carried out at 15 minutes intervals for a minimum period of 7 days for an individual case or complaint. Overall system performance shall be established for a Monitoring Period of not less than 6 months.

##### Compliance:

System performance shall be deemed to be compliant to voltage regulation standard if Equivalent Frequency of Voltage Deviation (EFVD), defined as the percentage of measurements with voltage deviation outside the specified bandwidth, is equal to or less than 5%. Penalties shall be charged if EFVD exceeds 5%.

Where EFVD =  $\frac{\{NRV_{ob}\}}{NRV}$   
 NRV<sub>ob</sub> = Number of registered values outside the bandwidth.  
 NRV = Sum of registered values.

The standard bandwidths for the voltage shall be ± 6%.

##### Penalties (In two scenarios).

#### Scenario 1—

Indemnification for Poor Voltage Regulation (IVR) (where affected customers are known).

The Licensee shall make correction within (5 days), repair damaged equipment and pay affected customers indemnification if no correction is done within the five (5) days limit or as may be determined.

Where IVR = CAT · EFE<sub>ob</sub> · ADE · ED · Wf  
 and CAT = Tariff (K kWh) of affected customers.  
 ED = Excess Days to correct the problem.  
 Wf = Weighing factor.  
 ADE = Average Daily Energy consumption in kWh from last bill for the affected customers.  
 EFE<sub>ob</sub> = ES<sub>ob</sub> / TES.  
 (Equivalent Frequency of Energy supplied outside the voltage bandwidth specified above).

ES\_ob = Energy supplied outside the bandwidth during the measuring period.

TES = Total Energy supplied during the period.

The weighting factor ((Wf) ranges from 0.4 to 10) and is adjusted based on impact of non-compliance. Table 3-1-2 below refers—

Table 3-1-2  
Permissible Voltage Unbalance (%)

Average deviation above (below) the voltage band	Wf
≤ 1%	0.4
≤ 2%	0.8
≤ 4%	2.0
≤ 6%	4.0
≤ 8%	6.0
≤ 10%	10

Scenario 2 (Global Non-Compliance)—

Sanction for Poor Voltage Regulation (IVRg), where voltages have generally been outside the bandwidth). Proceeds are used to compensate the customers in proportion to electric service payments (consumption).

Where  $IVRg = ATc \times EFE\_ob \times TESc \times Wf$   
(Global indemnification).

and  $ATc =$  Average Tariff (K/kWh) for the company.

$TESc =$  Total Energy supplied during the control periods being considered (kWh).

Standard 3-2—

Voltage Imbalance in Three-Phase Services—

Voltage imbalance shall be defined by the following formula:

Voltage Regulation (%) =  $3(V_{max.} - V_{min.}) / (V_a + V_b + V_c) * 100$ .

And  $V_{max.} =$  Maximum voltage recorded during a measuring interval (k).

$V_{min.} =$  Minimum voltage recorded during a measuring interval (k).

$V_a =$  Voltage of Phase A recorded during a measuring interval (k).

$V_b =$  Voltage of Phase B recorded during a measuring interval (k).

$V_c =$  Voltage of Phase C recorded during a measuring interval (k).

**Compliance:**

System performance shall be deemed to be compliant to voltage imbalance standard if during the Measurement Period 5% of the measurements taken, voltage imbalance is equal or less than 3% for system voltage rating of up to 11 kV, and 1% at higher voltage rating. Penalties shall be charged if more than 5% of the measurements taken, voltage imbalance exceeds the limits.

**Penalties:**

The licensee shall make correction within (5 days) and be liable to related damages. If the fault is due to customer installation, time shall be fixed to make correction or be disconnected. Where the imbalance causes grave impact to affect other customers on the system, the licensee shall pay a penalty and be reimbursed by the responsible customer.

Indemnification for Voltage Imbalance (IVU) to affected customers.

Where IVU (Kwacha) = ADE × ED × AT × Wf.

and AT = Average Tariff (K/kWh) for the company.

ED = Excess Days to correct the problem.

Wf = Weighing factor.

ADE = Average Daily Energy consumption in kWh from last bill for the affected customers.

The weighing factor (Wf) ranges from 0.5 to 10 and is adjusted based on impact of non-compliance. Table 3-2-2 below refers---

Table 3-2-2

Average deviation beyond the acceptable values	Wf
< 1%	0.5
≤ 3%	2.0
≤ 5%	5.0
≤ 7%	8.0
≤ 7%	10

**Standard 3-3****Voltage Harmonic Distortion:**

Voltage Harmonic Distortion shall be measured in terms of Total Harmonic Voltage Distortion (THVD) and Individual Harmonic Voltage Distortion (IHVD) defined by the formulae below where---

$$\text{THVD (\%)} = \left\{ \left( \sum V_i^2 \right) / V_1^2 \right\} \times 100$$

$$\text{IHVD (\%)} = V_i / V_1^2$$

Where  $V_i$  = Voltage component of the order—i harmonic

$V_1$  = Voltage component of the fundamental frequency (50 HZ).

## Compliance:

System performance shall be deemed to be of poor quality if during the Measurement Period greater than 5% of the Measurement Period THVD or IHVD exceed the established tolerance range shown in Table 3-3-1 below.

Each point shall be measured for at least seven (7) days at ten (10) minutes intervals. Suspect points shall be monitored in the transition period. Measurements shall include 6 points across suspect area, which shall include—two residential, two commercial and two industrial customers.

Table 3-3-1

## Individual Harmonic Distortion Limits

Individual Harmonic (Voltage) Distortion, IHD (%)					
Old. Not Multiples of 3		Old. Multiples of 3		Even	
Order of the Harmonic (n)	Limit of Individual Harmonic	Order of the Harmonic (n)	Limit of Individual Harmonic	Order of the Harmonic (n)	Limit of Individual Harmonic
5	6	3	5	2	2
7	5	9	1.5	4	1
11	3.5	15	0.3	6	0.5
13	3	21	0.2	8	0.5
17	2	<21	0.2	10	0.5
19	1.5			12	0.2
23	1.5			<12	0.2
25	1.5				
<25	$0.2 + 1.3 * 25/n$				
Total Harmonic (Voltage) Distortion, THD (%)					8

## Penalties:

Indicator of the level of deviation above the threshold (between 0 and 1.0) shall be calculated and be used to calculate the compensation as below:

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$$PHDk = \text{Max.}[0, (THDk - THD)/THD] + 1/3 * \sum_{i=2} \text{Max.}[0, (IHDik - IHDi)/IHDi]$$

i = 2

and (PHDk) = Penalized Harmonic Distortion measured during the interval k.

- THDk = Total Harmonic Distortion measured during the interval k (k).
- THD = Threshold for Total Harmonic Distortion given in these Standards.
- IHDk = Individual Harmonic Distortion measured during the interval k (k).
- IHD = Threshold for Individual Harmonic Distortion given in these Standards.

The penalty during the interval k shall be calculated based on the value of PHDK above.

$$\text{Penalty (k)} = \begin{cases} \text{If } \text{PHDk} < 1 \Rightarrow (\text{PHDk})^2 \times (10 \times \text{AT}) \times \text{E(k)} \\ \text{If } \text{PHDk} \geq 1 \Rightarrow (10 \times \text{AT}) \times \text{E(k)}. \end{cases}$$

Penalty paid for the energy supplied with sub-standard conditions during the interval k.

Where AT = Average Tariff for affected customers

E(k) = Energy supplied during period k to the affected customers.

#### Standard 3-4

Voltage Flicker Distortion:

Quantitative methods shall be used to measure flicker and the standard shall be measured in terms of Short-term Flicker severity indicator (Fst), which shall not exceed 1.0. Reference is made to IEC standard 1000-3-7.

$$\text{i.e. } F_{st} \leq 1.0$$

Measurements shall be taken at six (6) points each month for a minimum period of seven continuous days at intervals of ten (10) minutes. Two for residential, two for commercial and two for industrial customers. A flicker meter shall be used according to IEC Standard 868 or IEC Standard 61000-4-15.

#### Compliance:

System performance shall be deemed to be of poor quality if during the Measurement Period greater than 5% of the Measurement Period, the records show that Flicker exceeded the compliance level.

#### Penalties:

DisCos shall be asked to correct the problems and shall be subject to sanctions.

The following Indicator of deviation shall be used:

$$\text{PFDk} = \text{Max.}[0, (\text{Fstk} - \text{Fst})/\text{Fst}]$$

Penalized Flicker Distortion during the interval k.

Where Fstk = Flicker severity factor measured during interval k.

Fst = Threshold total for Flicker severity (1.0).

The penalty during the interval k shall be calculated based on the value of PFDk above.

$$\text{Penalty (k)} = \begin{cases} \text{If } \text{PFDk} < 1 \Rightarrow (\text{PFDk})^2 \times (10 \times \text{AT}) \times \text{E(k)}. \\ \text{If } \text{PFDk} \geq 1 \Rightarrow (10 \times \text{AT}) \times \text{E(k)}. \end{cases}$$



Penalty paid for the energy supplied in sub-standard condition during the period k.

Where - AT = Average Tariff for affected customers.

E (k) = Energy supplied during period (k) to the affected customers.

#### Standard 3-5—

Harmonic Distortion of the Current (By a customer):

The customer shall be limited in the value of the harmonic currents that can be injected into the system.

Where a customer is connected at a voltage greater than 1.0 kV and demands greater than 10 kW the limit shall be defined in terms of Total Harmonic Current Distortion (THCD) and Individual Harmonic Current Distortion (IHCD).

Where THCD (%) =  $[(\sqrt{\sum I_i^2})/I_1] \times 100$

IHCD (%) =  $I_i/I_1 \times 100$

and  $I_i$  = Current intensity component of the order—i harmonic

$I_1$  = Current intensity component of the fundamental frequency (50 HZ).

Where a customer is connected at 1 kV or less with a demand of less than 10 kW the following formula shall apply—

Delta  $I_i$  = ( $I_i$  load -  $I_i$  maximum)

#### Compliance:

System performance shall be deemed to be of poor quality if during the Measurement Period is greater than 5% of the Measurement Period, Harmonic Current Distortion exceeded the compliance level. Table 3-5-1 refers—

Table 3-5-1  
Maximum Harmonic Tolerances to distortion produced by Customer

Order of the Harmonic (n)	P10 kW V1 kV	P>10 kW 1 kV<V60 kV
	Maximum Harmonic Intensity (AMP)	IHCD (%)
Odd, Not Multiples of 3		
5	2.28	12.0
7	1.54	8.5
11	0.66	4.3
13	0.42	3.0
17	0.26	2.7
19	0.24	1.9
23	0.20	1.6
25	0.18	1.6
>25	4.5/n	0.2 + 0.8*25/n
Odd, Multiples of 3		
3	4.60	16.6
9	0.80	2.2
15	0.30	0.6

Table 3-5-1—(continued)  
Maximum Harmonic Tolerances to distortion produced by Customer

Order of the Harmonic (n)	P10 kW V1 kV	P>10 kW 1 kV<V60 kV
	Maximum Harmonic Intensity (AMP)	IHCD (%)
Odd, Not Multiples of 3		
21	0.21	0.4
>21	4.5/n	0.3
Even		
2	2.16	10.0
4	0.86	2.50
6	0.60	1.0
8	0.46	0.8
10	0.37	0.8
12	0.31	0.4
>12	3.68/n	0.3
THCD (%)		20

**Penalties:**

The Authority shall discuss necessary remedies with the customer and agree the time frame to make corrections. The customer shall be subject to disconnection if not compliant and shall be asked to reimburse the licensee for any penalty.

**QUALITY OF SUPPLY STANDARDS FOR TRANSMISSION NETWORK**

**1.0 PURPOSE**

This standard specifies minimum acceptable limits for voltage dips, voltage harmonics, voltage imbalance, voltage regulation, voltage flicker, system frequency and quality of electricity services supplied by the Transmission Licensee to the Distribution Customers for operation of a transmission network with a rated voltage of 66 kV and above.

Network planning levels and Power Quality (PQ) process parameters are specified for use by Licensees and Customers to achieve an internationally acceptable level of system reliability. The standard defines a minimum level of investment, which shall enable the system meet customer projected demand and energy requirements, reliably deliver (from generation to large customers and distribution companies), achieve system flexibility in switching arrangement, voltage control, etc., and improve availability of the system to acceptable level.

Excessive dependence on any one transmission circuit, structure, right of way or substation and cascaded trip of any other element due to an outage of any facility (N - 1 criteria) shall be avoided.

The Licensee shall ensure speed recovery, sophistication of protective equipment and system restoration to reliable operation by limited load shedding or re-dispatching of generation in the system.

The Authority shall approve system expansion and transmission rate base paid for by system users. A Licensee in liaison with the Authority shall develop a transmission investment plan followed by international bidding for all major expansions. The Licensee shall construct and maintain the facilities and be subjected to availability standards and penalties for non-compliance.

## 2.0 SERVICE QUALITY AND RELIABILITY STANDARDS

### 2.1 Availability Measure:

The duration and frequency of forced outages shall be monitored in terms of accumulated duration of forced outages (Deik) in minutes per line or transformer per voltage class, (66 kV and 132 kV) in a fiscal year and in terms of frequency of forced outage (Feik) per line or transformer per voltage class, (66 kV and 132 kV) in a fiscal year.

Scheduled outages (O and M) deemed necessary by the Authority and outages due to events external to transmission system including generation related forced outages, outages due to other licensees, customer equipment, earthquakes, floods, wars, sabotage and other natural catastrophes shall be excluded.

Availability performance indices shall be calculated by voltage class and used as compatibility measure as shown below—

#### (a) Frequency Index ( $Fl_{v,c,k}$ ):

(For Transmission Lines)

Annual Average Forced Outage Frequency ( $Fl_{v,c,k}$ ) for all transmission lines per 100 km per voltage class.

$$i = Nk$$

$$\text{Where } Fl_{v,c,k} = (1/L_{vc}) \times \sum_{i=0}^{Nk} [Flik * 100]$$

$$i = 0$$

for  $i = 1$  to  $Nk$  (sum of forced outages on the element)

Average number of forced outages for all transmission line circuits in a voltage class within a fiscal year  $k$  (given by faults/100 km).

$L_{vc}$  = Total length of transmission line circuits in a voltage class in fiscal year  $k$ .

$Flik$  = Frequency of forced outages for the  $i$ th transmission line circuit in a fiscal year  $k$ .

#### (b) Frequency Index ( $Ft_{v,c,k}$ ):

(For Transmission System Transformers)

Annual Average Forced Outage Frequency ( $Ft_{v,c,k}$ ) for all transmission system transformers.

$$i = Nk$$

$$\text{Where } Ft_{v,c,k} = (1/Nt_{vc}) \times \sum_{i=0}^{Nk} [Ftik]$$

$$i = 0$$

for  $i = 1$  to  $Nk$  (sum of forced outages on the element).

Average number of forced outages for all transformers whose primary voltage is in a particular voltage class for the fiscal year k.

and  $N_{t,c}$  = Total number of transformers with a primary voltage rating in one voltage class in a fiscal year k.

$F_{tik}$  = Frequency of forced outages for the  $i$ th transformer in a fiscal year k.

(c) Duration Index:

(For Transmission Lines)

Accumulated Annual Average Forced Outage Duration ( $DI_{v,c,k}$ ) per 100 km of all transmission line circuits that experienced forced outage in the fiscal year k.

$$i = Nk$$

$$\text{Where } DI_{v,c,k} = (1/F_{t,c,k}) \sum_{i=0} [Dlik]$$

for  $i = 1$  to  $Nk$  (total duration of forced outages on the line circuit).

Accumulated Average Duration of Forced Outages for all transmission line circuits in a voltage class which experienced forced outages in a fiscal year k given by Min. (Outage/100 km).

and  $Dlik$  = Accumulated duration of forced outages for the  $i$ th transmission line circuit having a forced outage frequency availability measure ( $f_{ik} > 0$ ) in a fiscal year k.

(d) Duration Index ( $F_{t,c,k}$ ):

(For Transmission System Transformers)

Accumulated Annual Average Forced Outage Duration ( $Dt_{v,c,k}$ ) of transformers that experienced forced outage in a fiscal year.

$$i = Nk$$

$$\text{Where } Dt_{v,c,k} = (1/F_{t,c,k}) \sum_{i=0} [dtik]$$

for  $i = 1$  to  $Nk$  (sum of forced outages on the element).

Average number of forced outages for all transformers whose primary voltage is in a particular voltage class for the fiscal year k.

and  $dtik$  = Accumulated duration of forced outages for the  $i$ th transformer having a forced outage frequency availability measure ( $f_{ik} > 0$ ) for fiscal year k.

Compliance Limits:

Table 3-1 below specifies transmission lines tolerance values for the parameters specified above. The tolerance limits are set based on existing statistics of the licensee's system. The Authority shall adjust the limits towards internationally accepted standards (the permanent phase) to allow for improvements in system performance. The tolerance limit for system transformers shall be defined by the Authority taking into account the current performance and necessary investment to improve performance.

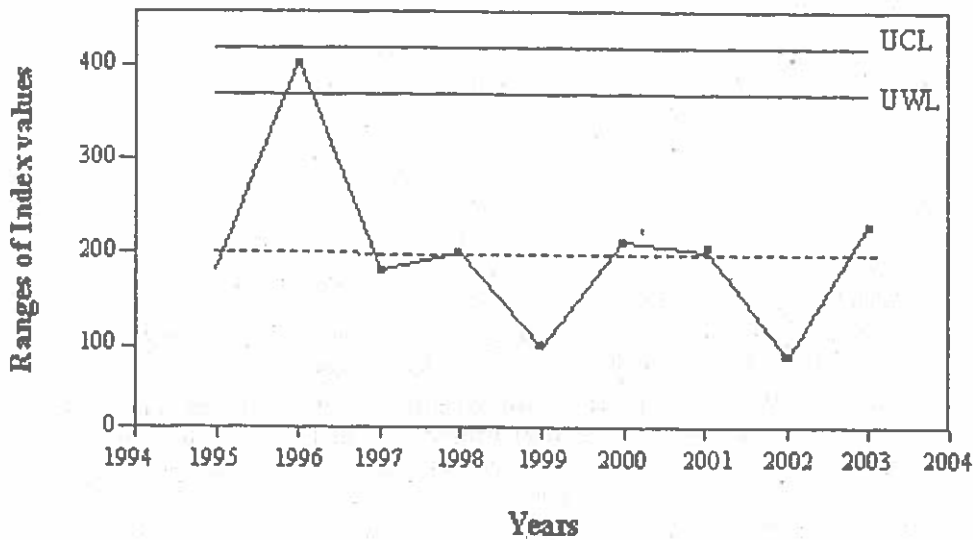
Table 3-1: Proposed Maximum Tolerance Values

	Symbol	Current Avg.	Testing Phase		Transition Phase		Permanent Phase	
			Warning Level	Max. Value	Warning Level	Max. Value	Warning Level	Max. Value
(Average Number of outages/100 km of transmission Lines/year)	F1_lim	10	8	10	6	8	5	6
Annual Average Forced outage duration (hours/100 km of transmission lines)	DI_lim	70	50	70	30	40	10	24

Control Charts:

Annual availability control charts shall be developed and Upper Control Limit and Upper Warning Limit (UCL and UWL) set to values to drive improvement in system performance. Reference is made to Table 3-1 above.

Figure 3-1  
Sample Control Chart  
Annual Performance Index



The center Line in figure 3-1 above is calculated based on the historical data. Control charts shall be developed for each line and transformer. The charts shall be reviewed quarterly and annually to track performance and evaluate to see if intended improvements are complied with.

**Penalties and Incentives:**

Outages due to scheduled maintenance and initiated by events caused by third parties shall not be considered.

The Authority shall specify a penalty factor per event in MK/event and a penalty factor per hour in MK/hour. Actual values of the penalty factor shall be defined taking into consideration the revenue that the Transmission Company (TransCo) receives from the of the service, i.e. Dividing annual payment TransCO receives for each asset by 8,760 (hours in a year) and multiplying the result by a penalty multiplier.

The formulae below shall apply—

(i) Where frequency of forced outages exceeds threshold:

$$PFI_{v,c,k} = \{RI_{v,c,k}/8,760\} \times (FI_{v,c,k} - FI\_lim) \times (L_{v,c}/100) \times 1 \text{ hour} \times Wf.$$

$$PFI_{v,c,k} = \text{Penalty factor for frequency.}$$

$$Wf = \text{Penalty factor (Based on importance of the transmission system, Typically 60 or more).}$$

$$RI_{v,c,k} = \text{Revenue per asset/voltage category.}$$

(ii) Where duration of forced outages exceeds threshold:

$$PDI_{v,c,k} = \{RI_{v,c,k}/8,760\} \times (DI_{v,c,k} - DI\_lim) \times (L_{v,c}/100) \times 1 \text{ hr} \times Wf.$$

$$PDI_{v,c,k} = \text{Penalty factor for duration.}$$

The proceeds from the penalties shall be used to compensate customers by a way of reducing transmission rates.

Penalty regimes consider that TransCo pay a maximum of either—

(i) Penalty based on violation of frequency index<sup>N</sup> or

(ii) Penalty based on violation of duration index<sup>M</sup>.

**System Maintenance:**

System maintenance, rehabilitation and reinforcement programmes shall be strategically planned to enable the licensee improve its services to the level required by these standards.

**3.0 TRANSMISSION SYSTEM OPERATION STANDARDS**

The TransCo responsible for system operation shall ensure that electric service is provided with appropriate levels of quality of service in terms of voltage quality and continuity of supply.

This standard specifies minimum acceptable limits for voltage regulation, voltage dips, voltage imbalance, voltage flicker and system frequency for operation of a transmission network with a rated voltage of 66 kV and above.

The transmission operation standards shall be consistent with the standards in force in the Southern African Power Pool (SAPP) which defines in detail obligations of parties connected to the pool in terms of generators response to frequency deviations, of generators to be controlled by other machines, the Automatic Generation Control (AGC) facility, reserve margin (standby spare capacity), frequency excursions generators and loads can withstand before tripping, information requirements and communication procedures.

<sup>N</sup>{Number of events exceeding tolerance × Penalty factors per event (MK/event)}

<sup>M</sup>{Number of hours exceeding tolerance × Penalty factors per event (MK/event)}

Table 3.3-2

Limits for the number of voltage dips per year for each category of dip window:

Transmission System	Number of Voltage Dips per Year				
Voltage Range	Dip Window Category				
	Z	T	S	X	Y (see Note)
<66kV to <132 kV	16	25	25	80	120
220 kV and above	5	6	11	45	88

Note:

The number of "Y" dips is provided for completeness of information, but is not intended to regulate licensees on the basis of the number of "Y" dips.

All three phases of the supply voltage shall be monitored. Measurements shall comprise phase to neutral voltage and phase-to-phase voltage wherever applicable. Metering classes of 0.1, 0.2, 0.5 and 1.0 shall be used for measurements. Measurement accuracy for the duration of the dip shall be 10 ms. The accuracy of the logged time of occurrence shall be  $\pm 10$  minutes.

The assessed level for each dip window shall be the number of dips that occur in that window. The assessed level shall be compared to the compatibility level for that window.

### 3.4 Voltage Flicker:

Voltage flicker shall be measured using a flicker meter in terms of Short-term flicker severity (Pst) and Long-term flicker severity (Plt). All three phases of supply voltage shall be monitored. Measurements shall comprise phase to neutral voltages and phase-to-phase voltages wherever applicable.

Measurements shall be carried out at 10-minute intervals for a minimum period of seven (7) days. The highest 10-minute Pst value in 24 hours, which is not exceeded for 95% of the time shall be recorded for each phase and the highest of these shall be retained as a daily value. High Pst values known to have occurred coincidentally with voltage dips shall be ignored.

Compatibility levels for Short-term flicker severity Pst and Long-term flicker severity Plt shall be 1.0 and 0.8, respectively.

Long-term flicker severity value shall be measured every 10 minutes and calculated over a two-hour period from the preceding (12) Pst values where

$$Plt = \sqrt{(\sum P_{st,k}^2 / 12)} \text{ for } k = 1 \text{ to } 12$$

and  $P_{st,k}$  = General term for consecutive 10-minute Short-term flicker severity.

The highest retained daily values over the full assessment period shall be compared with the compatibility levels specified above.

## 3.5 Frequency:

Frequency deviations from the nominal frequency of 50 Hz shall be limited to a maximum of  $\pm 2.5\%$ .

## 3.6 Harmonics and Total Harmonic Distortion (THD):

Total harmonic distortion (THD) shall be defined as follows—

$$\text{THD} = \sqrt{\sum V_k^2} \quad \text{for } k = 1 \text{ to } N$$

Where

$k$  = is the harmonic number

$V$  = is the percentage r.m.s. value of the  $h^{\text{th}}$  harmonic or inter-harmonic voltage component.

$N$  = the highest harmonic considered in the calculation and  $N$  shall be equal to 25.

The compatibility levels for harmonics on the transmission network shall be as provided in Table 3-6 below.

Table 3-6

## Compatibility Levels for Harmonic Voltages

(Expressed as a percentage of the operating voltage in the transmission system)

Odd Harmonics (Non-multiples of 3)		Odd Harmonics (Multiples of 3)		Even Harmonics	
Order (h)	Voltage (%)	Order (h)	Voltage (%)	Order (h)	Voltage (%)
5	2	3	2	2	1.5
7	2	9	1	4	1
11	1.5	15	0.3	6	0.35
13	1.5	21	0.2	8	0.4
17	1	>21	0.2	10	0.4
19	1			12	0.2
23	0.7			>12	0.2
25	0.7				
>25	$0.2 + 0.5 \times 25/h$				

Total Harmonic Distortion (THD)  $\leq$  xx%.

All three phases of the supply voltage shall be monitored. Measurements shall comprise phase to neutral voltages and phase-to-phase voltages wherever applicable.

The measurement shall be done continuously at a maximum of 3 seconds intervals for a minimum period of seven (7) days. The measurements shall be summated over a 10-minute period to obtain 10 minutes r.m.s. values using the following formula—

Where for the  $h^{\text{th}}$  harmonic

$V_{s,h}$  = measured r.m.s. value at 3 seconds intervals during the 10-minute period.

$H$  = the harmonic number

$N$  = the number of r.m.s. values within the measured 10-minute period.

$$V_{IQ,k} = \sqrt{\frac{\sum V_{s,k}^2}{N}}$$



The Transmission Operation standards shall be complemented by the SAPP Grid Code and Ancillary Services Normative. They shall be tools used by the TransCo to achieve correction of deviation from the operation standards described below once the responsible party is identified.

### 3.1 Voltage Regulation:

Variations in magnitude of transmission system voltage (rated at 66 kV and above) shall be limited to  $\pm 5\%$  of the nominal value.

Measurements shall be taken continuously for a minimum period of seven (7) days for 24 hours and at 10 minutes intervals. The highest 10 minutes r.m.s. voltage not exceeded for 95% of the time shall be recorded, and the highest of these values shall be retained as the daily high value. Similarly, the lowest 10 minutes r.m.s. values of the supply voltage within which the voltage remains for 95% of the time shall be recorded and the lowest of these values shall be retained as the low value.

All incidences where two or more consecutive 10 minutes values are outside compatibility levels shall be reported.

### 3.2 Voltage Imbalance (VImb):

Voltage imbalance shall be limited to a maximum value of 2%.

Where

$$V_{Imb} = \sqrt{\{(1 - \sqrt{3 - 6B}) / (1 + \sqrt{3 - 6B})\} \times 100}$$

and

$$B = \{V_{12}^4 + V_{23}^4 + V_{31}^4\} / \{V_{12}^2 + V_{23}^2 + V_{31}^2\}$$

$V_{12}$  fundamental frequency phase-to-phase voltage between phases 1 and 2, etc.

Measurements shall be taken continuously for a minimum period of seven (7) days and 24 hours in a day at 10 minutes intervals. The highest 10 minutes percentage unbalanced value not exceeded for 95% of the time is recorded as the daily high value. The highest of the daily value over the full assessment period shall be compared with the compatibility level.

The 10 minutes % imbalanced values ( $VU_{10}$ ) over a period of 24 hours (00:00 to 24:00) shall be calculated as follows:

$$VU_{10} = \sqrt{\left\{ \sum_{i=1}^N VU_i^2 / N \right\}}$$

Where  $VU_{10}$  = measured sample of imbalance within a 10-minute period.

$N$  = number of samples in that 10-minute period.

The total accuracy of the measurement shall be limited to a maximum value of 0.5% in the calculated imbalance and measuring instruments with an accuracy class of 0.2% or better shall be used.

### 3.3 Voltage Dips:

Voltage dips shall be defined in terms of dip windows. The dip windows shall be defined based on duration and magnitude of the voltage dips. Figure 3.3-1 below refers. The compatibility level shall be specified in terms of maximum number of dips in each dip window.

Figure 3.3-1  
**Measured Voltage Dip Parameters**

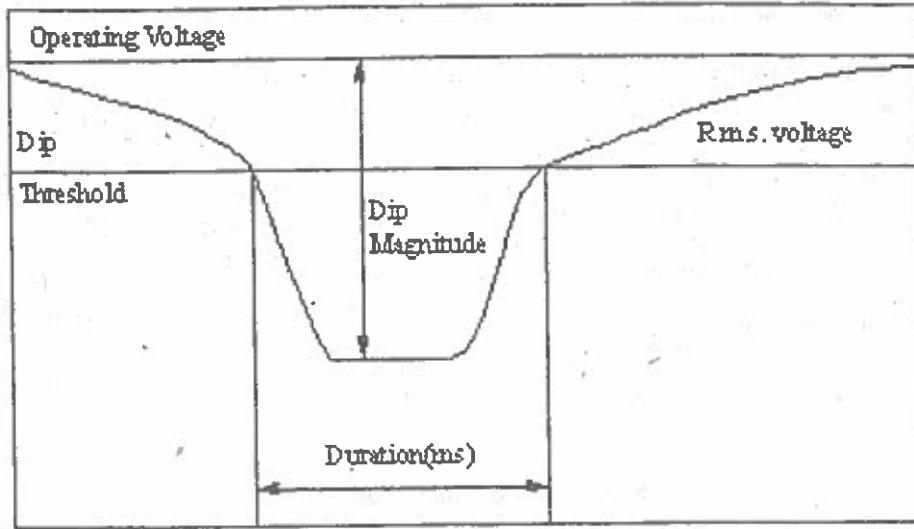


Figure 3.3-2 below defines the dip windows.

Magnitude  
of Voltage  
Depression

Figure 3.3-2  
**Voltage Dip Window**

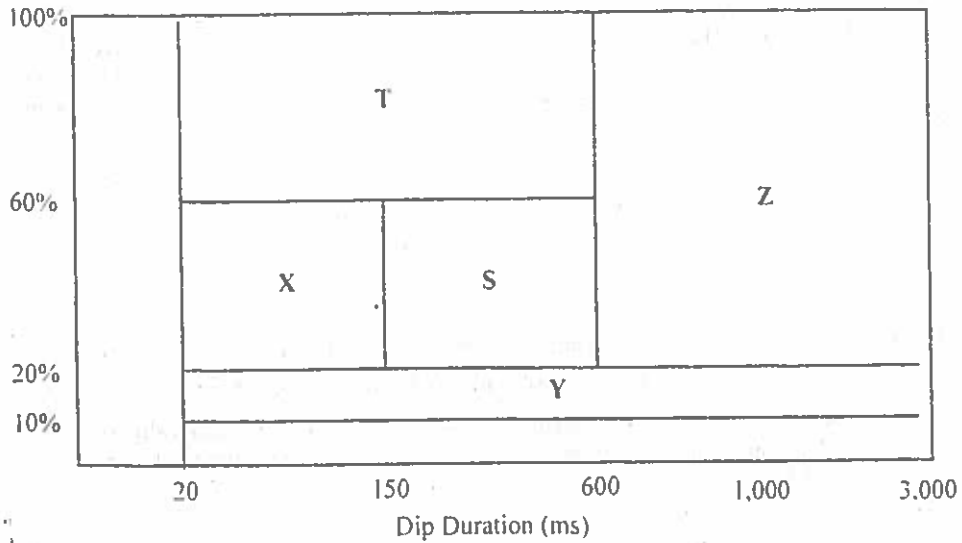


Table 3.3-2 specifies compatibility levels in terms of maximum number of dips per feeder per year for the defined ranges on voltage dip duration and magnitude (dip window categories "Z", "T", "S" and "X").

Where more than one sample is calculated in every 3 seconds  $V_{s,h}$  shall be calculated as below—

Where

$V_{o,h}$  = is the value in volts of each of the samples calculated using a time window of between 80 ms and 500 ms.

$$V_{s,h} = \sqrt{\frac{\sum_1^N V_{o,h}^2}{N}}$$

A gap between the windows shall be permissible. The highest 10 minutes r.m.s. values for each harmonic and THD, within each 24-hour period (00:00 – 24:00) not exceeded for 95% of the time shall be recorded for each phase. The highest of the values in each phase shall be retained as the assessed daily values over the assessment period. The highest of the retained assessed daily values over the full assessment period shall be compared with the compatibility levels.

The number of days during the assessment period during which the THD level exceeds the compatibility levels as provided in Table 3-6 above, shall be recorded. The assessed levels shall be less than the compatibility levels defined above.

TENTH SCHEDULE  
REPUBLIC OF MALAWI  
ELECTRICITY ACT  
(CAP. 73:01)  
ELECTRICITY BY-LAWS, 2009  
ELECTRICITY TARIFF FORMULAE (by-law 212)

The Normal Tariff Formula:

The formula for normal tariff setting or tariff review process for electricity is based on the traditional Revenue Requirement Approach [RRA]. This approach defines what should be the acceptable annual revenue requirement [RR] and reasonable rate of return on investment [RRI].

In practice the revenue to be earned by a licensee is equal to the cost of supply for electricity plus a fair return on the rate base as shown below.

Revenue Requirement	=	Electricity Production Cost
	+	Operation and Maintenance [O and M]
	+	Customer Service Costs
	+	Overhead Costs
	+	Depreciation Costs
	+	Rate of Return on Investment [RRI]
	+	Cost of Working Capital
	+	Bad Debts
	-	Income from other sources.

The Automatic Tariff Adjustment Formula (AIAF):

The formula is applied when the licensee's costs rise or fall as a result of fluctuations in exchange rate and inflation rate above or below a defined trigger limit of  $\pm 5\%$ .

The automatic tariff adjustment formula is structured as follows:

$$\frac{\Delta T}{TC} = \frac{\Delta TC}{TC} = DC \times 0.2 \frac{\Delta CPI}{CPI} + FC \times 0.8 \frac{\Delta ER}{ER}$$

The rate of change in tariff is equal to the rate of change in total cost which in turn is equal to the share of domestic cost in total cost multiplied by the rate of inflation plus the share of foreign costs in total costs multiplied by the rate of currency change.

Where:

- $\Delta T$  = Change in tariff
- $\Delta TC$  = Change in total cost
- DC = Percentage of the total cost which is domestic.
- FC = Percentage of the total cost which is foreign.
- CPI = The consumer price index.
- ER = The exchange rate between Malawi Kwacha and USA Dollar.

Dated this 10th day of February, 2012.

(FILE NO. C48/2/20)

LYTON ZINYEMBA  
Chairperson