ELECTRICITY DISTRIBUTION CODE
OF
LIBERIA

JUNE 2022

Table of Contents

Foreword

The Electricity Distribution Code specifies the procedures for the planning and operation of the distribution network during normal and exceptional conditions. It is a live working document continuously subjected to revisions and amendments to comply with legislation and good industry practices. It takes cognizance of the present situation in Liberia, where a small percentage of the population has access to electricity in the Monrovia area and a few other selective areas connected to cross-border supplies from neighboring Cote d'Ivoire.

The Distribution Code shall also serve as a guide to operators under the mini-grid code in the development and planning of their isolated mini-grid networks and systems, especially if they plan or are expected to interconnect to the distribution network in the future. In line with the 2015 ELL's objectives of promotion of renewable energy resources utilization, the Distribution Code also includes a Section that specifies minimum technical and design conditions for the connection of a Variable Renewable Power Plant (with Wind or Solar PV resource harnessing technology) that is connected to or seeking connection directly to the distribution network.

As the rest of the country that is currently being supplied or that will be supplied from isolated standalone mini-grids, the LERC shall also develop and issue a Mini-grid Code for the planning and operation of these standalone or isolated Mini-grids.

The proposals for changes will be received by a Distribution Code Technical Committee (DCTC). The DCTC is a stakeholder representative committee, and its composition is laid down in the Distribution Code. The roles and responsibilities of the DCTC are prescribed in the Distribution Code one of which, includes proposing recommendations to the LERC for changes to the Distribution Code.

This Distribution Code provides a general framework for the revision of the existing Technical Standards and Procedures thereby ensuring harmonization for the safe, secure, and reliable operation of electrical distribution networks in Liberia. It will work in conjunction with other legal and regulatory documents, including but not limited to the 2015 Electricity Law of Liberia, the Liberia National Energy Policy of May 2009 (or any other policy thereafter approved), the Liberia Electricity Grid Code (LEGC) and other regulatory guidelines issued by the LERC.

PART A: GENERAL PROVISIONS

Introduction:

The General Provisions contain the purpose and scope of the Distribution Code, a definition of roles, responsibilities, terminology, transitional provisions, measures, and exemptions, as well as arrangements for the management and governance of the Distribution Code.

SECTION 1: PREAMBLE

1.1 Purpose and Scope of Electricity Distribution Code

1.1.1 The Electricity Distribution Code of Liberia referred to in this document as the Distribution Code, sets out the conditions that a Distribution Licensee must meet in carrying out its obligations to distribute electricity under its license and in accordance with the ***Customer Service and Quality of Supply Regulations < >.*** The Distribution Code establishes the requirements, procedures, practices, and standards that govern the development, operation, maintenance, and use of the distribution network in Liberia. The purpose of the Distribution Code is to ensure that the Distribution Licensee provides fair, transparent, nondiscriminatory, safe, reliable, secure, and cost-efficient delivery of electrical energy supply services to consumers via the distribution network. The Distribution Code defines minimum technical requirements for the Distribution Licensee and the Users and establishes information exchange requirements among them.

1.1.2 This Distribution Code issued by LERC is based on the provisions of Sections 3.3: A. 5, 6, 8, 9, B.4 and 3.4 of the Electricity Law of Liberia, 2015 (ELL), hereinafter referred to as the Law.

1.1.3 Unless otherwise stated in a license or a code issued under the Law, the sections of this Code apply to transactions and interactions involving users of the distribution system including distribution licensees, embedded generators, retailers, traders, end-use customers, and any other entity with equipment connected to the distribution network.

1.2 Scope of a Distribution Network

In accordance with the Section 5.7.1 of the Law, LERC has determined that a distribution network shall comprise “all electricity plant and equipment within the borders of Liberia that function or are operated at a system voltage of 33kV and below, as well as any associated feeder or supply equipment that are for shared or common use in the area or zone designated by LERC”. The scope of a distribution network as provided in this section includes a distribution network connected (to the transmission network) or not connected to the transmission network. Despite the separation, the different Parts of the Distribution Code are intended to be consistent and complementary for the satisfactory delivery of distribution and sale services. Nothing in this Distribution Code precludes the application of evolving technologies and processes as they become available.

1.3 Structure of the Distribution Code

1.3.1 The Parts of the Distribution Code are generally organized according to the legal instruments by which they are to be implemented.

1.3.2 This Part A, the General Provisions, contains the purpose and scope of the Distribution Code, a definition of roles, responsibilities, terminology, transitional provisions, measures, and exemptions, as well as arrangements for the management and governance of the Distribution Code.

1.3.3 Part B of the Distribution Code defines the Conditions of the Distribution and Sale License. This Part contains the sub-codes that deal with planning requirements,

connection arrangements, rights and the requirements for transparency and nondiscrimination.

1.3.4 Part C, the Rules of Practice, details the arrangements for system operations, scheduling, and safety. It also covers issues relating to liabilities, force majeure situations, distribution licensee's condition of service and assets management requirements.

1.3.5 Part D, the Standards of Performance, states the indicators and benchmarks for quality and reliability of supply. It also contains the sub-code for metering which describes the applicable standards and installation arrangements for metering.

1.3.6 Part E, the Renewable Energy Provisions, provides the basic technical performance requirements that a VRPP needs to comply with in order to connect its generating facility to the distribution network in the Republic of Liberia.

1.3.7 Part F, the Definitions, provides meanings and definitions for special words and technical terms used in the text to bring out the meanings in the context that they have been used in the Distribution Code.

SECTION 2: ABBREVIATIONS

AMR	Automatic Meter Reading
CRM	Customer Relations Management
CT	Current Transformer
LEC	Liberia Electricity Corporation
LERC	Liberia Electricity Regulatory Commission
LEGC	Liberia Electricity Grid Code
EMS	Energy Management System
ELR	Electricity Licensing Regulations
EPA	Environmental Protection Agency
DCTC	Distribution Code Technical Committee
DMS	Distribution Management System
GoL	Government of Liberia
GPS	Global Positioning System
GWh	Gigawatt-hour or one billion (109) watt-hours of energy
IEC	International Electro-technical Committee
ISO	Independent System Operator
ITU	International Telecommunication Union
kVA	kilovolt-ampere, or one thousand volt-amperes
kVar	Kilovar, or one thousand volt-amperes of reactive power
kW	Kilowatt or one thousand watts of active electric power
kWh	Kilowatt-hour or one thousand watt-hours of electrical energy
MEDs	Momentary (outage) Event Durations
MOU	Memorandum of Understanding
MULR	Micro Utility Licensing Regulations
MVA	One million volt-amperes
Mvar	Megavar, one million volt-amperes of reactive electric power
MW	Megawatt, one million watts of active electric power
SCADA	Supervisory Control and Data Acquisition
VAR	Volt Amperes Reactive

VEE	Validate, Estimate and Edit
VRPP	Variable Renewable Power Plant

SECTION 3: APPLICATION OF THE CODE

3.1 Users

3.1.1 This Code applies to a Distribution Licensee and the following Users, who shall comply with the Code:

(a) retailers of electricity,

(b) embedded generators including VRPPs, and

(c) customers of a Distribution Licensee or retailer.

3.1.2 A customer shall comply with this Code where an obligation to do so is included as a term or condition in a contract for the supply of electricity by a Distribution Licensee or the sale of electricity by a retailer to the customer or in a deemed or presumed distribution contract.

3.1.3 A Distribution Licensee is a person licensed by LERC (under the ELR or the MULR) to distribute and sell electricity without discrimination to consumers in an area or zone designated by the LERC.

3.1.4 A retailer is a person licensed by LERC to:

(a) sell or offer electricity to a consumer;

(b) act as an agent or broker for a retailer with respect to the sale or offering for sale of electricity; or

(c) act or offer to act as an agent or broker for a consumer with respect to the sale or offering for sale of electricity.

3.1.5 An embedded generator or a VRPP is a facility that is licensed by LERC to operate at a specific location and is connected directly to a distribution network.

3.1.6 A customer is a person that has contracted for:

(a) the supply of electricity by a Distribution Licensee or

(b) the purchase of electricity from a retailer.

3.2 Responsibility of a Distribution Licensee

3.2.1 A Distribution Licensee shall operate its distribution network to provide services in accordance with the Performance and Reliability Standards of the Distribution Code. The Distribution Licensee's responsibilities in this regard shall include:

(a) the development of the System Operational Manual, Safety Rules for coordinated and safe operation of the distribution network;

(b) supervising and ensuring adherence to Safety Rules by the User;

(c) operating all distribution network equipment, installation and facilities in accordance with operational manuals or Prudent Utility Practices;

(d) making distribution connection and capacity available and ensuring unhindered, equitable and non-discriminatory access to the distribution

network for all licensed or permitted Users in accordance with the Regulations and provisions of this Code;

(e) undertaking planning, system studies and design schemes for network expansion to meet load forecast requirements for demand growth and network stability.

(f) to ensure distribution network security by prudent operation and control within the designed technical limits including adherence to safety clearances to live equipment and in accordance with the provisions of this Code;

(g) undertaking outage planning and coordinating maintenance activities of all equipment, remote terminal distribution networks within substations and substation facilities.

(h) coordination of upgrades and other maintenance activities that impact distribution network reliability;

(i) deployment, coordination of expansion and upgrades of SCADA/DMS solutions with essential backup systems that allow monitoring and supervision and data acquisition for the early detection of anomaly to avoid service interruptions and disconnections;

(j) investigation and review of each major power system operational incident and the issuance of the relevant reports;

(k) procurement, installation, and maintenance of revenue meters of the distribution network;

(l) administering power supply and power purchase agreements;

(m) Implement distribution system loss reduction strategy by the real-time monitoring and recording of electric power and energy balance for the accounting and billing function for the distribution network supply and services; and

(n) collection of information and statistics, publication of reports, and dissemination of information relating to the performance of its distribution network.

3.3 Responsibility of Users

3.3.1 A User that intends to establish and connect to the distribution network any new or modified equipment or network that it owns, operates or controls shall

(a) liaise with the Distribution Licensee and submit a more detailed analysis determining the impact on the distribution licensee's network;

(b) must report to the distribution licensee any derogation to the distribution code that may be required for an assessment of any impacts on the security and stability of the distribution licensee's network

(c) provide the remedial steps it proposes to take and proposed timetable for coming into compliance including a committed plan of continual updates of developments to the distribution licensee and

(d) obtain the required approvals from LERC.

3.3.2 A licensed or permitted User shall pay to the distribution licensee fair compensation as enshrined in the Tariff regulations.

3.4 Compliance with Laws and Industry Standards

A Distribution licensee and the Users shall comply with all relevant laws, the Regulations, the requirements of the Distribution Code and other codes, Licenses & Permits and Prudent Utility Practice. Despite the separation, the different Parts of the Distribution Code are intended to be consistent and complementary for the satisfactory delivery of distribution and sale services and nothing in this Distribution Code precludes the application of evolving technologies and processes as they become available.

SECTION 4: TRANSITIONAL PROVISIONS AND EXEMPTIONS

4.1 Purpose and Scope

This section of the Distribution Code makes recommendations for a transition period. These recommendations include temporary reliefs, relaxation of standards and capacity building in response to changes in roles, obligations, and responsibilities. It provides the rationale and suggests the duration of any reliefs, relaxations, or exemptions.

4.2 Configuration of Equipment and Installations

4.2.1 The distribution licensee shall within six months of the coming into force of the Distribution Code prepare a "Non-compliance Listing" of all assets and connected facilities indicating the specific technical characteristics which do not comply with the Distribution Code.

4.2.2 The LERC shall approve a transitional period for the coming into compliance of all assets and connected facilities on the "Non-compliance Listings" prepared by the Distribution Licensee.

4.2.3 All generating equipment and facilities, distribution network facilities, and off-taker facilities that are in operation within the distribution network at the time of the coming into force of this Distribution Code shall, despite any noncompliance with the Distribution Code, continue to operate for a period **not exceeding thirty-six months** following the Effective Date of the Distribution Code, provided that the noncompliance has been identified and included in the "Non-compliance Listing". Each equipment and facility not included in the Non-compliance Listing shall be deemed to be fully compliant.

4.2.4 Every User, in consultation with the Distribution Licensee, shall prepare "Compliance Plans" for the upgrade of their respective affected off-taker facilities, and the Distribution Licensee shall prepare "Compliance Plans" for the upgrade of each affected distribution network node or distribution network facility to make them fully compliant within a reasonable period and, in any case, not exceeding the transition period allowed.

4.2.5 The Distribution Licensee shall present all such Compliance Plans to LERC for acceptance and approval within a period of **nine months** after the coming into force of the Distribution Code and thereupon confirm to the respective User their obligations and accepted timeframe to remedy the identified non-compliance and/or deficiencies.

4.2.6 The non-compliance and/or deficiencies identified for each listed asset or node shall for all other purposes of the Distribution Code be deemed to be compliant during the transition period.

4.2.7 During such part of the transitional period as has been accepted by LERC for implementation of remedial action on that non-compliant asset or node, no User may be disconnected or denied service based on that deficiency or non-compliance which has been identified and included in the "Non-compliance Listing".

4.3 Service Performance Standard During Transition Period

Prior to the completion of the upgrade of any distribution network node or facility that was declared to be non-compliant; the performance benchmarks for only those services affected by the recorded deficiency shall not be applicable.

4.4 Management Systems

4.4.1 The application of the procedures prescribed in this Distribution Code for supply may be deferred with the consent of LERC until the associated commercial arrangements and corresponding energy accounting, billing and settlement instruments are finalized.

4.4.2 Enforcement of the procedures for maintenance and outage planning may be deferred by up to nine months with the consent of LERC to enable the Users and the Distribution Licensee complete administrative arrangements for introduction of the procedures.

4.5 Capacity Building (Human Resource Development)

The Distribution Licensee shall employ, train, suitably equip and maintain an adequate workforce that is qualified and competent in distribution planning, maintenance scheduling and performance monitoring as well as commissioning and testing of distribution network components to enable it to perform its functions.

4.6 Existing Contracts

4.6.1 Each contract in respect of distribution services consummated by the Distribution Licensee and existing at the commencement of this Distribution Code shall continue in force unless the contract is revoked or amended by agreement.

4.6.2 The Distribution Licensee shall have responsibility for distribution services required under an existing contract when the Distribution Code comes into effect.

4.6.3 LERC shall determine the charges payable to the Distribution Licensee for the distribution services rendered by the Distribution Licensee.

4.6.4 The Distribution Code shall apply to all such existing contracts in so far as the Distribution Code does not impair the obligations arising from the existing contract.

4.6.5 The Distribution Licensee shall endeavor to negotiate for new or amended contracts which shall conform to all the provisions of the Distribution Code within **one year** from effective date of coming into force of this Distribution Code.

4.6.6 The Distribution Licensee shall not enter a new contract or extend any existing contract that is not in accordance with the Distribution Code.

SECTION 5: MANAGEMENT AND GOVERNANCE OF DISTRIBUTION CODE

5.1 Purpose and Scope

This section defines the arrangements for the management and governance of the provision of distribution network services and for the implementation of the Distribution Code.

5.2 Conduct of Distribution Licensee

5.2.1 The Distribution Licensee shall responsibly conduct the management of its distribution network in accordance with the Distribution Code and always guided by prudent utility practices.

5.2.2 The Distribution Licensee shall always be guided by the fundamental principles of fairness, transparency, non-discrimination and open access in the governance and management of its distribution network.

5.2.3 A report of the activities of the Distribution Licensee shall be made available for review by an interested User. Any cost thereof in respect of the interested User request shall be borne by the interested user.

5.2.4 The Distribution Licensee shall be accountable to LERC for the performance of its distribution network and shall endeavor to be compliant with the Distribution Code.

5.2.5 A User shall, where applicable, have a valid Connection Agreement with the Distribution Licensee.

5.3 Role of LERC

5.3.1 LERC shall regulate all technical operations, activities, and transactions of the Users on the distribution network and control with rules the performance of all the functions of the Distribution Licensee and other Users towards ensuring the fulfilment of their roles as required under the Distribution Code. The LERC shall ensure full compliance of the Distribution Licensee and all Users with the Distribution Code.

5.3.2 LERC shall have the mandate to review and assess on a regular basis the following:

(a) proposals for the revision of the Distribution Code, procedures, practices, rules, or regulations covering the distribution network;

(b) distribution network development strategies and plans;

(c) data archiving systems of Users and the Distribution Licensees;

(d) any distribution network related complaints; and

(e) established procedures for the resolution of disputes among Users:

5.4 Distribution Code Technical Committee

5.4.1 There is hereby established the Distribution Code Technical Committee (DCTC) to assist in the discharge of its regulatory responsibility with respect to the implementation of the Distribution Code.

5.4.2 The DCTC shall comprise the following persons knowledgeable in the electricity supply industry:

(a) A representative each of the following:

(i) operators engaged in the distribution of electricity with network connected to the main Liberia Grid;

(iii) generators/suppliers connected through the Liberia interconnected transmission system to the distribution network;

(ii) operators of cross-border distribution networks;

(iv) the transmission Licensee;

(v) embedded generators connected directly to the distribution network;

(vi) the LERC

(vii) the Ministry of Mines and Energy;

(viii) the Electrical Engineering Academia;

(ix) the Engineering Society of Liberia; and

(x) RREA and

(b) two representatives of consumers

5.4.3 LERC shall appoint the members of the committee upon their nomination by the relevant entity or institution where applicable.

5.4.4 A member of the DCTC, except a representative from the LERC shall hold office for a three-year term subject to re-nomination and re-appointment.

5.4.5 Any changes of representation by entity or institution shall be communicated in writing to LERC which shall confirm the appointment within thirty (30) days.

5.4.6 The LERC shall appoint a chairperson from amongst the members of DCTC.

5.4.7 The representative of the LERC shall be the Secretary to the DCTC and shall publish the latest list of members of the DCTC within 14 days of any change.

5.4.8 The LERC shall house the DCTC Secretariat and provide all administrative and secretarial personnel, logistics and support for the Committee's work and meetings.

5.4.9 All members shall have a designated backup replacement to serve on the DCTC in case of unforeseen circumstances. Such nominations shall be made in writing to the DCTC Secretariat and shall be approved by LERC. The constituency of

representatives may replace members at any given time, provided they give 14 days' written notice to the DCTC and the LERC.

5.4.10 The LERC may request the replacement of members by their constituency upon recommendation of the DCTC, if they have not attended three consecutive meetings.

5.5 Role and Functions of the DCTC

The DCTC shall serve as a forum for ensuring effective collaboration and harmony among the Users and other stakeholders in the implementation of the Distribution Code and shall perform the following functions:

(a) advise on the effective and consistent application of the rules and standards in the Distribution Code;

(b) issue guidance on the interpretation and implementation of the Distribution Code

(c) review and make recommendations to LERC regarding proposals for derogations in relation to compliance with the Distribution Code;

(d) assist the LERC in the dispute resolution process as provided under section 5.8;

(e) receive and review proposals for changes or amendments to the Distribution Code to achieve sector objectives and goals;

(f) recommend proposed changes and amendments to the Distribution Code arising from sub-section 5.5(c) to the LERC; and

(g) perform any other functions conferred on it by the Distribution Code.

5.6 Meetings of DCTC

5.6.1 The DCTC shall meet at least twice every year.

5.6.2 The Chairperson shall preside over all meetings of the DCTC and in the absence of the chairperson a member of the DCTC elected by the members present from among their number shall preside.

5.6.3 The chairperson shall at the request of not less than one third of the membership of the DCTC convene an extraordinary meeting of the DCTC at the place and time determined by the chairperson.

5.6.4 The quorum at a meeting of the DCTC is seven members or a greater number determined by the DCTC in respect of an important matter.

5.6.5 Matters before the DCTC for determination shall be decided by a simple majority of members present and voting and in the event of an equality of votes, the person presiding shall have a casting vote.

5.6.6 The Secretary shall be responsible for preparing and keeping accurate records of all meetings.

5.6.7 The DCTC shall prepare and submit for the review of the LERC every six months, the performance report of the aspects of distribution operations that came to its attention during the period and how the issues were resolved. The biannual performance report shall be submitted to the LERC within 14 days after the end of the period. Any other outstanding matters related to the distribution network operations may be considered by the DCTC provided these matters have been placed on the agenda.

5.6.8 At each meeting only matters on the approved agenda shall be discussed or considered and decisions shall be only made by the approval or rejection of the written resolutions that accompanied the agenda and were distributed prior to the meeting. Neither a written resolution that was not previously circulated with the agenda nor a verbal resolution shall be considered or passed as a decision of the meeting.

5.6.9 Unless otherwise stated, the agenda for each meeting shall include all items requested by a User or member to be on the agenda and in respect of which a written memorandum has been submitted by the concerned User.

5.6.10 The Secretary shall prepare the agenda for each meeting in consultation with the Chairperson and convene meetings on the dates and the times agreed with the Chairperson.

5.6.11 There shall be a written memorandum for each item on the agenda else the agenda item shall be struck-off by the Chairperson without further consideration of the matter.

5.6.12 The Chairperson of the DCTC shall submit to the LERC semi-annually, reports on the activities of the DCTC within six weeks after the end of the period.

5.7 Revision of Distribution Code

5.7.1 Proposals for the revision of any provision of the Distribution Code may be made by any User, the “Proposer”.

5.7.2 All proposals for Distribution Code revisions shall be in writing and shall be sent to LERC with a copy to the Distribution Licensees.

5.7.3 The LERC shall receive, register, and acknowledge all submissions.

5.7.4 The LERC shall notify Users, the DCTC, and Distribution Licensees of all such proposals and make copies accessible to them either over the internet or through other appropriate means.

5.7.5 All relevant Users and Distribution Licensees shall within three months of their receipt of a revision proposal, provide the DCTC, LERC and the “Proposer” with their views.

5.7.6 The DCTC shall consider each revision proposal at the next regular meeting and make recommendations which shall be forwarded to the LERC.

5.7.7 The LERC shall consider the submissions of the “Proposer”, the Distribution Licensee and the recommendations of the DCTC and advise all the parties of its decision with full and written justifications.

5.8 Complaints and Disputes

5.8.1 Any User may lodge a complaint in writing with the DCTC Secretariat where it believes that the rules, regulations, or procedures of the Distribution Code are not operating fairly.

5.8.2 A User may also lodge a complaint where it believes that the Distribution Licensee or another User is not acting in accordance with the Distribution Code.

5.8.3 The DCTC Secretariat shall receive, register, and acknowledge all complaints.

5.8.4 The DCTC Secretariat shall promptly notify the relevant parties to the complaint and the Distribution Licensee of the receipt of such a complaint and make copies of the complaint accessible to them either over the internet or through other appropriate means.

5.8.5 All affected parties shall, within 14 days of their receipt of a complaint, provide the complainant, the Distribution Licensee and the DCTC with their views, comments, and responses to the complaint.

5.8.6 The DCTC shall meet and consider each complaint at a meeting in accordance with its procedures for dispute resolution and make recommendations to the parties for the resolution of the complaint or dispute.

5.8.7 The normal operations of a User should never be disrupted by any situation of dispute. The majority decision of the meeting of affected Users or the considered determination of the Distribution Licensee shall be implemented unless and until the DCTC meets and issues a different ruling.

5.8.8 If an aggrieved User is not satisfied with the ruling of the DCTC the matter shall be referred to the LERC whose decision is final.

5.9 Distribution Code Violations and Sanctions

If a User or Distribution Licensee is in breach of any provisions of the Distribution Code, the LERC shall impose administrative and financial penalties as provided in the applicable laws, Regulations, and provisions of the License.

PART B: CONDITIONS OF DISTRIBUTION & SALE LICENCE

Introduction:

This Part of the Code defines the Conditions of the Distribution and Sale License. It contains the sub-codes that deal with planning requirements, connection arrangements, rights and the requirements for transparency and nondiscrimination.

SECTION 6: TRANSPARENCY & NON-DISCRIMINATION REQUIREMENTS

6.1 Publication of Procedures

6.1.1 The Distribution Licensee shall develop, publish, and provide in hard copies of detailed requirements, qualifications, and administrative procedures to be fulfilled or followed to those seeking services provided by the Distribution Licensee.

6.1.2 The requirements shall include all technical standards of the distribution licensee or existing national standards for connection equipment, communication, operating parameters, and performance benchmarks for service provision.

6.1.3 The qualifications shall include all legal, financial, environmental, and technical qualifications to be fulfilled.

6.1.4 The administrative procedures shall include all administrative, financial, technical and any other procedures to be followed prior to the commissioning of the connection as well as the obligations of the Users for the continued provision of the service.

6.1.5 The LERC shall publish the Distribution Code on its website and make readily available to the public copies of the distribution code and all other related publications upon the payment of applicable fees.

6.2 Equal Application of the Distribution Code

The Distribution Code shall be fairly and uniformly applied to all classes within a category of Users. All conditions and situations that are similar shall also receive consistent and equitable treatment.

6.3 Exercise of Discretion by the Distribution Licensee and other Officials

6.3.1 The Distribution Licensee or any other person shall not make a decision that is inconsistent with the Distribution Code in respect of the usage or provision of services from the distribution network.

6.3.2 The Distribution Licensee may use its discretion and good judgment in making decisions on any matter on which this Distribution Code does not contain complete or adequate stipulations.

6.3.3 The exercise of a discretionary power shall however be justified in writing to the LERC and the affected party while such decision is taken.

6.3.4 The principles and rationale for any discretion exercised or decision taken by the Distribution Licensee shall be published and made available to any person upon request.

6.3.5 A person aggrieved by a discretionary decision taken by the Distribution Licensee may request for a review by the LERC, as necessary.

6.3.6 The LERC shall consider the complaint and uphold or recommend a reconsideration of the decision.

6.4 Charges for Distribution Network Services

Charges for the use of the distribution network or the services of the Distribution Licensee shall not exceed those approved by the LERC and published in the Gazette or national dailies.

SECTION 7: PLANNING REQUIREMENTS [Planning Sub-Code]

7.1 Distribution Planning Responsibility

A Distribution Licensee shall be responsible for Distribution Planning, including:

(a) Forecasting of the future load or demand for its licensed distribution area over a 5-year planning period as stated in sub-section 7.4.1

(b) Analyzing the impact of the connection of new facilities such as loads, distribution lines, or substations and generation including embedded generation connected to the Distribution system;

(c) Planning the expansion of the Distribution System to ensure its adequacy to meet forecast demand and the connection of new loads and generation; and

(d) Identifying and correcting problems on Quality of Supply, Power Quality and System Losses in the Distribution System.

7.2 Request for Information

7.2.1 A customer, embedded generator, or retailer (User) must, on request from a Distribution Licensee, provide details of loads connected or planned to be connected to the distribution system which are required by the Distribution Licensee for the purpose of planning its distribution system. The information details shall include the following as may be applicable:

(a) customer information

(b) system performance statistics including quality and reliability of supply;

(c) the location of load in the distribution system;

(d) existing loads;

(e) existing load profile;

(f) changes in load scheduling;

(g) planned outages;

(h) forecasts of load growth;

(i) anticipated new loads;

(j) distribution network expansion master plans; and

(k) anticipated redundant loads.

7.2.2 A Distribution Licensee must on request from another Distribution Licensee provide such information concerning a point of common coupling as the other Distribution Licensee may reasonably require for the purpose of the integrated planning of the system.

7.3 Distribution Planning Data

7.3.1 The Standard Planning Data and Detailed Planning Data as stipulated in Technical Schedules TS-S and TS-T of the Distribution Code respectively shall be submitted by the Users to the Distribution Licensee. The Distribution Licensee shall consolidate and maintain the Distribution planning data according to the following categories:

(a) Forecast Data;

(b) Estimated Equipment data; and

(c) Registered Equipment Data.

7.3.2 The Forecast Data shall contain the User's best estimate of the data, including Energy and Power, being projected for the 5-year planning period.

7.3.3 The Estimated Equipment Data shall contain the User's best estimate of the values of parameters and information pertaining to its Equipment.

7.3.4 The Registered Equipment Data shall contain validated actual values of parameters and information about the User's Equipment, usually required at the time of connection.

7.3.5 If there is any change to its planning data during the planning period, the User shall notify the Distribution Licensee of the change as soon as practicable. The notification shall contain the time and date when the change took effect or is expected to take effect. If the change is temporary, the time and date when the data is expected to revert to its previous registered value shall also be indicated in the notification.

7.3.6 The User shall give [48 hours] notice to the Distribution Licensee if the Connection is no longer required.

7.4 Distribution Network Planning Report

7.4.1 A Distribution Licensee must submit to LERC an annual report called the "Distribution Network Planning Report" detailing how it plans over the next following 5 calendar years to:

(a) meet predicted energy and demand for electricity supplied through its distribution lines, zone substations and high voltage lines;

(b) improve quality and reliability of supply to its customers; and

(c) implement any security of supply upgrade plan; and

(d) expand or extend the network to new areas to connect new customers.

7.4.2 In fulfilling the requirements of sub-section 7.4.1(a), the report must include the following information:

(a) the historical and forecast demand from, and capacity of, each zone substation;

(b) an assessment of the magnitude, probability, and impact of loss of load for each sub transmission line and zone substation;

(c) the Distribution Licensee's planning standards including distribution feeder routing and sizing;

(d) a description of feasible options for meeting forecast demand including opportunities for embedded generation, demand management and reactive power compensation plans;

(e) where a preferred option for meeting forecast demand has been identified, a reasonably detailed description of that option, including estimated costs;

(f) the availability of possible contributions from embedded generation or customers adoption of demand-side management practices to reduce forecast demand and defer or avoid augmentation of the Distribution Licensee's distribution network. (targeted at possible reductions in the forecast levels so that distribution system reinforcement investments can be delayed or avoided);

7.4.3 In fulfilling the requirements of sub-section 7.4.1(b), the report must include the following information:

(a) a description of the nature, timing, cost, and expected impact on performance of the Distribution Licensee's reliability improvement programs;

(b) an evaluation of the reliability improvement programs undertaken in the preceding year; and

(c) Distribution Licensee's network reinforcement and loss reduction plans.

7.4.4 In fulfilling the requirements of sub-section 7.4.1(c) (if applicable), the report must include the following information:

(a) an outline of the capital and other works carried out in the preceding year in implementing the security of supply upgrade plan;

(b) an evaluation of whether the relevant security of supply objectives specified in the security of supply upgrade plan have been achieved in the preceding year; and

(c) an outline of the capital and other works connected with the security of supply objectives proposed to be carried out in the following **five** years.

7.4.5 In fulfilling the requirements of sub-section 7.4.1(d), the report must include the following information:

(a) an outline of the capital and other works carried out in the preceding year in implementing the expansion of the network to cover new areas and connect new customers;

(b) an evaluation of how the expansion plan is consistent with national energy policy set forth by the Ministry of Energy;

(c) an outline of the capital and other works connected with expansion or extension of the distribution network objectives are proposed to be carried out in the following **five** years; and

(d) a summary of the technical and economic analysis performed to justify the [5-year] Distribution Plan.

7.5 System Studies requirement

7.5.1 As part of the planning process of the Distribution Licensee the following System studies must be carried out by the Distribution Licensee to support the development of the [5- Year] Distribution Plan:

(a) **Voltage Drop Studies:** to determine that the expected voltages at the User's Connection Points comply with the requirements stated on the Technical Requirements section and in the Performance Standards Code;

(b) **Short Circuit Studies:** identify the Equipment that could be damaged when current exceeds the design limit of the Equipment. The studies shall also identify the Circuit Breakers and fuses, which may fail when interrupting possible short circuit currents;

(c) **Three-phase short-circuit studies:** to identify the most severe conditions that the Distribution System Equipment may be exposed to, and to determine possible constraints in fulfilling the Power Quality standards set out in the Performance Standards Code;

(d) **System Losses Studies:** to identify, classify, and quantify the losses in the Distribution System, and to propose measures to gradually reduce them if technically and economically feasible;

(e) **Distribution Reliability Studies:** to determine the frequency and duration of User Interruptions in the Distribution System, to assure the requirements stated in the Performance Standards Code are met.

7.5.2 The 5-year Distribution Plan shall be submitted to LERC for approval and constitute the basis for LERC to monitor and audit its effective implementation. The report shall be updated annually taking into consideration developments in the previous year and current year and an outlook for the next 3 years.

7.5.3 Each Distribution Licensee must publish the Distribution Network Planning Report on its website and, on request by a customer, provide the customer with a copy. The Distribution Licensee may impose a charge (determined by reference to its approved statement of charges) for providing a customer with a copy of the report.

7.6 Consolidated Distribution Planning Report

7.6.1 The LERC, following the submission of the Distribution Network Planning Reports from all Distribution Licensees, shall prepare a Consolidated Distribution Planning Report detailing how together all the Licensees plan to meet predicted demand for electricity

supplied into their distribution networks from the Bulk Supply Points (BSP) in accordance with the time frame as specified in sub-section 7.5.2 .

7.6.2 The report must include the following information:

(a) the historical and forecast demand from, and capacity of, each Bulk Supply Point (BSP);

(b) an assessment of the magnitude, probability, and impact of loss of load for each BSP;

(c) each Distribution Licensee's planning standards;

(d) a description of feasible options for meeting forecast demand at each BSP including opportunities for embedded generation and demand management and information on land acquisition where the possible options are constrained by land access or use issues;

(e) the availability of any contribution from each Distribution Licensee including where feasible, an estimate of its size, which is available to embedded generators or customers to reduce forecast demand and defer or avoid augmentation of a BSP; and

(f) where a preferred option for meeting forecast demand has been identified, a description of that option, including its estimated cost, to a reasonable level detail.

(g) a detailed summary of planned activities and works intended to extend the network and expand the availability of services to other areas of the country including a proposed schedule for accomplishing stated objectives and capital investment requirements.

7.6.3 The LERC shall publish the Consolidated Distribution Network Planning Report on its website and made accessible to all Users. The LERC may impose a charge covering production cost for providing a requesting customer with a published hardcopy of the report.

7.7 Upgrade and Relocation of Plants

7.7.1 **Upgrade:** For the purpose of improving systems operating characteristics and mitigating system capacity constraints, a Distribution Licensee must continuously plan and develop its distribution network. The following considerations are key in the upgrade process for meeting forecast load growth:

(a) Good utility practice;
(b) Improvement of the system to either meet or maintain required performance-based indices;
(c) Current levels of customer service and reliability and potential improvement from the Upgrade; and
(d) Costs to customers associated with current levels of distribution reliability and potential improvement from the enhancement.

7.7.2 **Relocation of Plant:** When requested to relocate a distribution plant, a Distribution Licensee shall exercise its rights and discharge its obligations in accordance with existing legislation, regulations, formal agreements, easements, and common law. In the absence of existing agreements, a Distribution Licensee is not obligated to relocate the plant. However, the Distribution Licensee shall resolve the issue in a fair and reasonable manner. Resolution in fair and reasonable manner shall include a response to the requesting party that explains the feasibility or infeasibility of the relocation and a fair and reasonable charge for relocation based on cost recovery principles.

SECTION 8: CONNECTION AGREEMENT REQUIREMENTS *[CONNECTION SUB-CODE]*

8.1 Connection Policy

A Distribution Licensee shall establish a connection policy as specified in its Conditions of Service and in compliance with its obligations under this Code, the LERC's Customer Service and Quality of Supply Regulations, other Regulations and License or Permit.

8.2 Customer Connection Arrangement

8.2.1 The Distribution Licensee shall, upon request by a customer, provide, install, and maintain standard metering and necessary associated equipment, at a suitable location to be provided by the customer in the distribution licensee's designated area.

8.2.2 A customer seeking a new connection to the distribution system must apply in writing using the application form provided by the Distribution Licensee for the purpose.

8.2.3 The application form established by the Distribution Licensee for a new connection must at the minimum require the applicant seeking a new connection to the distribution system to provide information relating to the:

(a) type, capacity, voltage and requested date for the proposed connection;

(b) location of the proposed connection;

(c) test and commissioning results;

(d) safety coordination;

(e) electrical diagrams and connection point diagrams;

(f) any additional information the Distribution Licensee may require to adequately assess the application to connect.

8.2.4 A customer applying for connection to a medium or high voltage supply shall provide additional information on fluctuating loads, capacitor banks and reactors that could affect the performance of the distribution system including all other relevant information specified in Technical Schedules TS-S and TS-T of the Distribution Code.

8.2.5 On receipt of the application form and payment of the required charges for the connection the Distribution Licensee must comply with all other requirements relevant to the connection process specified in this code.

8.3 Requirement to Connect

Where a connection request has been made by a person or a retailer on behalf of a customer, a Distribution Licensee must use best endeavors to connect the customer at the new location address on the date agreed by following through the connection process specified in this code and the Customer Service and Quality of Supply Regulations.

8.4 No Energization

8.4.1 A Distribution Licensee must not energize a customer's location address unless:

(a) a request to do so is made by:

(i) a customer; or

(ii) a customer's retailer.

(b) there is a relevant emergency; or

(c) energization is otherwise expressly authorized or required by this Code or by law.

8.4.2 If a person contacts a Distribution Licensee to request energization and that person is not a customer of the Distribution Licensee but rather a customer of the retailer, the Distribution Licensee must advise the person that the request must be made by the person's retailer.

8.5 Connection Without Energization

Subject to sub-section 8.7.1, where a connection request has been made by a customer and the customer's supply address cannot be energized due to the operation of sub-section 8.4.1 a Distribution Licensee must use best endeavors to connect but not energize a new supply address on the date agreed with the customer. Where no date is agreed, the Distribution Licensee must perform its obligations within the period specified in Technical Schedule TS-G of this Code and in accordance with the LERC's Customer Service and Quality of Supply Regulations.

8.6 Previous Connection

Where a customer only requires energization and the customer provides acceptable identification and has settled all financial obligations to the Distribution Licensee or the customer's Retailer, a Distribution Licensee must use best endeavors to energize the customer's location address if such request has been made to the Distribution Licensee orally through the CRM System or in writing within the timeframe specified in Technical Schedule TS-G of this Code and in accordance with the LERC's Customer Service and Quality of Supply Regulations.

8.7 Conditions for Customer Connection

8.7.1 The Distribution Licensee's obligation to connect is subject to:

(a) an adequate supply of electricity being available at the required voltage at the boundary of the new supply address;

(b) an Installation Completion Certificate (ICC) being provided to the Distribution Licensee in respect of the customer's electrical installation at the customer's supply address;

(c) the customer complying with sub-section s 14.3.2 and 14.3.3;

(d) the customer complying with reasonable technical requirements required by the Distribution Licensee; and

(e) the customer providing acceptable identification.

8.7.2 Where a Distribution Licensee is not required to connect because of a situation stated under sub-section 8.7.1, the Distribution Licensee must comply with such obligation as soon as practicable after the removal or elimination of the reason for which connection or connection without energization was not made.

8.8 Retailer's Request as Customer's Agent

8.8.1 A retailer shall have the responsibility to apply to the Distribution Licensee for a new service connection to be made to a customer for which the retailer is an agent. In this instance, the retailer shall work with the customer to ensure that all electrical connections to be made to the Distribution Licensee's system meet the Distribution Licensee's requirements. The payment of all connection fees directly to the Distribution Licensee shall be the responsibility of the retailer.

8.8.2 In the instance where the customer previously received service directly from the Distribution Licensee and is now to obtain service through the retailer, the retailer shall liaise with the Distribution Licensee to arrange for the necessary disconnection and reconnection of service (equipment e.g., meters, etc.) to affect the provision of services to the customer through the retailer. The payment of all connection fees directly to the Distribution Licensee shall be the responsibility of the retailer.

8.8.3 If the Distribution Licensee informs the retailer that the Distribution Licensee is unable or unwilling to connect the retailer's customer, and the Distribution Licensee provides the reason(s) for not connecting the customer, the retailer shall take all steps to provide a remedy to resolve the issue as agent for the customer, or to assist the Distribution Licensee to provide a remedy to resolve the issue, or shall accept the Distribution Licensee's offer to connect as mentioned in sub-section 8.9.3.

8.9 Distribution Licensee's Refusal to Connect

8.9.1 Subject to section 8.1, a Distribution Licensee may consider the following reasons to refuse to connect, or disconnect a customer:

(a) contravention of the laws of Liberia including the Electrical Wiring Regulations;

(b) violation of conditions of a Distribution Licensee's license;

(c) materially adverse effect on the reliability or safety of the distribution network;

(d) imposition of unsafe worker situation beyond normal risks inherent in the operation of the distribution network;

(e) a material adverse effect on the quality of the distribution network;

(f) a materially adverse effect on the quality of distribution services received by an existing connection; and

(g) if the person requesting the connection owes the Distribution Licensee money for distribution services, or for non-payment of a security deposit, the Distribution Licensee shall give the person a reasonable opportunity to provide the security deposit.

8.9.2 A Distribution Licensee shall ensure that all electrical connections to its system meet the Distribution Licensee's design requirements, unless the electrical connections are separated by a protection device that has been approved by the Distribution Licensee. If an electrical connection does not meet the Distribution Licensee's design requirement and the provisions of the Electrical Wiring Regulations, a Distribution Licensee may refuse connection.

8.9.3 If a Distribution Licensee refuses to connect a customer, the Distribution Licensee shall inform the person requesting the connection of the reason(s) for not connecting and, where the Distribution Licensee is able to provide a remedy, make an offer to connect. If the Distribution Licensee is unable to provide a remedy to resolve the issue, it is the responsibility of the customer to do so before a connection may be made.

SECTION 9: CONNECTIONS FOR EMBEDDED GENERATION *[Connection Sub-code Cont'd]*

9.1 Generation Facility Connection Information Requirements

9.1.1 A Distribution Licensee shall promptly make available a generation connection information package to any person who requests for such package. The package shall contain the following information:

(a) the process for having a generation facility connected to the Distribution Licensee's distribution network, including any form necessary for applying to the Distribution Licensee;

(b) information regarding any approvals from LERC or EPA, that are required before the Distribution Licensee will connect a generation facility to its distribution network;

(c) the technical requirements for connection to the Distribution Licensee's distribution system including the metering requirements; and

(d) the standard contractual terms and conditions for connection to the Distribution Licensee's distribution network.

9.1.2 Subject to all applicable laws, a Distribution Licensee shall make all reasonable efforts to promptly connect to its distribution network the following class of embedded generation facilities depending on the prevailing conditions of the distribution network:

(a) Micro-embedded load displacement generation facility with capacity not exceeding 10 kW

(b) Small-sized embedded generation facility with capacity not exceeding 1 MW

(c) Medium-sized embedded generation facility with capacity between 1MW and 10MW

(d) Large-sized embedded generation facility with capacity exceeding 10MW

9.2 Micro-Embedded Load Displacement Generation Facility Connection Process

9.2.1 A Distribution Licensee shall require a person that applies for the connection of a micro-embedded load displacement generation facility to the Distribution Licensee's distribution network to provide, upon making the application, the following information:

(a) the nameplate rated capacity of each unit of the proposed generation facility and the total nameplate rated capacity of the proposed generation facility at the connection point;
(b) the fuel type of the proposed generation facility;
(c) the type of technology to be used; and
(d) the location of the proposed generation facility including address and account number with the Distribution Licensee where available.

9.2.2 Where the proposed micro-embedded load displacement generation facility is located at an existing customer connection, the Distribution Licensee shall within the period specified in the relevant section in Appendix E, make an offer to connect or provide reasons for refusing to connect the proposed generation facility. The Distribution Licensee shall not revoke the offer to connect until the period specified for the process in Appendix E has expired. The Distribution Licensee shall not charge for the preparation of the offer to connect.

9.2.3 The Distribution Licensee shall make any necessary metering changes and follow through the process to connect the applicant's micro-embedded load displacement generation facility to its distribution network within the period set out in Appendix E and the applicant paying the Distribution Licensee for the costs of any necessary metering changes.

9.3 Connection Process for Other Embedded Generation Facility

9.3.1 A Distribution Licensee shall require a person that applies for the connection of a small, medium, or large embedded generation facility to the Distribution Licensee's distribution network to provide, upon making the application, the following information:

(a) the nameplate rated capacity of each unit of the proposed generation facility and the total name plate rated capacity of the generation facility at the connection point;
(b) the fuel type of the proposed generation facility
(c) the type of technology to be used; and
(d) the location of the proposed generation facility including address and account number with the Distribution Licensee where available.

9.3.2 Where the person requests a preliminary meeting with the Distribution Licensee and provides the required information, the Distribution Licensee shall provide a time when it is available to meet with the person which shall be within the period specified relevant section in Appendix E.

9.3.3 At the preliminary meeting, the Distribution Licensee shall discuss the basic feasibility of the proposed connection including discussing the location of existing distribution facilities in relation to the proposed generation facility and providing an estimate of the time and costs necessary to complete the connection. The Distribution Licensee shall not charge for its preparation for and attendance at the meeting.

9.4 Requirement for Impact Assessment Study

9.4.1 A Distribution Licensee shall require a person who applies for the connection of a generation facility to the Distribution Licensee's distribution network to, upon making the application, pay for the cost of impact assessment study and provide the following additional information in addition to information set out in sub-section 9.3.1 (if not already provided) to the Distribution Licensee:

(a) a single line diagram of the proposed connection; and
(b) a preliminary design of the proposed interface protection.

9.4.2 The Distribution Licensee shall upon receipt of payment conduct the impact assessment and provide an applicant proposing to connect a generation facility to the distribution network with

(a) an impact assessment report on the proposed generation facility connection,

(b) a detailed cost estimate of the proposed connection and

(c) an offer to connect or otherwise

within the time periods specified in Appendix E for the various types embedded generation facilities.

9.4.3 The Distribution Licensee's impact assessment shall set out the impact of the proposed generation facility on the Distribution Licensee's distribution network and any customers of the Distribution Licensee including:

(a) any voltage impacts, impacts on current loading settings and impacts on fault currents;

(b) the connection feasibility

(c) the need for any line or equipment upgrades;

(d) the need for transmission system protection modifications; and

(e) any metering requirements.

9.4.4 Any material revisions to the design, planned equipment or plans for the proposed generation facility and connection arising from the impact assessment shall be filed with the Distribution Licensee and the Distribution Licensee shall conduct a new impact assessment within the relevant period set out in Appendix E.

9.4.5 Once the impact assessment report is provided to the applicant, the Distribution Licensee and the applicant shall enter into a Memorandum of Understanding (MOU) on the scope of the project and the Distribution Licensee shall provide the applicant with a detailed cost estimate and an offer to connect.

9.4.6 Where the proposed embedded generation facility is of the medium or a large size, the Distribution Licensee, in accordance with prudent utility practice, shall advise the Transmission Licensee or Distribution Licensee whose transmission or distribution network is directly connected to the Distribution Licensee's distribution network of the developments for their information and any necessary reaction.

9.4.7 Once the applicant has entered a connection MoU inclusive of the costs with the Distribution Licensee and has provided the Distribution Licensee with detailed engineering drawings with respect to the proposal, the Distribution Licensee shall conduct a design review to ensure that the detailed engineering plans are acceptable.

9.4.8 The Distribution Licensee shall have the right to witness the commissioning and testing of the connection of the generation facility to the Distribution Licensee's distribution network.

9.4.9 Once the applicant informs the Distribution Licensee that it has received all necessary approvals and provides the Distribution Licensee with a copy of the authorization to connect from the LERC and enters into the Connection Agreement, the Distribution Licensee shall act promptly to connect the generation facility to its distribution network.

9.4.10 Subject to any delays in commissioning and testing of the embedded generation facility which are beyond the control of the Distribution Licensee, a Distribution Licensee shall connect the proposed embedded generation facility within the time periods specified in Appendix E.

9.4.11 A Connection Agreement for a small, mid-sized or large embedded generation facility shall be in the standard form of a contract as set out in Appendix D for the specified size of embedded generation facility.

9.4.12 The recommended process for connecting a generation facility to a distribution network is set out in Appendix E.1 for information purposes only.

9.5 Agreement to Connect

9.5.1 A Distribution Licensee must ensure that its distribution network is able to receive a supply of electricity from an embedded generating unit connected to its distribution network, in accordance with an agreement with the embedded generator on the terms and conditions of dispatch, connection and disconnection.

9.5.2 If such an agreement is sought by an embedded generator, the Distribution Licensee and embedded generator must negotiate in good faith.

9.5.3 Despite sub-section 9.5.1, if two or more embedded generating units are connected in parallel, their obligations under sections 15.11 to 15.14 of this Code shall apply to the point of common coupling and the maximum permissible contribution of each embedded generating unit is to be determined in proportion to their capacity, unless otherwise agreed.

9.5.4 For the avoidance of doubt, a Distribution Licensee is not liable for any loss of income by an embedded generator for being unable to receive a supply of electricity from an embedded generating unit connected to its distribution network because of any supply interruption arising under section 16.9 of this Code.

SECTION 10: CONNECTIONS TO OTHER DISTRIBUTION NETWORKS *[Conn Sub-code Contd.]*

10.1 Connection of Distribution Licensee's Network to another Distribution Network

10.1.1 A Distribution Licensee shall not build any part of its distribution network in another Distribution Licensee's licensed service area except under the following conditions:

(a) the part of the distribution network that is to be located inside another licensee's service area is dedicated to the delivery of electricity to the Distribution Licensee who owns the distribution facilities; and

(b) there is no apparent opportunity for both Licensees to share the distribution facilities; and

(c) the Distribution Licensee in whose service area the distribution facilities are to be located determines that the presence of the distribution facilities in that location does not impinge on its distribution operations.

10.1.2 A Distribution Licensee shall make every reasonable effort to respond promptly to another Distribution Licensee's request for connection. A Distribution Licensee shall provide initial consultation with another Distribution Licensee regarding the connection process within 30 days of receiving written request for connection. A final offer to connect the Distribution Licensee to the host Distribution Licensee's network shall be made within 90 days of receiving a written request for connection, unless other necessary information outside the Distribution Licensee's control is required before the offer can be made.

10.1.3 A Distribution Licensee shall make a good faith effort to enter into a Connection Agreement with another Distribution Licensee that requests for a connection to the Distribution Licensee's network. The contents and format of the Connection Agreement shall be in the discretion of the Licensees that participate in the Connection Agreement but must conform to the requirements of this Code. Appendix F provides an example of the process that a Distribution Licensee shall follow in providing a connection to another Distribution Licensee.

10.1.4 The reliability of supply and the voltage level at the point(s) of connection between a host Distribution Licensee's network to an embedded Distribution Licensee's distribution network shall be as good as or better than what is provided to other customers of a host Distribution Licensee.

10.1.5 A Distribution Licensee shall not build any part of its distribution network in another Distribution Licensee's service area except under the following conditions:

(a) the part of the distribution network that is to be located inside another licensed service area is dedicated to the delivery of electricity to the Distribution Licensee who owns the distribution facilities;

(b) there is no apparent opportunity for both licensees to share the distribution facilities as provided under section 17.5 of this Code; and

(c) the Distribution Licensee in whose service area the distribution facilities are to be located determines that the presence of the facilities in that location does not impinge on its distribution operations.

10.1.6 A Distribution Licensee that owns equipment in another Distribution Licensee's service area shall allow the Distribution Licensee that has mandate to service the area access to the equipment:

(a) during an emergency;

(b) when the equipment may have caused a violation of a license condition of the Distribution Licensee who is licensed for the service area;

(c) upon a reasonable request by the Distribution Licensee who is licensed for the service area; or

(d) in accordance with any arrangement between the two licensees.

SECTION 11: CONNECTIONS REQUIRNG EXPANSION WORKS & CONNECTION BOUNDARIES OWNERSHIP *[Connection Sub-code Contd.]*

11.1 Economic Evaluation of Expansion Project Cost Estimates for New Connection

11.1.1 If a Distribution Licensee must construct new facilities to its main distribution network or increase the capacity of existing distribution network facilities to be able to connect a specific customer or group of customers, the Distribution Licensee shall perform an economic evaluation of the expansion project to determine if the future revenue from the customer(s) will pay for the capital cost and ongoing maintenance cost of the expansion project.

11.1.2 If an expansion of the Distribution Licensee's main distribution network is needed for the Distribution Licensee to connect a customer, the Distribution Licensee is required to make an offer to connect the customer. The Distribution Licensee's offer shall include the following:

(a) A description of the material and labor required by the Distribution Licensee to build the expansion required to connect the customer.

(b) An estimate of the amount that will be charged to the customer to construct the distribution network expansion necessary to make the connection.

(c) A description of the estimate of the connection charges that would apply to the offer in accordance with section 8.1.

(d) Indication as to whether the offer is a firm offer or is an estimate of the cost that would be revised in the final payment to reflect the actual costs incurred.

(e) An indication whether the offer includes work for which the customer can obtain alternative bid and, if so, the process by which the customer may obtain an alternative bid.

(f) A reference to the Conditions of Service and information on how the person requesting the connection may obtain a copy.

11.1.3 A Distribution Licensee will be responsible for the preliminary planning, design and engineering specifications of the work required for the distribution network expansion and connection. Specifications shall be made according to the Distribution Licensee's standards for design, material, and construction.

11.2 Determination of Connection Cost Estimates

11.2.1 In providing the estimates for the amount to be charged to the customer to construct the distribution network referenced in sub-section 11.1.1, a Distribution Licensee shall delineate estimated costs specifying those costs attributed to engineering design, materials, labor, equipment, and administrative activities.

11.2.2 The amount a Distribution Licensee may charge a customer other than a Generator or another Distribution Licensee to construct the expansion to the Distribution Licensee's distribution network shall not exceed that customer's share of the difference between the present value of the projected capital costs and ongoing maintenance costs for the

equipment and the present value of the projected revenue for distribution services provided by those facilities. The methodology and inputs that a Distribution Licensee shall use to calculate this amount is presented in Appendix B.

11.2.3 The amount a Distribution Licensee may charge a generator to construct the expansion to connect a generation facility to the Distribution Licensee's distribution network shall not exceed the generator's share of the present value of the projected capital costs and on-going maintenance costs for the equipment. Projected revenue and avoided costs from the generation facility shall be assumed to be zero, unless otherwise determined by the rates approved by LERC. The methodology and inputs that a Distribution Licensee shall use to calculate this amount is presented in Appendix B.

11.2.4 If a shortfall between the present value of the projected costs and revenues is calculated, the Distribution Licensee may propose to collect all or a portion of that amount from the customer, in accordance with the Distribution Licensee's documented policy on capital contributions by customer class.

11.3 Capital Contribution Estimation

11.3.1 Customers that were not part of the initial forecast but who connect to the distribution network during the customer connection horizon will benefit from the earlier expansion and should contribute their share. In such an event, the initial contributor shall then be entitled to a rebate from the Distribution Licensee as follows:

(a) For a period of up to the customer connection horizon as defined in Appendix B, the initial contributor shall be entitled to a rebate without interest, based on apportioned benefit for the remaining period.

(b) The apportioned benefit shall be determined by considering such factors as the relative load level and the relative line length *(in proportion to the line length being shared by both parties)*

11.3.2 If a Distribution Licensee's offer to connect is a firm offer, the Distribution Licensee shall provide one offer to the customer for any plans submitted to the Distribution Licensee for an expansion project, at no expense to the customer. If the customer submits revised plans, the Distribution Licensee may provide a new firm offer based on the revised plans at the customer's expense.

11.3.3 If a Distribution Licensee's offer is an estimate of the costs to connect the expansion and not a firm offer, the final amount charged to the customer shall be based on actual costs incurred, the methodology described in Appendix B and the capital contribution policy of the Distribution Licensee. The Distribution Licensee shall calculate the estimate and the final amount of customer contribution at no expense to the customer.

11.3.4 Sub-section 11.3.2 and the 2nd sentence of sub-section 11.3.3 do not apply to a customer who is or proposing to become an (embedded) generator unless the customer's proposed or existing generation facility is an emergency backup generation facility.

11.4 Alternative Bids

11.4.1 A Distribution Licensee shall inform the customer requesting a connection that the customer has the choice to obtain alternative bids for the connection and expansion facilities ("alternative bid") from qualified contractors if the offer meets the following conditions:

(a) the project requires a capital contribution from the customer; and

(b) construction works will not involve work with existing circuits.

11.4.2 If a customer is interested in obtaining an alternative bid, the Distribution Licensee shall, in a non-discriminatory, fair, and reasonable manner inform the customer:

(a) of the work that the customer may obtain through an alternative bid; or

(b) that the customer may choose among the contractors that have been pre-qualified by the Distribution Licensee to perform the work eligible for an alternative bid.

11.4.3 The Distribution Licensee shall develop and document fair and reasonable criteria and processes to pre-qualify contractors for construction work on electricity distribution projects. The Distribution Licensee shall maintain a list of contractors prequalified to perform such construction work. The criteria and processes shall not be discriminatory.

11.4.4 If a customer chooses to pursue an alternative bid and elects to obtain the services of an alternative contractor for an aspect of the expansion project, the Distribution Licensee shall:

(a) require that customer to select, hire and pay the contractor's costs for the eligible work for the alternative bid and to assume full responsibility for the construction of that aspect of the expansion project;

(b) require that customer to be responsible for administering the contract or to have the customer pay the Distribution Licensee to do this activity on a fee for service basis. (i.e., administering the contract includes acquisition of all required permissions, permits, and easements);

(c) reserve the right to inspect and approve all aspects of the constructed facility as part of a system commissioning activity, prior to connecting the constructed facilities to the existing distribution network, and be reimbursed on a fee for service basis; and

(d) agree with the customer the amount to be capitalized by the Distribution Licensee.

11.4.5 The Distribution Licensee may charge a customer that chooses to pursue an alternative bid any costs incurred by the Distribution Licensee associated with the expansion project including but not limited to the following:

(a) costs for additional design, engineering, or installation of facilities required to complete the project over and above the original offer to connect; and

(b) costs for inspection or approval of the work performed by the contractor hired by the customer.

11.4.6 The details of customer contributions shall be entered into a separate Customer Contribution Register which shall be submitted to LERC together with the annual report by March 30 each year.

11.5 Ownership Boundaries at Connection Point

11.5.1 The point or points at which supply is given or taken between the Distribution System and a User shall be agreed between the Distribution Licensee and the other party as required. For MV connections, including connections between the Distribution Licensee and a User and, where necessary, busbar-connected supplies at LV, the Connection Points will be subject to specific agreement between the parties in each case.

11.5.2 The respective ownership of Plant or Equipment shall be recorded in the Connection Agreement. In the absence of specific provision in the contrary, construction, commissioning, control, operation, and maintenance responsibilities shall follow ownership.

11.5.3 For supplies to Generators Connected to Distribution that operate in parallel with the Distribution System and all supplies at MV the Distribution Licensee will prepare, with the User's agreement, a Site Responsibility Schedule and Operation Diagrams showing the agreed Ownership Boundary, which will be included in the Connection Agreement.

11.5.4 The Site Responsibility Schedule shall detail the demarcation of responsibility for safety of persons carrying out work or testing at sites having a Connection Point to the Distribution System or circuits which cross an Ownership Boundary at any point.

11.5.5 Changes in the boundary arrangements proposed by either party must be agreed in advance and will be recorded on the Connection Agreement.

PART C: RULES OF PRACTICE

Introduction:

This Part of the Code emphasizes the Rules of Practice, detailing the arrangements for system operations, scheduling, and safety. It also covers issues relating to liabilities, force majeure situations, distribution licensee’s condition of service and assets management requirements.

SECTION 12: GENERAL PROVISIONS

12.1 Liability

12.1.1 A Distribution Licensee shall only be liable to a customer and a customer shall only be liable to a Distribution Licensee for any damages which arise directly out of the willful misconduct or negligence:

(a) of the Distribution Licensee in providing distribution services to the customer;

(b) of the customer in being connected to the Distribution Licensee's network; or

(c) of the Distribution Licensee or Customer in meeting their respective obligations under this Code, their licenses, permits or authorizations and any other applicable law.

12.1.2 The Distribution Licensee shall educate its customers on the use of appropriate equipment to control loss or damage, which may result from poor quality or reliability of electricity supply within its distribution network.

12.1.3 A customer shall be liable to the Distribution Licensee for any loss or damage resulting from the use of electricity in a manner that will make the Distribution Licensee's system unsafe.

12.2 Force Majeure

12.2.1 Neither party shall be held to have committed an event of default in respect of any obligation under this Code if prevented from performing that obligation, in whole or in part, because of a force majeure event.

12.2.2 The Distribution Code contains procedures for the management of day-to-day technical situations on the distribution networks, considering a wide range of operational conditions likely to be encountered under both normal and abnormal conditions.

12.2.3 The Distribution Code cannot foresee all the possible operating conditions on the Distribution Networks. Users must therefore understand and accept that Distribution Licensees may be required, in such unforeseen circumstances, to act decisively to discharge their obligations under their License condition(s), within the following general principles and priorities:

(a) firstly, to preserve or restore the integrity of the distribution system or the transmission system, including the avoidance of breakdown, separation or system collapse (total or partial);

(b) compliance by the Distribution Licensee with the Law, conditions in its Distribution License or Concession, as applicable, and the LEGC;

(c) preserving the safety of equipment, to prevent damage to plant and/or equipment, and public safety to prevent personal injury; and

(d) the achievement of objectives specifically identified in the Distribution Code.

12.2.4 Users shall, as may be required under sub-section 12.2.3, provide such reasonable cooperation with and assistance to the Distribution Licensee.

12.2.5 If circumstances not envisaged by the provisions of the Distribution Code should arise, the Distribution Licensee shall, to the extent reasonably practicable in the circumstances, consult promptly and in good faith with the DCTC or all affected Users to reach agreement as to what should be done.

12.2.6 If agreement between the Distribution Licensee and the DCTC or affected Users cannot be reached in the time available, the Distribution Licensee shall determine what shall be done in accordance with the Distribution Code.

12.2.7 The Distribution Licensee shall promptly refer any unforeseen circumstance identified, together with the determinations and interpretations made, to the DCTC for their consideration.

12.2.8 Each User shall comply with all instructions given to it by the Distribution Licensee following a determination for an unforeseen circumstance or a difference in interpretation, provided that such instructions are consistent with the technical characteristics of the User's System and the principles established in the Distribution Code, and do not endanger the safety of its equipment or personnel.

12.2.9 Users should note that the provisions of the Distribution Code may be suspended in whole or in part during a Security Period, or in accordance with an emergency declaration as may be initiated by the LERC or other competent GoL Authority.

SECTION 13: CONDITIONS OF SERVICE

13.1 Establishment

13.1.1 Each Distribution Licensee shall have a Conditions of Service which must be consistent with the provisions of this Code and all other applicable Codes, regulations, and legislation.

13.1.2 The Conditions of Service shall describe the operating practices and the connection policies of the Distribution Licensee. Subject to this Code and other applicable laws, a Distribution Licensee shall comply with its Conditions of Service but may waive a provision of its Conditions of Service in favor of a customer or a potential customer with the approval of the LERC.

13.1.3 A Distribution Licensee shall

(a) file a copy of its Conditions of Service with the LERC;

(b) publish its Conditions of Service on its application form and website; and

(c) make copies of its Conditions of Service available to customers upon request.

13.1.4 A Distribution Licensee's existing Conditions of Service shall meet the standards set out in this Code for a period of one year following the coming into force of this Code after which date the Distribution Licensee must fully comply.

13.1.5 A Distribution Licensee's Conditions of Service may be subject to review by LERC as part of the Distribution Licensee's performance-based rates plan.

13.1.6 A Distribution Licensee's Conditions of Service shall include, at minimum, a description of the following:

(a) the types of connection service performed by the Distribution Licensee for each customer class, and the conditions under which these connections will be performed;

(b) the Distribution Licensee's basic connection service that is recovered through its revenue requirements and does not require a variable connection charge;

(c) the Distribution Licensee's capital contribution policy by customer class for an offer to connect, including procedures for collection of capital contributions;

(d) the demarcation point at which the Distribution Licensee's ownership of distribution equipment ends at the customer;

(e) the billing cycle period and payment requirements by customer class;

(f) design requirements for connection to the distribution network;

(g) voltages at which the Distribution Licensee provides electricity and corresponding load thresholds;

(h) type of meters provided by the Distribution Licensee;

(i) meters required by customer class;

(j) Quality of Service standards to which the distribution network is designed and operated;

(k) conditions under which supply may be unreliable or intermittent;

(l) conditions under which service may be interrupted;

(m) conditions under which the Distribution Licensee may disconnect a consumer;

(n) policies for planned interruptions;

(o) the business process the Distribution Licensee uses to disconnect and reconnect consumers, including means of notification and timing;

(p) the Distribution Licensee's rights and obligations with respect to a customer;

(q) rights and obligations a consumer or embedded generator has with respect to the Distribution Licensee;

(r) the Distribution Licensee's limitations in accordance with this Code;

(s) the Distribution Licensee's dispute resolution procedure; and

(t) terms and conditions under which the Distribution Licensee provides other services in its capacity as a Distribution Licensee.

13.2 Security Deposit

13.2.1 A Distribution Licensee's Conditions of Service shall include the Licensee's security deposit policy which shall be consistent with the provisions of this Code. A Distribution Licensee's security policy shall, include at a minimum, the following

(a) a list of all potential types or forms of security accepted;

(b) a detailed description of how the amount of security is calculated;

(c) limits on amount of security required;

(d) the planned frequency, process, and timing for updating security;

(e) criteria customers must meet to have security deposit waived and/or returned; and

(f) methods of enforcement where a security deposit is not paid.

13.2.2 In managing customer non-payment risk, a Distribution Licensee shall not discriminate among customers with similar risk profiles or risk related factors except where expressly permitted under this Code.

13.2.3 If a Distribution Licensee's Conditions of Service are documented in a form or in an order different from that specified in the generic Conditions of Service attached to this Code as Appendix A, the Distribution Licensee shall provide a mapping of terms in its Conditions of Service to the various sections as presented in Appendix A.

13.2.4 A Distribution Licensee shall provide advance public notice of any changes to its Conditions of Service. Notice shall be, at a minimum, provided to each customer by means of a note on and/or included with the customer's bill or payment receipt (esp. for prepayment customers). The public notice shall include a proposed timeline for implementation of the new Conditions of Service and means by which public comment may be provided. A Distribution Licensee shall provide the LERC with a copy of the new Conditions of Service once they are implemented. The copy of the revised document shall include a cover letter that outlines the changes from the prior document, as well as a summary of any public comments on the changes.

13.2.5 A Distribution Licensee may require a security deposit from a customer who is not billed by a competitive retailer under retailer-consolidated billing unless the customer has a good payment history over the last 12 months. The time or period that makes up the good payment history must be the most recent period. A Distribution Licensee shall provide a customer with the specific reasons for requiring a security deposit from the customer.

13.2.6 For the purposes of sub-section 13.2.5, a customer is deemed to have a good payment history unless, during the last 12 months:

(a) the customer has received more than one disconnection notice from the Distribution Licensee;

(b) the customer has more than one cheque given to the Distribution Licensee by the customer has been returned for insufficient funds; or

(c) the customer has more than one pre-authorized payment to the Distribution Licensee which has been returned for insufficient funds; or

(d) a disconnect-collect trip has occurred more than once in respect of the customers service connection.

If any of the preceding events occur due to an error by the Distribution Licensee, the customer's good payment history shall not be affected.

13.2.7 Despite sub-section 13.2.5, a Distribution Licensee shall not require a security deposit where:

(a) a customer provides a letter from another Distribution Licensee or water Distribution Licensee in Liberia confirming a good payment history with that Distribution Licensee as set out in sub-section 13.2.5; or

(b) a customer, other than a Large customer, provides a satisfactory credit check made at the customer's expense.

13.2.8 The maximum amount of a security deposit which a Distribution Licensee may require a customer to pay shall be calculated in the following manner:

(a) Billing cycle factor multiplied by estimated bill based on the customer's average monthly load with the Distribution Licensee during the most recent 12 consecutive months within the past two years.
(b) Where relevant usage information is not available for the customer for 12 consecutive months within the past two years or where the Distribution

Licensee does not have systems capable of making the above calculation, the customer's average monthly load shall be based on a reasonable estimate made by the Distribution Licensee.

13.2.9 For purposes of sub-section 13.2.8, the billing cycle factor is

(a) 2.50 if the customer is billed monthly,

(b) 1.75 if the customer is billed bi-monthly and

(c) 1.50 if the customer is billed quarterly.

13.2.10 Where a customer has a payment history which discloses more than one disconnection notice in a relevant 12-month period, the Distribution Licensee may use that customer's highest actual or estimated monthly load for the most recent 12 consecutive months within the past two years for the purposes of making the calculation of the maximum amount of security deposit under sub-section 13.2.8.

13.2.11 Subject to sub-section 13.2.2, a Distribution Licensee may in its discretion reduce the amount of a security deposit, which it requires a customer to pay for any reason including where the customer pays under an interim payment arrangement and where the customer makes pre-authorized payments.

13.2.12 The form of payment security deposit for a residential customer shall be cash or cheque at the discretion of the customer or such other form as is acceptable to the Distribution Licensee.

13.2.13 The form of payment of a security deposit for a non-residential customer shall be cash, cheque or an automatically renewing, irrevocable letter of credit from a bank acceptable to the Licensee. The Distribution Licensee may also accept other forms of security such as surety bonds and third-party guarantees.

13.2.14 Interest shall accrue monthly on security deposits made by way of cash or cheque commencing on receipt of the total deposit required by the Distribution Licensee. The interest shall be 50% of the policy rate as published by the Central Bank of Liberia. The interest accrued shall be paid out at least once every 12 months or on the return or application of the security deposit or closure of the account, whichever comes first, and may be paid by crediting the account of the customer or otherwise.

13.2.15 A Distribution Licensee shall review every customer's security deposit at least once every calendar year to determine whether the entire amount of the security deposit is to be returned to the customer as the customer is now in a position that it would be exempt from paying a security deposit under sub-section 13.2.5 or sub-section 13.2.7 had it not already paid a security deposit or whether the amount of the security deposit is to be adjusted based on a re-calculation of the maximum amount of the security deposit under sub-section 13.2.8.

13.2.16 A customer may, no earlier than 6 months after the payment of a security deposit or the making of a prior demand for review, demand in writing that a Distribution Licensee undertake a review to determine whether the entire amount of the security deposit is to be returned to the customer as the customer is now in a position that it would be exempt from paying a security deposit under sub-section 13.2.5 or sub-section 13.2.7

had it not already paid a security deposit or whether the amount of the security deposit is to be adjusted based on a re-calculation of the maximum amount of the security deposit under sub-section 13.2.8 or sub-section 13.2.11.

13.2.17 Where the Distribution Licensee determines in conducting a review under sub-section 13.2.15 or sub-section 13.2.16 that some or all the security deposit is to be returned to the customer, the Distribution Licensee shall promptly return the amount to the customer by crediting the customer's account or otherwise.

13.2.18 A Distribution Licensee shall promptly return any security deposit received from the customer upon closure of the customer's account, subject to the Distribution Licensee's right to use the security deposit to set off other amounts owing by the customer to the Distribution Licensee. The security deposit shall be returned within ***six weeks*** of the closure of an account.

13.2.19 A Distribution Licensee shall apply a security deposit to the final bill prior to the change in service where a customer changes from postpaid to prepaid billing or from a Licensee to a Retailer. A Distribution Licensee shall promptly return any remaining amount of the security deposit to the customer. A Distribution Licensee shall not pay any portion of a customer's security deposit to a competitive retailer.

13.2.20 Despite sub-sections 13.2.15 to 13.2.19, where the Distribution Licensee keeps a security deposit for a period in excess of 8 months, it shall pay such interest or other compensation from the eighth month, as LERC shall determine.

SECTION 14: ASSETS MANAGEMENT

14.1 Good Asset Management

14.1.1 A Distribution Licensee or customer who is the asset owner must:

(a) ensure that the records of an equipment that affect the integrity of the distribution system or relevant to the interconnection are maintained for reference for the duration of the operational life of the plant; and

(b) make relevant information requested by the Distribution Licensee about its assets available within a reasonable time.

14.1.2 The Distribution Licensee shall indicate to the customer what information is considered as relevant under this code.

14.1.3 A Distribution Licensee must use their best endeavors to:

(a) assess and record the nature, location, condition, and performance of its distribution network assets;

(b) develop and implement plans for the acquisition, creation, maintenance, operation, refurbishment, repair, and disposal of its distribution network assets:

(i) to comply with the laws and other performance obligations which apply to the provision of distribution services including those contained in this Code;

(ii) to minimize the risks associated with the failure or reduced performance of assets; and

(iii) in a way which minimizes costs to customers considering distribution losses; and

(c) develop, test, or simulate and implement contingency plans (including where relevant plans to strengthen the security of supply) to deal with events which have a low probability of occurring, but are realistic and would have a substantial impact on customers.

14.2 Customer's Electrical Installation and Equipment

14.2.1 A customer must use best endeavors to ensure that:

(a) the customer's electrical installation and any equipment within it:

(i) complies with this Code; and

(ii) is maintained in a safe condition; and

(b) protection equipment in the customer's electrical installation is always effectively coordinated with the electrical characteristics of the distribution network.

14.2.2 A customer must use their best endeavors to:

(a) ensure that the distribution network and the reliability and quality of supply to other customers are not adversely affected by the customer's actions or equipment;

(b) not allow a supply of electricity to its electrical installation to be used other than at the customer's premises nor supply electricity to any other person except in accordance with the LERC's Customer Service and Quality of Supply Regulations, the Electrical Wiring Regulations, and this Code;

(c) not take electricity supplied to another supply address at the customer's supply address;

(d) not allow electricity supplied to the supply address to bypass the meter;

(e) not allow electricity supplied under a domestic tariff to be used for non-domestic purposes; and

(f) not allow electricity supplied under a specific purpose tariff to be used for another purpose.

14.3 Distribution Licensee's Equipment on Customer Premises

14.3.1 A customer must:

(a) not interfere, and must use best endeavors not to allow interference with the Distribution Licensee's distribution network including any of the Distribution Licensee's equipment installed in or on the customer's premises; and

(b) provide and maintain on the customer's premises any reasonable or agreed facility required by its Distribution Licensee to protect any equipment of the Distribution Licensee.

14.3.2 Provided official identification is produced by the Distribution Licensee's representatives on request, a customer must always provide to the Distribution Licensee representatives convenient and unhindered access:

(a) to the Distribution Licensee's equipment for any purposes associated with the supply, metering, or billing of electricity; and

(b) to the customer's electrical installation for the purposes of:

(i) the inspection or testing of the customer's electrical installation to assess whether the customer is complying with this Code; or

(ii) connecting, disconnecting or reconnecting supply, and safe access to and within the customer's premises for the purposes described in this sub-section 14.3.2.

14.3.3 If necessary, the customer must provide safety equipment and appropriate safety instructions to representatives of the Distribution Licensee to ensure safe access to the customer's premises.

14.3.4 In cases other than emergencies, a Distribution Licensee must use best endeavors to access a customer's premises at a time, which is reasonably convenient to both the customer and the Distribution Licensee.

OPERATIONS SUB-CODE

SECTION 15: DISTRIBUTION SYSTEM TECHNICAL REQUIREMENTS

15.1 Quality of Supply

15.1.1 A Distribution Licensee, Users and customers shall comply with the supply quality standard specified in the LERC's Customer Service and Quality of Supply Regulations and in this Code. The quality of supply standard under this Distribution Code is specified in terms of the nominal voltage, voltage variations, voltage unbalance, harmonic voltage distortion effects and frequency of the supply at the connection point.

15.1.2 A Distribution Licensee shall follow good utility practice in managing the power quality of its distribution network regarding the parameters set out in this section of the Code and in accordance with the performance benchmarks set out under Part D of this Code and the Customer Service and Quality of Supply Regulations issued by the LERC. The Distribution Licensee must define in its Conditions of Service, the quality of supply standards to which the distribution network is designated and operated.

Nominal Voltage

15.1.3 The standards for nominal voltage levels and allowed tolerance limits for steady state operations at a connection point of the distribution of the system are as specified in Technical Schedule TS-A of this Code.

Voltage variations

15.1.4 Under fault and circuit switching conditions the rated frequency component of voltage may fall or rise transiently. The fall or rise in voltage will be affected by the method of earthing of the neutral point of the Distribution System, and voltage may fall transiently to zero at the point of fault. The transient voltage variation limits allowed at a connection point in the distribution network are as specified in Technical Schedule TS-B of this Code.

15.1.5 The Distribution Licensee's distribution system and the network or system connected by a User shall be designed and operated to include devices that will mitigate the effects of transient over voltages on the interconnected systems. The Distribution Licensee and User shall consider the effect of electrical transients when specifying the insulation of their respective electrical Equipment.

15.1.6 A Distribution Licensee shall practice reasonable diligence in maintaining voltage variance limits specified in the Code and the LERC's Customer Service and Quality of Supply Regulations but shall not be responsible for variations in voltage arising from external sources, such as operating contingencies, exceptionally high loads and low voltage supply from the Transmission Licensee or host Distribution Licensee.

Frequency

15.1.7 The System frequency under this Code shall be 50 Hz and the permissible limits of variations shall be as specified in the LEGC. A Distribution Licensee and all Users including embedded generators shall ensure that their Equipment can operate reliably and safely within the specified supply frequency limits during Normal Operation and

can withstand the limits specified under System Stress and extreme System fault conditions.

Voltage Unbalance

15.1.8 The phase voltages of a 3-phase supply at a distribution connection interphase with the transmission system shall nominally be of equal magnitude and 120 degrees apart in phase angle. A Distribution Licensee shall ensure that its Phase voltage unbalance does not exceed the limits specified in the **LEGC**. A User shall ensure that its System shall not cause the Voltage Unbalance in the Distribution System to exceed the limits specified by the Distribution Licensee.

Harmonic Distortion Limits

15.1.9 Distortion of the System voltage waveform, caused by certain types of Equipment, may result in annoyance to Users or damage to other connected equipment. To limit these effects, a Distribution Licensee shall ensure that Total Harmonic Distortion and the Individual Harmonic Content of the voltage at any Connection Point, is within the limits prescribed in Technical Schedule TS-C_1 and in accordance with the LERC's Customer Service and Quality of Supply Regulations.

15.1.10 A Distribution Licensee shall ensure that the Maximum current harmonic distortion limits generated by a User as a percentage of the maximum demand load current and the corresponding individual harmonic order 'h' (Odd Harmonics) at any Connection Point, are in compliance with IEC/TR3 61000-3-7 standard or ***IEEE Standard 519-1992 'Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems'*** and within the limits prescribed in Technical Schedule TS-C_2 and in accordance with the Customer Service and Quality of Supply Regulations.

15.1.11 Measurements may be taken by the Distribution Licensee at the Connection Point of a User and the measurements shall be taken in accordance with methodologies of ***IEC 61000-4-7*** lasting for at least 24 hours taken at 10-minute intervals.

15.1.12 A Distribution Licensee shall take appropriate actions to control harmonic distortions beyond the limits prescribed in this Code and found to be detrimental to consumers' connection to the distribution network. If the Distribution Licensee is unable to correct the problem without adversely impacting other distribution network customers, a Distribution Licensee may choose not to make the corrections. In deciding which actions to take, a Distribution Licensee should use appropriate industry standards and *Prudent Utility Practice* as guidelines.

15.1.13 A customer must ensure that its equipment's contribution to the harmonic distortion levels in the distribution network at the point of connection is within the limits prescribed in sub-sections 15.1.9 and 15.1.10 of this Code and the LERC's Customer Service and Quality of Supply Regulations.

Voltage Flicker

15.1.14 Flicker Severity at the connection point of a User shall not exceed the maximum values stated in IEC 61000-3 Standard (or IEEE Std 1547) for more than 3 % of the measured period.

15.2 Distribution Licensee's mandate for supply quality assurance

15.2.1 A Distribution Licensee shall respond to and take reasonable steps to investigate all consumer power quality complaints and report to the consumer on the results of the investigations.

15.2.2 If the source of a power quality problem is found to have been caused by the consumer making the complaint, the Distribution Licensee may seek reimbursement for the time and cost spent to investigate the complaint.

15.2.3 A Distribution Licensee may direct a customer connected to its distribution network to take corrective or preventive action on the consumer's or customer's electric system when there is a direct hazard to the public or the consumer's, or customer's operation is causing or could cause adverse effects to the quality of supply or reliability of the Distribution Licensee's distribution network. If the situation is not corrected, the Distribution Licensee may disconnect the consumer or customer in accordance with its disconnection policy.

15.3 Reliability of Supply

15.3.1 The reliability of power supply in the distribution network for any period is considered acceptable when the total duration of unacceptable quality of supply resulting in interruptions to customers is maintained within acceptable limits.

15.3.2 The reliability performance criteria for the distribution system shall be determined in terms of interruption indices as stipulated under Section 19 of this Code.

15.4 System Protection Requirements

15.4.1 A Distribution Licensee must design and maintain the protection system of the network appropriately. The protection system of the distribution network must be appropriately designed and maintained to ensure:

(a) the protection system can detect an electrical fault within a specific zone of the electrical network and trip only the appropriate or relevant sections of the network to clear that fault with minimum disturbance to the rest of the network; and

(b) safety and minimum interruptions to customers.

15.4.2 A customer must install and maintain protection, which is compatible with the existing distribution system protection. The protection settings of a customer must ensure coordination with the protection of the Distribution Licensee; and shall make provisions to safeguard the equipment of both parties from faults occurring on either side of the point of connection.

15.4.3 A customer or User must provide the Distribution Licensee with appropriate test certificates, prior to commissioning, of the protection system that is installed at the point of interface with the Licensee's distribution network.

15.4.4 Where equipment or protection schemes are shared, each of the sharing parties must provide the necessary equipment and interconnections to the equipment of the other party.

15.5 Load Power Factor

15.5.1 A customer with a maximum demand meter must ensure that the power factor at the connection point stays within the limits as prescribed in Technical Schedule TS-F of this Code. This is to enable the Distribution Licensee to meet its technical requirements at the connection points with the Transmission System.

15.5.2 If the power factor goes beyond the limits specified in sub-section 15.5.1, the customer must take corrective action within a reasonable timeframe to remedy the situation. A User or customer intending to install shunt capacitors or other equipment for the purpose of complying with the power factor requirements must obtain the approval (or consent) of the Distribution Licensee in writing prior to the installation of that equipment.

15.6 Earthing Requirements

15.6.1 A Distribution Licensee must advise a customer about the appropriate neutral earthing methods used in the distribution system. The method of neutral earthing used at the point of connection of a customer's installation with the distribution system on those portions of installations of a customer that are physically connected to the distribution system must comply with the applicable earthing standards of the Distribution Licensee.

15.6.2 Protective earthing of equipment must be done in accordance with IEC 60364 standard or other applicable international standard for earthing and reasonable requirements of the Distribution Licensee. In cases where the calculated ground potential rise exceeds **5kV** according to calculations per *Institute of Electrical and Electronic Engineering (IEEE) 80*, the responsible party must inform the affected parties.

15.6.3 Lightning protection requirements must be applied to the distribution system and switching yards in accordance with IEC 62305 standard. A Distribution Licensee must earth the last overhead line tower to the substation switch yard earth.

15.7 Distribution System Losses

15.7.1 A loss in the distribution system shall be classified as either:

(a) technical losses; or

(b) non-technical losses;

15.7.2 The Technical losses of the distribution system under this Code are losses due to energy dissipated in conductors, equipment used for the distribution system and including magnetic losses in transformers. Non-technical losses are losses that occur due to unidentified, misallocated, or inaccurate energy flows or can be thought of as electricity that is consumed but not billed.

15.8 Equipment Compliance

15.8.1 Equipment at the connection point must comply with the:

(a) prescribed standards of the Distribution Code; and

(b) other national standards and codes prevailing at the time.

15.8.2 A Distribution Licensee must provide the customer with the necessary information to enable the customer to install appropriate equipment with the required rating and capacity.

15.8.3 A User must ensure that all equipment at the connection point is maintained at least in accordance with the specifications of the manufacturer or an alternate industry recognized practice.

15.8.4 A User with demand meters must retain the test results and maintenance records relating to the metering equipment at the connection point (in accordance with the Metering Sub-code of the LEGC) and make this information available if requested.

15.9 Minimum Requirements for (Synchronous) Embedded Generating Units

15.9.1 An embedded generating unit over 1 MW but less than 10 MW must have:

(a) an excitation control system including voltage regulator;

(b) a governor system responsive to system frequency changes; and

(c) real time systems events log.

15.9.2 In addition to the requirements under sub-section 15.9.1, an embedded generator with a nameplate rating over 10 MW must ensure that each of its embedded generating units complies with the appropriate technical system requirements with regards to:

(a) response to disturbances;

(b) safe shutdown without external electricity supply;

(c) restart following loss of external electricity supply; and

15.10 Supply Frequency

An embedded generator must ensure that the embedded generating unit is capable of continuous operation at the system frequency of 50 Hz and permitted variations as provided in sub-section 15.1.7.

15.11 Negative Sequence Voltage

An embedded generator must ensure that an embedded generating unit's contribution to the negative sequence voltage at the point of connection between the embedded generating unit and the distribution network is less than one percent (1%).

15.12 Harmonics

15.12.1 An embedded generator must ensure that an embedded generating unit's contribution to the harmonic distortion levels in the supply voltage at the point of connection between the embedded generating unit and the distribution network are within the limits and meet the requirements specified in sub-sections 15.1.9 to 15.1.14.

15.12.2 **Inductive Interference** – An embedded generating unit must not cause inductive interference above the limits specified. A Distribution Licensee shall notify the embedded generator that its embedded generating unit is causing interference above the limits set out in sub-sections 15.1.9 and 15.1.10 and report the matter to the DCTC for monitoring and correction.

15.12.3 The DCTC shall instruct the defaulting embedded generator to reduce the level of interference to below the established limits within 90 days from the notification failing which appropriate sanctions will be taken against the embedded generator by the LERC on the recommendation of the DCTC.

15.13 Earthing

A large, embedded generator must ensure that its embedded generating units are earthed in accordance with the Distribution Licensee's earthing requirements. The embedded generator must provide earth fault protection to isolate each embedded generating unit from the distribution network under earth fault conditions.

15.14 Fault Levels

15.14.1 An embedded generating unit must be designed to work within specified technical limits and not contribute (other than an agreed contribution) to the system maximum fault level and the feeder capacity to which it is connected.

15.14.2 The maximum system fault level at a PoC for each system voltage within the distribution network shall be determined through studies conducted according to sub-section 16.13.13 and the resulting fault levels shall be provided as part of the System Operational Manual established by the Distribution Licensee.

15.14.3 An embedded generating unit shall be designed to operate so that it does not cause fault levels in the distribution network to exceed the levels as determined and specified in accordance with sub-section 15.14.2.

SECTION 16: DISTRIBUTION SYSTEM OPERATIONS

16.1 Purpose and Scope

16.1.1 The purpose of this Section is to define the general arrangements, obligations of the Distribution Licensee and Users, policies, criteria, and procedures needed to ensure the coordinated operation of the interconnected distribution system to facilitate supply of reliable power to customers under normal and emergency conditions.

16.1.2 This Section specifies the procedures and practices to be followed for a safe and efficient operation of the Distribution System by the Distribution Licensee and by the Users whose Equipment / Apparatus and lines are connected to the distribution system. This shall also apply to any electrical interface between two connected distribution networks for a safe and efficient operation of the interface by the different licensees.

16.2 General Responsibilities of Distribution Licensee

16.2.1 A Distribution Licensee must operate the distribution system to achieve the highest degree of reliability practicable and take appropriate remedial action promptly to relieve any abnormal condition that may jeopardize reliable operation.

16.2.2 A Distribution Licensee must co-ordinate voltage control operating on the distribution system and conduct security monitoring on a system-wide basis to ensure safe, reliable, and economic operation of the distribution system. The Licensee must operate the system in such a way as to minimize adverse effects of disturbances on customers.

16.2.3 In the event of an embedded generator having to shut down or operate as an island plant because of a disturbance on the distribution system, the Distribution Licensee must carry out network restoration to minimize the time required to resynchronize the shed embedded generating units.

16.2.4 The Distribution Licensee must operate the distribution system as far as practical so that instability, uncontrolled separation, or cascading outages do not occur because of the most severe double contingency.

16.2.5 Multiple distribution outages of a credible nature must be examined and whenever practical, the Distribution Licensee must operate the distribution system to protect it against instability, uncontrolled separation, and cascading outages.

16.2.6 A Distribution Licensee is responsible for efficient restoration of the distribution system after supply interruptions.

16.2.7 The Distribution Licensee must operate and maintain primary and emergency control centers and facilities to ensure continuous operation of the distribution system.

16.2.8 A Distribution Licensee must:

(a) establish and implement operating instructions, procedures, standards, and guidelines to cover the safe operation of the distribution system under normal and abnormal system conditions; and

(b) maintain a database with version control of all the documents, relating to the establishment and implementation contemplated in paragraph (a), which follow license conditions.

16.2.9 The Distribution Licensee must operate the distribution system, as far as reasonably possible, within defined technical standards and equipment ratings.

16.2.10 The Distribution Licensee must manage constraints on the distribution system through the determination of operational limits.

16.2.11 To achieve a high degree of service reliability the Distribution Licensee must ensure adequate and reliable communications between all control centers, power stations and substations.

16.2.12 The Distribution Licensee is responsible for the ongoing determination of the distribution system protection philosophy, as contrasted to equipment protection.

16.2.13 A Distribution Licensee must determine and review on a regular basis the relay settings for main and backup protection on the distribution system.

16.2.14 The Distribution Licensee must develop for LERC approval Load Shedding Procedures. All approved Load shedding procedures must be published by the Distribution Licensee.

16.2.15 The Distribution Licensee must ensure adequate and reliable communications to all Users of the distribution system.

16.3 Voltage, Frequency and Power Factor Monitoring and Control

A Distribution Licensee shall monitor the voltage, frequency, and power factors on the Distribution System at different points at peak and off-peak hours and take reasonable measures for improvement of the same in co-ordination with directly connected generating units, Users with demand of 1 MW and above and the Transmission System Operator.

16.4 Voltage monitoring and control

16.4.1 A Distribution Licensee shall establish monitoring and control procedures relating to the following:

(a) voltage monitoring at each substation feeding 22kV or 33kV Distribution Systems shall be carried out by data logging.

(b) voltage monitoring on the low voltage side of distribution transformers shall be carried out at least once a week during peak load hours to cover at least two transformers in each 22kV or 33kV feeder as follows:

(i) one transformer at the beginning of the feeder.

(ii) one transformer at the tail end of the feeder.

(c) improvement to voltage conditions shall be achieved by operating on-load tap changing transformer (OLTC) wherever available in 33 kV, 66kV/22kV or 66kV/33kV substations and by contacting over telephone the operators of

Transmission Licensee at the point of interconnection, to correct voltage at the sending end whenever required.

16.4.2 A Distribution Licensee shall take Power Factor improvement measures at strategic points in the Distribution System by carrying out System Studies and installing the required reactive compensation equipment to maintain the distribution system within the power factor limits prescribed in sub-section 15.5.1.

16.4.3 A Distribution Licensee shall maintain at each Load monitoring Station, Log Sheets and Registers for substation operations (or through any alternative efficient means) for recording the hourly readings of meters such as current, load, voltage etc., and the station operations. A separate register (or recording means) for the daily energy meter readings for both the active and reactive energy received and sent out shall also be maintained for each substation.

16.5 Data Logging

The following data logging protocol and procedure shall be established by a Distribution Licensee to track equipment and system performance, and operational events and incidents at various points of the distribution system:

(a) all important data such as Voltage, Current, Power factor, kW, kVar, transformer data such as tap position, oil/winding temperature, etc. shall be logged on hourly basis in all substations feeding distribution lines.

(b) the following records among others shall be maintained at each station:

(i) Operation and maintenance manuals for the equipment and the entire station consisting of the details of operation of the station and maintenance of equipment, maintenance registers for the equipment and station batteries,

(ii) Interruption Registers,

(iii) Line Fault Clearance Register, and

(iv) Equipment registers.

(c) A detailed analysis of the above data shall be made periodically to assess the performance of the equipment, overloading conditions, and the necessity for major maintenance.

16.6 Load balancing

A Distribution Licensee shall ensure that:

(a) the unbalanced load on the Low Voltage side of the distribution transformers does not exceed 10% of the peak load; and

(b) the secondary currents and voltages of the distribution transformers shall be recorded at least once a month during expected peak load hours on all the phases.

16.7 Safety Coordination

16.7.1 A Distribution Licensee shall follow good utility practice in operating and maintaining the distribution system and shall abide by safety rules, codes and regulations that apply to routine utility work.

16.7.2 A Distribution Licensee must in accordance with the relevant codes and legislation governing health and safety in the workplace establish a Technical and Safety Management Plan (TSMP) and implementation guidelines to ensure the health and safety of personnel working on the distribution system or any equipment connected to the distribution system.

16.7.3 The implementation guidelines and procedures for the TSMP required in sub-section 16.7.2 must have a set of rules and instructions for implementing safety precautions on Medium Voltage and High Voltage equipment and must contain, at the least, the following details:

(a) safety coordination procedures;
(b) appointment of safety coordinators or authorized safety personnel and maintenance of "authorized and competent safety personnel register";
(c) safety logs and record of safety precautions;
(d) location of safety precautions;
(e) implementation of safety precautions;
(f) environmental safety issues; and
(g) documentation control.

16.7.4 Workmen must adopt the implementation guidelines as a rule of practice for any work that is to be done on the distribution system or on the installation of the customer. All Users must coordinate the appointment of safety personnel and must agree on the duties to be carried out by the appointed persons.

16.7.5 The TSMP established by the Distribution Licensee shall contain programs for training and regularly conducted audits including Public Education and Public safety initiatives.

16.7.6 Any problems that a Distribution Licensee identifies as part of an audit shall be remedied as soon as possible or in accordance with the Distribution Licensee's health and safety procedures.

16.8 Health Safety and Environment

16.8.1 A Distribution Licensee shall show good utility practice in operating and maintaining its distribution network and shall abide by the health safety rules and regulations that apply to routine work.

16.8.2 A Distribution Licensee shall implement an industry recognized health safety program that includes training and regularly conducted audits. This program also will include Public Education and Public Health Safety Initiatives.

16.8.3 Any problems that a Distribution Licensee identifies as part of the audit shall be remedied as soon as possible or in accordance with the Distribution Licensee's health safety program.

16.8.4 A Distribution Licensee shall have a corporate policy that addresses environmental stewardship that applies to all the Distribution Licensee's operations. A documented program such as the Licensee's *Health safety and Environmental Management Plan* (HEMP) supporting procedures and appropriate training should be in place to ensure compliance with environmental regulations and indicate a proactive approach to environmental damage avoidance.

16.9 Distribution Licensee's Right to Interrupt Supply

A Distribution Licensee may interrupt supply for any of the following reasons:

(a) planned maintenance, repair, or augmentation of the distribution system;
(b) unplanned maintenance or repair of the distribution system in circumstances where, in the opinion of the Distribution Licensee, the customer's electrical installation or the distribution system poses an immediate threat of injury or material damage to any person, property or the distribution system;
(c) to shed load/energy because the total demand for electricity at the relevant time exceeds the total supply available;
(d) as required (or directed) by the Transmission System Operator;
(e) the installation of a new supply to another customer;
(f) in the case of an emergency; or
(g) to restore supply to a customer.

16.10 Planned Interruptions

16.10.1 In the case of a planned interruption or outage, the Distribution Licensee must provide each affected customer with information relating to the expected date of the outage, time and duration of the outage and must establish reasonable means of communication to the affected customers for outage related enquiries. The information and communication requirements expected from a Distribution Licensee to affected customers of a planned interruption shall be in accordance with procedures prescribed in Technical Schedule TS-E of this Code and in accordance with the Customer Service and Quality of Supply Regulations issued by LERC.

16.10.2 Despite sub-section 16.10.1, a Distribution Licensee shall make all reasonable efforts to minimize the duration and frequency of planned outages. The Distribution Licensee's policies and procedures with respect to planned outages shall be described in the Conditions of Service.

16.10.3 The Distribution Licensee must use best endeavors to restore the customer's supply as quickly as possible or in accordance with LERC's Customer Service and Quality of Supply Regulations.

16.11 Load Shedding

16.11.1 A Distribution Licensee may resort to demand management under which it may shed customer load to maintain system integrity and must restore customer load as soon as possible with due consideration of the possibility of cascading system failure or the system operating at abnormally low frequency or voltage for an extended period.

16.11.2 Wherever reasonable and practicable, a Distribution Licensee must provide prior information to customers who may be interrupted by load shedding in accordance with the Customer Service and Quality of Supply Regulation issued by LERC.

16.11.3 Despite sub-section 16.11.2 if the duration of Load Management to any part of the Distribution System exceeds [8 hours] or is expected to exceed the time limits prescribed in Technical Schedule TS-E, the public should be notified promptly through the media. Consumers with Demand of 1 MW and above and the essential services such as Hospital, Public Water Works etc. shall be intimated over the telephone wherever possible.

16.11.4 In the event of a sustained period of shortfall, due to any constraint in the Transmission System and/or Distribution System, then the Distribution Licensee shall prepare and publish a rotational load shedding management plan to enable affected customers manage the impacts of the load shedding in accordance with provisions specified in the Customer Service and Quality of Supply Regulations issued by LERC.

16.12 Unplanned Interruptions and outages

16.12.1 A situation may arise on a part of the Distribution System due to local breakdowns in the Distribution System itself or a breakdown in the Equipment /Apparatus of a User [of the Distribution System or the Transmission Licensee] at the point of connection that can lead to unplanned supply interruptions that may be classified as:

(a) System Blackout – any situation that leads to either total or partial blackout at any point of interconnection (could be from the distribution system or failure of equipment of the Transmission Licensee); or
(b) Distribution System failure – Interruptions to power supply in any part of the Distribution System lasting for more than ***[two hours]*** due to breakdown in any part of the Distribution System as prescribed in TS-E of this Code.

16.12.2 In the case of unplanned interruptions or an emergency, a Distribution Licensee must:
(a) within one hour of being advised of the interruption or emergency, or otherwise as soon as practicable, make available, by way of a 24-hour telephone service, radio announcement and by way of frequently updated entries on a prominent part of its website, information on the nature of the interruption and an estimate of the time when supply will be restored or when reliable information on restoration of supply will be available;
(b) provide options for customers who call the service to be directly connected to a telephone operator if required; and
(c) use best endeavors to restore the customer's supply as soon as possible making allowance for reasonable priorities.

16.12.3 A Distribution Licensee shall establish outage management policies that shall include the following:
(a) arrangements for on-call personnel in accordance with good utility practice;
(b) establishment and operation of a Call Centre or equivalent telephone service to provide consumers with available information regarding an outage; and

(c) identification of the location of distribution circuits for emergency services and critical customers such as hospitals, water supply, health care facilities, and designated emergency shelters for coordination with other agencies.

16.12.4 A Distribution Licensee may require a consumer or customer or a party to a joint use agreement to comply with reasonable and appropriate instructions from the Distribution Licensee during an unplanned outage or emergency.

16.12.5 To assist with distribution network outages or emergency response, a Distribution Licensee may require a customer to provide the Distribution Licensee emergency access to customer-owned distribution equipment that normally is operated by the Distribution Licensee or Distribution Licensee-owned equipment on customer property.

16.13 Emergency and Contingency Planning

16.13.1 A Distribution Licensee must develop and maintain a Distribution System Emergency Procedures Manual to manage and respond to system contingencies and emergencies that are relevant to the performance of the distribution system and the interconnected power system. Description of a typical development process and elements of an Emergency Response Plan is provided under Section 18 of this Code.

16.13.2 During an emergency, a Distribution Licensee may interrupt supply to a consumer in response to a shortage of supply or to effect repairs on the distribution network or while repairs are being made to consumer-owned equipment.

16.13.3 A Distribution Licensee shall develop and maintain appropriate emergency and contingency plans and management policies in accordance with the guidelines provided under Section 18 of this Code and requirements of the Customer Service and Quality of Supply Regulations. A Distribution Licensee's emergency plan shall include, at a minimum, mutual assistance plans with neighboring licensees or other measures to respond to a wide-spread emergency.

16.13.4 A contingency plan in accordance with sub-section 16.13.3 must be developed in consultation with all Users and must be consistent with internationally acceptable utility practices that must include:

(a) under-frequency load shedding;
(b) prevention of voltage slide and collapse;
(c) meeting national disaster management requirements including the necessary minimum load requirements;
(d) forced outages at all points of interface; and
(e) supply restoration.

16.13.5 Emergency plans must allow for safe and orderly recovery from a partial or complete system collapse, with minimum impact on customers.

16.13.6 Contingency or emergency plans must be periodically tested with simulations or other approved methodologies and the results must be appropriately documented.

16.13.7 If the tests contemplated in sub-section 16.13.6 cause undue risk or undue cost to a User, the Distribution Licensee must take that risk or cost into consideration when deciding whether to conduct the test.

16.13.8 The tests contemplated in sub-section 16.13.6 must be carried out at a time that is least disruptive to the User (s) and the costs of the tests must be paid for by the respective asset owners.

16.13.9 The Distribution Licensee must ensure the co-ordination of the tests contemplated in sub-section 16.13.6 in consultation with all affected Users.

16.13.10 The Distribution Licensee must, in consultation with the Transmission Licensee and the TSO, set the requirements and implement:

(a) automatic and manual under frequency load shedding in accordance with the requirements of the system operator;
(b) automatic and manual under voltage load shedding to prevent voltage collapse; and
(c) manual load shedding to maintain network integrity.

16.13.11 Users must make available loads and schemes to comply with these requirements.

16.13.12 The Distribution Licensee is responsible for:

(a) determining emergency operational limits on the distribution system;
(b) updating the emergency operational limits contemplated in paragraph (a) periodically; and
(c) making the emergency operational limits contemplated in paragraph (a) available to the Users.

16.13.13 The Distribution Licensee must conduct network studies which may include but not be limited to load flow, fault level, stability, and resonance studies to determine the effect that various component failures would have on the reliability of the distribution system.

16.14 Special Needs

16.14.1 Where a customer or a retailer provides a Distribution Licensee with confirmation from a registered medical practitioner or a hospital that a person residing at the customer's supply address requires a life support machine, the Distribution Licensee must:

(a) register the supply address as a life support machine supply address and regularly update the register;
(b) not disconnect supply to the customer's supply address while the supply address remains registered as a life support machine supply address; and
(c) give the customer:
    (i) at least 3 business days written notice of any planned interruption to supply at the supply address to be counted from the date of receipt of the notice;
    (ii) advice to assist the customer to prepare a plan of action in case an unplanned interruption should occur; and
    (iii) an emergency telephone contact number.

16.14.2 A customer whose supply address has been registered by a Distribution Licensee in accordance with sub-section 16.14.1, must inform the Distribution Licensee or the customer's retailer if the person for whom the life support machine is required vacates the supply address or no longer requires the life support machine. The Distribution Licensee may then cancel the registration of the supply address as a life support machine supply address.

16.14.3 At least once in each year a Distribution Licensee must take all reasonable steps to ensure the accuracy and completeness of its register kept under sub-section 16.14.1 (a).

16.15 Disconnection and Reconnection

General Provisions

16.15.1 A Distribution Licensee may disconnect supply to the supply address of a customer if the customer fails to comply with the written notice of non-compliance issued by the Licensee or any arrangement between the Distribution Licensee and the customer which the customer has failed to comply with including non-compliance with the applicable standards of the Distribution Licensee.

16.15.2 A Distribution Licensee shall establish a process for disconnection and reconnection that specifies timing and means of notification consistent with the Customer Service and Quality of Supply Regulations. In developing physical and business processes for reconnection, a Distribution Licensee shall consider safety and reliability as a primary requirement. A Distribution Licensee must document its business process for disconnection and reconnection in the Distribution Licensee's Conditions of Service (or Customer Charter).

16.15.3 A Distribution Licensee may rely on any of the provisions in sub-section 8.9.1 as reason to disconnect or refuse to reconnect a customer's supply.

16.16 Disconnection for non-payment

16.16.1 Without limiting the generality of the processes contemplated under sub-section 16.15.2, prior to disconnecting a property for non-payment, a Distribution Licensee shall, in accordance with the Distribution Licensee's Conditions of Service, provide to any person that receives notice of disconnection:

(a) the Fire Safety Notice of the Liberia National Fire Service (LNFS); and

(b) any other public safety notices or bulletins issued by public safety authorities and provided to the Distribution Licensee, which provide information to consumers respecting dangers associated with the disconnection of electricity service.

16.16.2 A Distribution Licensee shall include a copy of the notices or bulletins referred to in sub-section 16.16.1 along with any notice of disconnection that is left at the property at the time of actual disconnection for non-payment.

16.16.3 A Distribution Licensee shall inform a customer responsible for an overdue amount that it may be disconnected in accordance with provisions of the Customer Service

and Quality of Supply Regulations and prescribed in Technical Schedule TS-G of this Code.

16.16.4 A Distribution Licensee may disconnect without notice in accordance with a court order or for emergency, safety, or system reliability reasons.

16.16.5 A Distribution Licensee shall not disconnect the supply of a special needs customer address for non-payment unless in accordance with the provisions of the Customer Service and Quality of Supply Regulations.

16.16.6 A customer, with demand meter, must give written notice to the Distribution Licensee of any intended voluntary disconnection.

16.16.7 The Distribution Licensee must reconnect supply to the customer on request by the customer or retailer acting on behalf of the customer, subject to compliance with the relevant provisions of this Distribution Code, the Customer Service and Quality of Supply Regulations and other applicable standards including the timing of reconnection and payment of any reconnection charge imposed by the Distribution Licensee.

16.16.8 The physical process by which a Distribution Licensee disconnects or reconnects shall reflect good utility practice and considered safety as a primary requirement.

16.16.9 A Distribution Licensee may recover from the customer responsible for the disconnection reasonable costs associated with disconnection, including overdue amounts payable by the customer. A Distribution Licensee may recover from the customer responsible for the disconnection reasonable costs for repairs of the Distribution Licensee's physical assets attached to the property in reconnecting the property.

16.17 Disconnection due to Health, Safety or Emergency

16.17.1 A Distribution Licensee may disconnect supply to a customer's location address if supply otherwise would potentially endanger or threaten to endanger the health or safety of any person or the environment or an element of the environment or if there is otherwise an emergency.

16.17.2 Except in the case of an emergency, or where there is a need to reduce the risk of fire or where relevant regulations require otherwise, a Distribution Licensee must not disconnect a customer's supply address under sub-section 16.16.1 unless the Distribution Licensee has:

(a) given the customer written notice of the reason;

(b) allowed the customer 5 business days from the date of receipt of the notice to eliminate the cause of the potential danger; and

(c) at the expiration of those **five** business days, given the customer by way of a written disconnection warning another **five** business days' notice of its intention to disconnect the customer counting from the date of receipt of the notice.

16.18 Customer's Request for Disconnection

A Distribution Licensee must disconnect supply to a customer's location address if the customer has requested disconnection and must use best endeavors to disconnect supply in accordance with the customer's request.

16.19 Unauthorized Energy Use

16.19.1 A Distribution Licensee shall use its discretion in taking action to mitigate unauthorized energy use. Upon identification of possible unauthorized energy use, a Distribution Licensee shall disconnect the supply and investigate.

16.19.2 A Distribution Licensee shall monitor losses and unaccounted for energy use on a quarterly basis to detect any upward trends that may indicate the need for management policies to moderate unauthorized energy use.

16.19.3 A Distribution Licensee may recover from the customer responsible for the unauthorized energy use all reasonable costs incurred by the Distribution Licensee arising from unauthorized energy use.

16.20 Illegal Supply and/or Power Theft

A Distribution Licensee may disconnect supply to a customer's supply address immediately and may proceed further to take any other appropriate legal action if:

(a) the supply of electricity to a customer's electrical installation is used other than at the customer's premises, except in accordance with the Law;
(b) a customer takes at the customer's supply address electricity supplied to another supply address;
(c) a customer tampers with, or permits tampering with, the meter or associated equipment; or
(d) a customer allows electricity supplied to the customer's supply address to bypass the meter.

16.21 Underground Cable Network

Preliminary Works

16.21.1 Before any civil works are undertaken, due notice in writing shall be given to all utilities whose services may conflict with the proposed cable route, e.g., telephone, water, sewage, road, and railway, etc. Where cables are to be installed in roads, footpaths, or streets, it is advisable to liaise closely with the roads authority and police to ensure that all necessary measures are taken to minimize the hazards and disruptive effects of installation works.

Safety

16.21.2 Working signs, bollards, danger tapes, light and flagmen shall be provided where necessary to ensure ample advance warning of, and restrict public access to, the works area. Warning lights and signs shall be displayed along pits and trenches, on

both sides. Steel plate or wooden planks shall be provided across the trench at entrances to residences.

Use of Line Markers for Buried Underground Cables

16.21.3 A Distribution Licensee shall ensure that a line marker is placed and maintained as close as practical over each buried underground cable:

(a) at each crossing of a public road and railway; and

(b) whenever necessary to identify the location of the buried underground cable to reduce the possibility of damage or interference.

Caption For Line Markers

16.21.4 A Distribution Licensee shall ensure that the following is written legibly on a background of a sharply contrasting color on each line marker:

(a) the word “Warning”, “ Caution”, or “Danger” followed by the words “MV Cable” or “LV Cable”; and

(b) the name of the Distribution Licensee and telephone number, on which the Distribution Licensee can be always reached.

16.22 System Inspection Requirements and Maintenance

16.22.1 A Distribution Licensee shall maintain its distribution network in accordance with good utility practice and performance standards to ensure reliability and quality of electricity service, on both a short-term and long-term basis.

16.22.2 A Distribution Licensee shall perform inspection activities of its distribution network in accordance with the requirements in **Appendix C** to the Code.

16.22.3 A Distribution Licensee shall perform more frequent inspections if warranted due to local conditions such as geographic location, climate, environmental conditions, technologies available to perform the inspection, type and vintage distribution technology in place, manufacturer specifications, system design or relative importance to overall system reliability of a particular piece of equipment or portion of the Distribution Licensee’s distribution network.

16.22.4 A Distribution Licensee shall perform inspection activities using persons qualified to identify the types of defects that could be discovered during such inspection activities. Persons performing inspection activities shall be trained to protect both themselves and the public, and to respond to emergencies that may arise because of inspection activities.

16.22.5 A Distribution Licensee shall address any defects discovered during the inspection activities within a reasonable period after the discovery of the defect. A Distribution Licensee shall address a defect by scheduling a more detailed inspection, by planning repair activities or by performing any other action that is an affirmative response to the discovery of the defect. A Distribution Licensee shall have an internal review procedure to ensure that the identified defects and follow-up activities have been addressed appropriately.

16.22.6 A Distribution Licensee shall determine the methodology by which inspection cycles are structured and the way defects identified during inspection activities are to be repaired in accordance with good utility practice.

16.23 Maintenance and Testing

16.23.1 A Distribution Licensee shall prepare maintenance schedules for Lines and Equipment to meet the level of maintenance as required by best industry practice and meet Safety Standard for Distribution System as provided in its License conditions and the Distribution Code.

16.23.2 Regular testing of all the Equipment, such as Transformers, Switchgear, Protective Relays etc., shall be carried out as recommended by the manufacturers and the appropriate industry code of practices operating at the time. The test shall be carried out at the prescribed intervals and the test results shall be recorded in the maintenance registers. Wherever the test results indicate a decline in the insulation resistance and/or deterioration of the Equipment, preventive maintenance shall be carried out to ensure serviceability, safety, and efficiency.

16.23.3 A Distribution Licensee shall maintain well trained hot-line personnel, ensure that all the required tools are in good condition, and conduct the maintenance work by using hot-line technique, wherever possible, to reduce the period of interruption.

16.23.4 All Users shall maintain their equipment, tools, and power lines always conforming to manufacturers and the appropriate industry code of practices operating at the time in order to assure their suitability to remain connected to the Distribution System in a safe and reliable manner.

16.24 Tools and Spares

16.24.1 A Distribution Licensee shall ensure availability of proper tools and tackles at all workplaces for carrying out the maintenance. The tools and tackles shall be checked from time to time and their serviceability shall be ensured.

16.24.2 A Distribution Licensee shall maintain an inventory of spares required for maintenance and replacement purposes at suitable locations according to a clear policy to be agreed with the LERC.

16.25 Training

A Distribution Licensee shall make appropriate arrangements for imparting training in both cold line and hotline work to its workers and supervisory staff, incorporating up-to-date health and safety techniques of Distribution System design, construction, operation, and maintenance. A suitable training programme for this purpose shall be developed by the Distribution Licensee.

SECTION 17: OTHER RESPONSIBILITIES AND OBLIGATIONS OF DISTRIBUTION LICENSEE AND USERS

17.1 Responsibilities & Obligations of Distribution Licensee to Customers

17.1.1 A Distribution Licensee has an implied contract with each customer that is connected to the Distribution Licensee's distribution network and receives distribution services from the Distribution Licensee. The terms of the implied contract are embedded in the Distribution Licensee's Conditions of Service, the Distribution Licensee's rate schedules, the Distribution Licensee's license, and the Distribution Code.

17.1.2 A Distribution Licensee may require a large consumer to enter into a Connection Agreement with the Distribution Licensee if the Distribution Licensee believes that the large consumer has characteristics that require an explicit document to describe the relationship between the Distribution Licensee and the large consumer. Suggested information to be included in the Connection Agreement with customers is listed in Appendix A.

17.1.3 A Distribution Licensee shall make every reasonable effort to respond promptly to a Large Customer's request for connection. In any event a Distribution Licensee shall respond to a Large Customer's written request for a customer connection within 15 calendar days. A Distribution Licensee shall make an offer to connect within 60 calendar days of receipt of the written request, unless other necessary information is required from the Large Customer before the offer can be made.

17.1.4 Before entering a property to carry out an inspection or rectification of a fault, the Distribution Licensee shall:

(a) provide reasonable notice of the entry to the occupier of the property;
(b) in so far as is practicable, restore the property to its original condition; and
(c) provide compensation for any damages caused by the entry that cannot be repaired.

17.2 Responsibilities & Obligations of Distribution Licensee and Embedded Generators

17.2.1 A Distribution Licensee's responsibilities and obligations to Generators do not apply to the connection or operation of an emergency backup generation facility within a customer premises.

17.2.2 A Distribution Licensee shall enter into a Connection Agreement

(a) with all existing generators who have a generation facility connected to the Distribution Licensee's distribution network; and
(b) prior to connecting a new generation facility to the distribution network.

17.2.3 Where a Distribution Licensee does not have a Connection Agreement with an existing generator that has a generation facility connected to the Distribution Licensee's distribution network, the Distribution Licensee shall be deemed to have an implied contract with the generator. The terms of the implied contract are embedded in the

Distribution Licensee's Conditions of Service, the Distribution Licensee's rate schedules, the Distribution Licensee's License, and the Distribution Code.

17.2.4 A Distribution Licensee shall ensure that the safety, reliability, and efficiency of the distribution network is not materially adversely affected by the connection of a generation facility to the distribution network. A Distribution Licensee shall require that a new or significantly modified generation facility meets the technical requirements specified in Appendix E.2.

17.2.5 A Distribution Licensee shall ensure that the distribution network is adequately protected from potential damage or increased operating costs resulting from the connection of a generation facility. Despite sub-section 12.1.1, if damage to the distribution network or increased operating costs result from the connection of a generation facility other than a micro-embedded load displacement generation facility, the Distribution Licensee shall be reimbursed for these costs through appropriate tariff mechanisms by the generator.

17.2.6 A Distribution Licensee shall require that a generator with a generation facility connected to the Distribution Licensee's distribution network has a regular, scheduled maintenance plan to ensure that the generator's connection devices, protection systems and control systems are maintained in good working order. This requirement (shall) will be provided for in the Connection Agreement.

17.2.7 All equipment that is connected, operating, or procured, or ordered by the effective date of this Code is deemed to be in compliance with the Technical Requirements of this Code.

17.2.8 A Distribution Licensee may require that equipment deemed compliant under sub-section 17.2.7 be brought into actual compliance with the Technical Requirements of this Code within a specific reasonable period where there is:

(a) a material deterioration in reliability of the distribution network resulting from the performance of the generator's equipment;
(b) a material negative impact on the quality of power of an existing or a new customer resulting from the performance of the generator's equipment; or
(c) a material increase in generator capacity at the site where the equipment deemed compliant is located.

17.2.9 The Distribution Licensee may act in accordance with sub-section 17.2.8 once the Distribution Licensee has developed rules and procedures for requiring equipment to be brought into actual compliance and these rules and procedures have been provided to the generator.

17.3 Co-ordination and Compliance of Embedded Generating Units

17.3.1 A Distribution Licensee may disconnect or request the owner of an embedded generator to disconnect, any embedded generating unit from the distribution network if the embedded generating unit breaches any safety regulations or is not in compliance with the requirements of this Code or any other codes or relevant regulations in Liberia.

17.3.2 An embedded generator must ensure that:

(a) the embedded generating unit, and any equipment within it that is connected to a distribution network;
  (i) complies with this Code;
  (ii) complies with all environmental standards and regulations, and any other relevant standards, codes, and regulations of Liberia; and
  (iii) is maintained in a safe condition;
(b) protection equipment is always effectively coordinated with the electrical characteristics of the distribution network;
(c) If requested under sub-section 17.3.1, the owner of an embedded generator must disconnect the embedded generating unit from the distribution network.

17.4 Register of Embedded Generators

A Distribution Licensee shall maintain a record of all embedded generators connected to its networks. As a minimum, the register must contain the name of the original owner, or the person who has a relevant Connection Agreement with the Distribution Licensee, the associated National Metering Identifier (NMI) of the embedded generator and the Connection address.

17.5 Sharing Arrangements Between Distribution Licensees

17.5.1 A Distribution Licensee that owns distribution facilities in another Distribution Licensee's licensed service area and decides to share those distribution facilities with the Distribution Licensee licensed to service the area, shall have an arrangement (or agreement) that prescribes the terms of sharing of their assets, resources, services, and information.

17.5.2 An operating agreement for multiple ownership circuits shall include, among other conditions, clauses that require that:

(a) each section owner provides downstream owners with fault current information and protection settings of upstream protective devices;
(b) each section owner provides upstream owners with load forecasting information;
(c) each section owner ensures generally acceptable industry standards pertaining to power quality and the voltage levels are adhered to on the section owner's portion of the feeder;
(d) the owner of the feeder breaker be responsible for maintaining appropriate relay settings for overall feeder protection; and
(e) each Distribution Licensee shall be responsible to provide the required information to accomplish appropriate relay settings for overall feeder protection, including information on feeder characteristics and loading information.

17.5.3 In existing or new multiple ownership circuits, a Distribution Licensee shall be responsible for maintenance, protection, and power quality of the Distribution Licensee's own portion of the shared feeder. The Distribution Licensee shall ensure that its portion of the feeder has proper fault protection and voltage within proper limits.

This generally would require the owner of each section of the feeder to provide for suitable overcurrent protection devices and voltage regulators, as appropriate, at the upstream boundary and suitable metering, if not already available for settlement purposes, at the downstream boundary.

17.6 Load Transfers

17.6.1 A Distribution Licensee *(referred to in this section as the geographic Distribution Licensee)* that provides distribution services through a load transfer may continue to do so under the following conditions:

(a) the load transfer customer enters into a Connection Agreement or is deemed to have an implied contract with the geographic Distribution Licensee and interacts only with the geographic Distribution Licensee;

(b) the geographic Distribution Licensee provides service to the load transfer customer in accordance with its Condition of Service and bills the load transfer customer in accordance with its regulated charges and rates;

(c) the geographic Distribution Licensee is responsible for system reliability or equipment failures associated with the distribution network equipment it owns or operates that is used to deliver electricity to the load transfer customer;

(d) the geographic Distribution Licensee allows the Distribution Licensee that owns the connection assets *(referred to as the physical Distribution Licensee)* access to the distribution equipment used to service the load transfer customer, as required for system reliability and safety;

(e) the geographic Distribution Licensee is responsible to the physical Distribution Licensee for all charges and costs incurred by the load transfer customer for all the costs of electricity provided to the customer through the physical Distribution Licensee's distribution network; and

(f) the physical Distribution Licensee is responsible for facilities the loading transfer customer's access to retail competition and shall interact with any competitive retailer chosen by the customer.

17.6.2 A physical Distribution Licensee that provides distribution services through a load transfer may continue to do so under the following conditions:

(a) the physical Distribution Licensee refers the load transfer customer or a retailer that intends to service the load transfer customer to the geographic Distribution Licensee for all issues. The geographic Distribution Licensee is responsible to work with the physical Distribution Licensee on any issues that are the direct responsibility of the physical Distribution Licensee;
(b) the physical Distribution Licensee is responsible for system reliability or equipment failures associated with the distribution equipment it owns or operates that is used to deliver electricity to the load transfer customer; and
(c) the physical Distribution Licensee allows the geographic Distribution Licensee access to its equipment, as required for system reliability and safety.

17.6.3 During the five-year period after this Code comes into effect, a physical Distribution Licensee shall be obligated to continue to service an existing load transfer customer unless otherwise negotiated between the physical Distribution Licensee and geographic Distribution Licensee.

17.6.4 During the five-year period after this Code comes into effect, a geographic Distribution Licensee that services a load transfer customer shall either:

(a) negotiate with a physical Distribution Licensee that provides load transfer services so that a physical Distribution Licensee will be responsible for providing distribution services to the customer directly, including application for changes to the licensed service areas of each Distribution Licensee; or
(b) expand the geographic Distribution Licensee's distribution network to connect the load transfer customer and service that customer directly.

17.6.5 Once a load transfer customer enters into a Connection Agreement or implied contract with the physical Distribution Licensee, the physical Distribution Licensee shall have sole responsibility for that customer.

17.6.6 A Distribution Licensee may enter into a new load transfer agreement with another Distribution Licensee after securing LERC's approval.

17.7 Net Metered Generators

17.7.1 For Net Metered Generators:

(a) "eligible generator" in respect of a Distribution Licensee means a customer of a Distribution Licensee that meets the following criteria;
  (i) the generator generates the electricity primarily for the generator's own use;
  (ii) the generator generates the electricity solely from a renewable energy source;
  (iii) the maximum cumulative output capacity of the equipment used to generate the electricity that the generator intends to return to the Distribution Licensee for net metering purposes is no greater than 500 kilowatts based on the rated maximum output capacity of the equipment; and
  (iv) the generator conveys the electricity that is generated directly from the point of generation to another point for the generator's own consumption without reliance on the Distribution Licensee's distribution system before conveying any electricity that is in excess of the generator's own needs at the time of generation into the Distribution Licensee's distribution system.

(b) "net metered generator" means an eligible generator to whom net metering has been made available by a Distribution Licensee.

17.7.2 A Distribution Licensee shall, upon receipt of a request, make net metering available to eligible generators in its licensed service area in accordance with the Net Metering Regulation, on first-come first-served basis, unless the cumulative generation capacity from net metered generators in its licensed service area equals one percent of the

Distribution Licensee's annual maximum peak load for the Distribution Licensee's licensed service area, averaged over three years, as determined by the LERC from time to time.

17.7.3 A Distribution Licensee shall bill a net metered generator on a net metering basis in accordance with the Net Metering Regulation provided that the net metered generator returns eligible electricity to the Distribution Licensee by conveying eligible electricity into the Distribution Licensee's distribution system.

17.7.4 A Distribution Licensee shall, in the manner and time specified by LERC, file with LERC the total rated maximum output capacity of generation facilities in its licensed service area to which the net metering has been made available as of such later date(s) stated by LERC.

17.8 Provision of Information

17.8.1 A Distribution Licensee shall communicate general market and educational information to consumers connected to its distribution network as required by LERC.

17.8.2 A Distribution Licensee shall inform a User about the User's obligations to the Distribution Licensee and shall monitor and require compliance to ensure that the User is meeting its obligations. A Distribution Licensee shall inform the consumer or customer about the Distribution Licensee's rights to disconnect service.

17.8.3 At the request of a customer, a Distribution Licensee shall provide a list of retailers who have Service Agreements in effect with the Distribution Licensee. The list should inform the consumer that an alternative retailer does not have to be chosen to ensure that the consumer receives electricity. Information as regards the terms that are available under the Standard Supply Service shall also be provided.

17.8.4 A Distribution Licensee shall not provide information on products retailed by a retailer.

17.8.5 Upon receiving an inquiry from a customer connected to its distribution network, the Distribution Licensee shall either respond to the inquiry if it deals with the Distribution Licensee's distribution services or provide the customer with contact information for the entity responsible for the item of inquiry.

17.8.6 An embedded Distribution Licensee that receives electricity from a host Distribution Licensee shall provide the host with load forecasts or any other information related to the embedded Distribution Licensee.

SECTION 18: EMERGENCY RESPONSE PLANS – TYPICAL PROCESS & ELEMENTS

18.1 Purpose

To ensure that the Users in the electricity distribution network in Liberia adequately identify, plan for and can respond effectively to emergency situations that might present adverse effects to personnel, facilities, or the environment.

18.2 Scope

This Emergency Response Plan applies to electricity distribution network operations including embedded generator facilities, retailer, and contractor-controlled areas. It addresses all aspects of an emergency preparedness and response systems including identification of potential emergencies, response personnel, preparedness measures, training, equipment, inspections, as well as detailed testing of the Emergency Response Plan.

18.3 Responsibilities/Accountabilities

It is the responsibility of all officials and personnel of the Users to ensure that persons in their area of control comply with this procedure. For specific responsibilities and accountabilities pertaining to emergency preparedness and response, see Table 18-1.

Table 18-1: Allocation of responsibilities & accountabilities

Role	Responsibilities/accountabilities
1) Chief Executive Officer /Managing Director/or the designation for the head of the User organization.	(a) Ensure the operation, maintenance, effective, and up-to-date emergency response plans, contact list and response teams for all major potential emergency considerations; (b) Ensure that the necessary resources are in place to effectively control foreseeable and probable emergency situations; (c) Responsible for the overall management of an emergency; and (d) Ensure mobilization of resources to achieve a satisfactory outcome to an emergency
2) Emergency Response Coordinator /Safety Coordinator/ or the designation for the personnel responsible of the supervision of plan in the User's organization.	(a) Response for oversight of the Emergency Response Plan, including adequate resource availability to respond to emergencies; (b) Review and revise the Emergency Response Plan annually and after any major emergency, if needed; (c) Participate in the development, implementation and supervision of the site-specific Emergency Response Plan; (d) Ensure adequate equipment is available for every site;

(e) Develop and schedule emergency response training programs and drills at every site;
(f) Maintain training and equipment records;
(g) Review of inspection records and testing results annually to ensure emergency equipment is of sufficient quantity and of the correct type for any foreseeable emergencies;
(h) Meet the intent of regulatory requirements related to the Emergency Response Plan; and
(i) Ensure that appropriate levels of skill and competency within the emergency response team are maintained based on the risk profile and probable emergencies of the operation for 24/7 coverage

3) Emergency Response Team	(a) Maintain appropriate levels of skill, competency, and fitness; (b) Carry out inspection and maintenance of emergency equipment; (c) Participate in training sessions and drills; (d) Direct action in the emergency, initiating appropriate activities to minimize the effects of injury at the scene of the incident; and (e) Coordinate efforts with the supervisor and/or management in charge
4) Employees and contractors	(a) Understand the procedure for notification of emergency situations; (b) Respond to alarms and follow directions from emergency response coordinator; (c) Ensure that employees and any visitor are accounted for in the event of an emergency evacuation; and (d) Be aware of emergency meeting locations, their role in an emergency, and the use of appropriate emergency equipment (e.g., fire extinguishers).

Planning Procedure

18.4 Identification of potential incidents and emergencies

18.4.1 All facilities and areas of operations shall be audited in accordance with relevant hazard identification procedures to systematically identify situations or events that require an emergency response including but not limited to:

(a) Electrical leaks or faults;
(b) Fires (structural, equipment, etc.);
(c) Medical emergencies, injuries;
(d) Major chemical or hydrocarbon spills or gas;
(e) Explosions;
(f) Civil disturbances; and
(g) Natural disasters.

18.4.2 Consideration must be given to extreme risks, geographic location of potential events, proximity to populated areas, concerned stakeholders, available external emergency services as well as internal and external communication channels.

18.4.3 Clean up and remediation procedures shall be included in the Emergency Response Plan, in particular for materials that pose a significant risk to human health and safety, the environment or the community.

18.4.4 As a minimum, each User organization will conduct an annual review.

18.4.5 Testing of the Emergency Response Plan, such as drills, and desktop situations shall be conducted to maximize the operation or facility's preparedness for emergencies.

18.5 Availability of Emergency Response Plans (ERP)

18.5.1 A controlled copy of the Emergency Response Plan shall be available to appropriate personnel and at key locations and must be linked to the safety systems of the Users

18.5.2 To ensure a systematic approach is applied to identify and manage the emergency or event, an emergency response plan shall be communicated to relevant organizations such as the Fire Service, Police and Hospitals.

18.6 Emergency notification and coordination

18.6.1 The Emergency Response Plan shall clearly define the actions required to manage and control significant risk situations, how to notify and activate internal and external emergency response service (fire response, police, ambulance, etc.), and how to liaise with government agencies in the event of an emergency.

18.6.2 Communications with media, government inquires, and release of public statements will be as per the User's Public Affairs policy and the policy must define who is responsible for dealing with media and government inquires and the release of public statements in case of an emergency.

18.6.3 Formal mutual agreements shall be established between appropriate operations, local emergency service groups, other utility companies, and other appropriate groups where they exist to provide beneficial or mutual assistance to the network's operation and community.

18.7 Emergency response team

18.7.1 Facilities and areas of operation shall have an adequate number of personnel with appropriate expertise who are trained and competent to respond to emergencies 24hours a day throughout the year.

18.7.2 Emergency Response Teams shall be trained to a skill level commensurate with the identified operational risks and hazards as a minimum.

18.8 Training and drill

Training and scenario exercise (physical/desktop) shall be conducted at least annually and actual response if formally critiqued, can be considered a sufficient training exercise.

18.9 Emergency equipment location

18.9.1 Areas of operation and facilities shall identify key locations and provide emergency equipment as required.

18.9.2 Emergency equipment shall be in easily accessible locations and within a reasonable distance from that identified source of the potential hazard and such locations shall be sign-posted and clearly marked on layout drawings that shall be maintained up to date in accordance with regulatory requirements; and

18.9.3 Alarms and warning devices such as lights, sirens, bells, etc and emergency evacuation lighting shall be installed in locations where personnel need to be warned of hazard or evacuate in the event of an emergency.

18.10 Inspections and maintenance

18.10.1 Emergency equipment, alarms, lighting and warning systems shall be regularly inspected in accordance with a schedule and maintained in proper working conditions.

18.10.2 Inspections shall be carried out by qualified personnel.

18.10.3 Formal records of inspection and testing shall be reviewed and maintained.

18.11 Post emergency activities

18.11.1 The site shall conduct a debriefing following emergency events or emergency response exercise to identify deficiencies and communicate these to the appropriate personnel.

18.11.2 Records of emergency response drills and/or events shall be maintained, and these include actions identified from the debriefing, which shall be documented for corrective action.

18.11.3 The Emergency Response Plan and any associated procedures shall be reviewed post emergency to identify any additional corrective actions and/or updates to the plan.

PART D: STANDARDS OF PERFORMANCE

Introduction:

The Standards of Performance, Part states the indicators and benchmarks for quality and reliability of supply. It also contains the sub-code for metering which describes the applicable standards and installation arrangements for metering.

SECTION 19: BENCHMARKS AND INDICES FOR STANDARDS OF SUPPLY: RELIABILITY AND QUALITY

19.1 Purpose

19.1.1 The purpose of this Section of the Distribution Code is to:

(a) specify the various indices to be used by LERC to monitor the performance of the operations of the Distribution Licensee;
(b) define minimum levels of quality of supply to customers;
(c) define minimum reliability standards, benchmarks and performance targets for the distribution system operations and
(d) enable Users to design, operate and maintain their systems and equipment to fit the environment within which they operate.

19.1.2 The Distribution Licensee shall monitor and report to the LERC the performance of the distribution system operations in terms of

(a) the quality and reliability of supply; and
(b) the quality of customer service.

19.2 Standards for power quality and reliability

19.2.1 The quality of power supply in the distribution network for any period shall be considered to be acceptable when the following conditions are present:

(a) Nominal voltage magnitudes are within the allowable deviation of 10% or are not contrary to the limits stipulated in Technical Schedule TS-A of this Code;
(b) Transient voltage variations are within the allowable threshold of plus or minus 15% for less than 1 minute and for less than ten (10) seconds for phase-to-earth and phase to phase fault conditions as prescribed in Technical Schedule TS-B of this Code;
(c) voltage fluctuations that cause flicker are within the allowable limits or are not contrary to the limits prescribed in sub-section 15.1.14 of this Code; and
(d) voltage and current harmonic distortions do not exceed the limits stipulated in Technical Schedule TS-C of this Code.

19.2.2 The reliability of power supply in the distribution network for any period is considered acceptable when the total duration of unacceptable quality of supply resulting in interruptions to customers is maintained within acceptable limits.

19.2.3 The following indices shall, at the minimum, be monitored and calculated for the purposes of assessing the reliability performance of the distribution system:

(a) system average minutes of interruptions per customer served (SAIDI) due to planned interruptions;
(b) average minutes of interruptions supply per customer served (SAIDI) due to unplanned interruptions;

(c) average number of unplanned interruptions per customer served (SAIFI), excluding momentary interruptions;

(d) average interruption durations for customers interrupted during a year (CAIDI).
(e) The average number of interruptions per customer served from the distribution system per year (CAIFI);
(f) average number of momentary interruptions per customer (MAIFI); and
(g) maximum duration of planned interruptions (for all voltage levels)

19.3 Reliability of Supply Targets

19.3.1 Subject to sub-section 19.3.3, the LERC is responsible for setting the performance targets for indices to be reported on periodically by the Distribution Licensee as part of its reporting obligations under the Distribution License and in accordance with the Customer Service and Quality of Supply Regulations.

19.3.2 The LERC shall evaluate the distribution system reliability indices annually to compare actual performance of the Distribution Licensee with the respective unique targets set for that year. The LERC shall publish the ensuing performance results.

19.3.3 Despite sub-section 19.3.1, before 31 December each year, a Distribution Licensee must publish on its website, and in a newspaper circulating in the area in which its distribution system is located, its targets agreed with LERC for reliability of supply for the following year.

19.3.4 The targets for the reliability indices as provided in sub-section 19.3.1 must be set for the entire distribution system and also disaggregated based on customers supplied from Cable, Industrial & Urban feeders, County Capital feeders and rural feeders in the format as stipulated in technical schedule TS-E.

19.3.5 A Distribution Licensee must use best endeavors to meet targets required in accordance with the provisions of the Customer Service and Quality of Supply Regulations and this Code or otherwise meet reasonable customer expectations of reliability of supply.

19.4 Targets for Distribution System Losses

19.4.1 **L**osses in the distribution system shall be classified as provided in sub-section 15.7.1 for the determination or assessment of efficiency performance of the distribution system.

19.4.2 The LERC shall set targets for acceptable levels of the types of losses in consultation with the Distribution Licensee and the Distribution Licensee shall report annually on the performance of its loss profiles. The LERC shall monitor trends in the development of losses for the Distribution Licensee.

19.5 Targets for Power Factor at Connection Point

19.5.1 Despite sub-section 15.5.1, at the minimum, the power factor at the connection point of a large customer with maximum demand meter must not be less than 0.95 lagging and it must not go leading unless otherwise agreed with the Distribution Licensee.

19.5.2 Where the power factor is allowed to fall outside the limits provided in sub-section 19.5.1 without any corrective response from the large customer, the customer shall be liable to a penalty charge as prescribed in the Customer Service and Quality of Supply Regulations.

SECTION 20: METERING

20.1 Purpose and Application

20.1.1 The purpose of this Section is to set out distribution metering provisions relating to –

(a) main metering installations and check metering installations used for the measurement of active and reactive energy;
(b) the collection of metering data;
(c) the provision, installation, and maintenance of equipment;
(d) the accuracy of all equipment used in the process of electricity metering;
(e) testing procedures to be adhered to;
(f) storage requirements for metering data;
(g) competencies and standards of performance; and
(h) the relationship of entities involved in the electricity metering industry.

20.1.2 The provisions under this Section apply to all Users in respect of a metering point at the boundary of the distribution system.

20.1.3 A metering point relating to a generator that sells its output to a trader and not to the Distribution Licensee shall be governed by the relevant provisions of the LEGC.

20.2 Provision of Meters and Metering Services

20.2.1 As a principle of metering under this Distribution Code, the following points within the distribution network must have a metering installation –

(a) each point of supply connecting an end-use customer to the distribution system;
(b) each point of connection between a generator and the distribution system; and
(c) each point connecting the distribution systems of Liberia to a neighboring country.

20.2.2 A Distribution Licensee shall provide, install, and maintain a meter installation for the retail settlement and billing purposes for each customer connected to the Distribution Licensee's distribution network, subject to sub-section 20.3.4.

20.2.3 A Distribution Licensee must have a metering installation that complies with the **NRS 057 metering specification**s at each of the Points of Connection listed under sub-section 20.2.1.

20.2.4 A Distribution Licensee may install a demand meter (measures kW every, say 15min) or interval meter (measures kWh in 15mins) for purposes of measuring demand (or energy-kWh) in order to assign the customer to a rate class or to set the appropriate distribution services rate for the customer.

20.2.5 As of the date this Code comes into force a Distribution Licensee shall have six (6) months to provide a demand meter to be installed for any existing customer that is billed on demand and energy unless otherwise agreed between the customer and the Distribution Licensee.

20.2.6 A Distribution Licensee may set the threshold level for installation of demand meters other than that required by sub-section 20.2.5 as long as the threshold is delineated by customer class in the Distribution Licensee's Conditions of Service with the approval of LERC.

20.2.7 A Distribution Licensee shall identify in its Conditions of Service the type of meters that are available to a customer, the process by which a customer may obtain such meters and types of charges that would be levied on a customer for each meter type.

20.2.8 Customers with a maximum demand beyond a limit specified in the Distribution Licensee's Conditions of Service (e.g., 5 MVA or more), generators and connections to neighboring countries must have *main and check metering*; and there must be separate *main* and *check* CT cores, but one dedicated VT must be allowed.

20.2.9 A Distribution Licensee shall provide a special purpose meter or *check meter* within a reasonable period to any customer who submits to it a written request for such a meter installation, subject to the following conditions:

(a) the customer that requests a special metering shall compensate a Distribution Licensee for all incremental costs associated with that meter, including the capital cost of the special meter, installation costs associated with the special meter, ongoing maintenance (including allowance for meter failure), verification and reverification of the meter, installation and ongoing provision of communication line or communication link with the customer's meter, and cost of metering made redundant by the customer request for special metering,

(b) a communication system utilized for special meters shall be in accordance with the Distribution Licensee's requirements, and

(c) a communication line shall be required in the case of inside or restricted access meters.

20.3 Metering Requirements for Generating Facilities

20.3.1 A Distribution Licensee shall require that a generator licensed by LERC whose plant is connected to its distribution network, that sells energy and settles through the Distribution Licensee's retail settlement process install an appropriate meter.

20.3.2 A Distribution Licensee shall meter customers with generation that does not require the LERC license, such as back-up capability or generation for load displacement, in the same manner as the Distribution Licensee's other load customers.

20.3.3 For a customer wishing to make a micro renewable infeed into the distribution system –

(a) the installation must not be metered using a pre-paid meter;

(b) the installation must have a meter capable of measuring active power flow in both directions;

(c) unless the Distribution Licensee has a small-scale infeed tariff approved by the LERC the energy supplied by the customer into the distribution system must be compensated by the Distribution Licensee at the same energy rate

as payable by the customer to the Distribution Licensee for energy supplied to the customer; and

(d) the installation must, where applicable, comply with net metering guidelines and rules established by the LERC.

20.3.4 A Distribution Licensee shall require that a customer with an embedded generation facility connected to the Distribution Licensee's distribution network install its own meter in accordance with the Distribution Licensee's metering requirements and provide the Distribution Licensee with the technical details of the metering installation.

20.3.5 Where practical, metering for an embedded generation facility shall be installed at the point of supply. If it is not practical to install the meter at the point of supply, a Distribution Licensee shall apply loss factors to the generation output in accordance with the loss factors applied for retail settlements and billing.

20.4 Responsibility for metering installations

20.4.1 A Distribution Licensee shall be responsible for **the meter and metering** installation and must ensure that all the points identified as metering points in accordance with the principles specified in sub-section 20.2.1 are provided with appropriate metering installations.

20.4.2 Metering equipment owned by the Distribution Licensee, and other Users (licensee, retailer, or metering service provider) but installed on the premises of the customer must remain the property of the service provider.

20.4.3 Except with written consent by the Distribution Licensee, access by customers or customer representatives to meters, metering circuits and metering data must be restricted to ensure that the integrity of the metering device, metering installation and meter data are not at risk.

20.4.4 Unless prior written approval has been obtained from the Distribution Licensee, customers or customer representatives may not have direct physical access to meters including access gained by downloading the metering information from the meter directly through the digital communication interface or remotely through any communication media such as a modem.

20.4.5 Despite sub-section 20.4.4 requests from customers to read their own meters must not be unreasonably refused.

20.4.6 Except with written consent by the Distribution Licensee, customers or customer representatives may not install any metering or other equipment integrated into the User**'s** CT and VT metering circuits, test blocks, terminals or any portion forming part of the electrical metering installation.

20.4.7 Where a metering installation is situated in a restricted area the procedures stated in **applicable legislation or agreed** on by the parties must be followed to gain access to the equipment.

20.4.8 If a customer or customer's representative requires real time energy pulses (kWh & kVArh) at a metering installation, the Distribution Licensee must provide the real-time

energy pulses through mutual agreement and the customer must pay the costs of installation in that event.

20.4.9 Any changes that may affect the authorized and safe access of the parties to the metering equipment must be reported as soon as it is brought to the attention of any of the parties.

20.4.10 Customers shall not tamper or permit tampering with metering equipment owned or operated by the Distribution Licensee.

20.4.11 The Distribution Licensee shall be responsible for managing and collecting metering information.

20.4.12 Users connected to or wanting to connect to the distribution system must provide the Distribution Licensee with all information considered necessary to enable performance of the metering duties.

20.4.13 In the event of a metering installation being positioned between two distribution networks operated by different licensees –

(a) both licensees shall be responsible for installing and maintaining the metering installation in accordance with the requirements of this Code;
(b) all costs related to the metering installation shall be shared by both Licensees; and
(c) the Licensees must ensure that the **transmission** metering administrator is given remote or electronic access to the metering installation where appropriate, and if access to the metering installation compromises the security of the installation, then metering data must be supplied to the **transmission metering administrator** daily in an appropriate format if required.

20.5 VEE Process

20.5.1 Metering data collected by a Distribution Licensee shall be subjected to a validating, estimating, and editing (VEE) process if it is to be used for settlement and billing purposes.

20.5.2 A Distribution Licensee shall establish a VEE process according to local practice that is fair and reasonable and provides assurance that correct data is submitted to the settlement process. The VEE process shall do the following:

(a) Convert raw metering data into validated, corrected or estimated “settlement-ready” metering data suitable for use in determining settlement amounts in accordance with the settlement schedule in the Retail Settlement Code.

(b) Detect errors in metering data introduced as a result of improper operational conditions and/or hardware/software malfunctions, including failures of or errors in metering or communication hardware, and metering data exceeding pre-financed variances or tolerances.

(c) Use operational system data, including historical generation and load patterns and data collected by the Distribution Licensee, as appropriate, for validating raw metering data, and for editing, estimating and correcting metering data, found to be erroneous or missing.

20.5.3 A Distribution Licensee's billing procedure shall be consistent with the provisions of the Customer Service and Quality of Supply Regulations issued by LERC and this Code.

20.5.4 Where an embedded generation facility metering installation does not conform to the standard of the National Standards Laboratory or the accuracy class of instrument transformer cannot be confirmed, a Distribution Licensee shall require the embedded generation facility to have a metering installation, including instrument transformers, tested and apply appropriate correction factors to meter readings until such time as standards conformance is achieved.

20.5.5 A Distribution Licensee shall ensure that persons involved in metering services have competency in performing these services. Competency may be based on recognized qualification requirements that include a training course that meets the requirements of the tasks to be performed. Metering services provided by a person that does not have the recognized qualification requirements shall be reviewed, affirmed and documented by a person with exhibited competency.

20.5.6 A Distribution Licensee that provides metering services directly through a contractor shall exercise appropriate diligence in detecting and acting upon instances of tampering with metering and service entrance equipment. Upon identification of possible meter tampering, the Distribution Licensee should rectify and take appropriate action.

20.5.7 Nothing in this Code shall affect the obligation of a Distribution Licensee to comply with all requirements of the National Standards Laboratory provided that, where this Code or other conditions of license prescribe a higher standard than that prescribed in those requirements, the Distribution Licensee shall comply with the higher standard.

20.5.8 A Distribution Licensee shall respond to customer and retailer metering disputes and shall establish a fair and reasonable charge for costs associated with resolution of these disputes. If the complaint is substantiated, the charge shall not be applied. In resolving the dispute, a Distribution Licensee may use a qualified, independent organization at any time during the dispute resolution process.

20.6 Periodic calibration and testing of metering equipment

20.6.1 Meters shall be calibrated and refurbished, as necessary, at intervals not exceeding those specified in Table 20-1.

20.6.2 Commissioning, auditing, and testing of metering installations shall be done in accordance with an acceptable industry standard specification **(i.e., NRS 057-4**.)

20.6.3 A User may request that testing of a metering installation be performed and that request may not be unreasonably refused. However, the costs associated with the testing shall be for the account of:

(a) the requesting User if the meter is found to be accurate; or
(b) the Distribution Licensee if the meter is found to be inaccurate.

Table 20-1 — Intervals for periodic calibration of meters

Load	Calibration interval (years)
≥ 100 MVA	5
10 MVA to < 100 MVA	5
1 MVA to < 10 MVA	10
< 1 MVA (electronic)	10
< 1 MVA (electromechanical)	20

20.7 Frequency of meter reading

A Distribution Licensee shall be accountable for meter reading of credit meters at minimum intervals as provided in Table 20-2. Prepayment metering is excluded from the provisions under this section, but some AMR systems might include meters that can be configured as both credit meters and prepayment meters.

Table 20-2 — Periodic meter reading intervals

Load	Meter reading interval
≥ 100 MVA	Daily
10 MVA to < 100 MVA	Weekly
1 MVA to < 10 MVA	Monthly
100 kVA< 1 MVA	Monthly
< 100 kVA	Three-monthly

20.8 Metering database

20.8.1 A Distribution Licensee must create, maintain, and administer a metering database containing the following information:

(a) name and unique identifier of the metering installation;
(b) the date on which the metering installation was commissioned;
(c) the connecting parties at the metering installation;
(d) maintenance history schedules for each metering installation;
(e) telephone numbers used to retrieve information from the metering installation;
(f) type and form of the meter at the metering installation;

(g) fault history of a metering installation; and
(h) commissioning documents for all metering installations.

20.8.2 Information relating to raw and official values of meter reading and billing must form part of the metering database and must be retained for at least five years for audit trail purposes.

20.9 Metering Database Inconsistencies

If testing reveals an inconsistency of meter data in the metering database, the Distribution Licensee shall inform all affected Users and corrections must be made to the official metering data and the associated billing to an extent as reasonably agreed between the parties.

20.10 Access to Metering Data

20.10.1 Metering data shall be accessed through a central database that stores all customer information and which shall be maintained by the Distribution Licensee.

20.10.2 The Distribution Licensee shall control access to all metering installations.

20.10.3 Electronic access to the meters may not be granted to the customer or any other party unless special permission has been granted by the LERC.

20.10.4 Schedules for accessing metering data from the central database must be administered by the Distribution Licensee.

20.10.5 All security requirements for metering data must be as specified in accordance with the agreed Standard.

20.10.6 Official metering data must be made available by the Distribution Licensee on request by the customer in a format agreed on by the parties and the Distribution Licensee may levy a charge for the provision of that data which is in relation to the cost of providing the data.

20.11 Confidentiality

Metering data and passwords shall be treated as confidential information. The Distribution Licensee shall ensure that metering data is protected from access by unauthorized persons.

SECTION 21: INFORMATION AND DATA EXCHANGE DISCLOSURE

21.1 Background, Purpose, and Scope

21.1.1 The Distribution Licensee has an obligation to ensure that the distribution network is operated in a reliable and secure manner. To achieve this, the Distribution Licensee shall obtain from and provide the Users with power system information needed for the maintenance of system security. The exchange of information will enable the Users to carry out their obligations and meet statutory reporting requirements.

21.1.2 The Distribution Licensee shall obtain from the Users, the technical and operational information needed for the discharge of the Distribution Licensee's responsibilities to provide open, fair and non-discriminatory access to the distribution network for all the Users.

21.1.3 This *(Information and Data Exchange)* Section is based on the requirements of the Distribution Code and other statutory requirements. The Distribution Code defines the reciprocal obligations of the Users regarding the provision of information and exchange of data for the implementation of the Distribution Code.

21.1.4 The requirements of this Section are complementary to any information and data exchange requirements defined in other sections of the Distribution Code.

21.2 Information Exchange Interface

21.2.1 The Distribution Licensee shall designate an office as its contact office for the exchange of information pertaining to the real time operation of the distribution network.

21.2.2 A User shall designate an office as its point of information and data exchange and shall provide the Distribution Licensee with all the relevant details of contact for its offices.

21.2.3 A User shall identify the following for each type of information exchange:

(a) the name(s), title(s)/position(s) and contact details of the person(s) designated by the User to be responsible for provision of the information; and
(b) the purpose for which the information is required.

21.2.4 Users shall agree on appropriate procedures for the transfer of information.

21.3 General Principles for Implementation of Information and Data Exchange

21.3.1 A User shall keep readily available, complete, and accurate records of all data required for the proper administration of the Distribution Code.

21.3.2 The Distribution Licensee will provide open and timely exchange of relevant information among the Users, to facilitate the secure and reliable operation of its distribution network.

21.3.3 The information exchanged between the Distribution Licensee and a User may be either confidential (bilateral) information or public information intended for all parties.

The provider of the information shall indicate whether the information being provided should be considered confidential or public.

21.3.4 The Distribution Licensee shall make available critical data to allow a User to make rational and informed decisions regarding the operations of its distribution network.

21.3.5 The Distribution Licensee shall publish all relevant non-confidential information in a timely manner, or make them accessible by all Users, in an open and non-discriminatory manner.

21.3.6 In the case of electronic data sharing, access to the distribution network information shall be provided on read-only basis.

21.3.7 A Distribution Licensee shall be responsible for the procurement and maintenance of the required communication systems as well as the data communication costs of its systems used for the purpose of Information and Data Exchange.

21.4 Information Exchange Between Users

Provision of Information to the Distribution Licensee

21.4.1 The Distribution Licensee may require information of a technical nature, to the extent not supplied under any other provisions of the Distribution Code, to be supplied by the Users to enable it (the Distribution Licensee) to undertake the following:

(a) analysis and evaluation of equipment and service performance of the distribution network as well as the preparation of the distribution network performance reports;
(b) survey of distribution network conditions;
(c) assessment of risks to distribution network operations;
(d) analysis of distribution network equipment performance; and
(e) analysis and validation of policies of the Distribution Code.

21.4.2 The Distribution Licensee shall, for the purposes of sub-section 21.4.1, send a written request to a User, setting out the information it reasonably requires, the preferred medium and format for the submission and the time by which it reasonably requires a response to the request.

21.4.3 A User shall use all reasonable endeavors to provide the required information in the required format and within the time stated.

21.4.4 Unless specifically provided in other sections of the Distribution Code, communications with the Distribution Licensee on all other matters shall be with the Head Office of the Distribution Licensee.

21.5 Planning Information

21.5.1 A User shall provide on a regular basis such information as the Distribution Licensee may reasonably request for the purposes of planning and developing the distribution network and to enable the Distribution Licensee to fulfil its statutory or regulatory

obligations. Users shall submit the information to the Distribution Licensee without unreasonable delay.

21.5.2 The Planning Information to be provided shall be as specified in Section 7 of this Distribution Code and any other information which may from time to time be required.

21.5.3 A distribution network Asset Owner shall provide a User with information about equipment and systems installed at LV distribution and sub-transmission substations.

21.5.4 The Distribution Licensee shall keep an updated technical database of its distribution network for purposes of modelling and studies on the distribution network.

21.5.5 The Distribution Licensee shall provide other distribution Companies and Large Customers with any relevant information that may be reasonably required to properly plan and design their networks and systems to comply with their obligations for Connection as prescribed under Sections 8,9, 10 and 11 [Connection Sub-Code] of this Distribution Code.

21.6 Network Information Exchange

21.6.1 A User shall promptly provide to the Distribution Licensee, on request, network information that is considered reasonable for the security and integrity of the distribution network.

21.6.2 Customers must exchange information with the Distribution Licensee within an agreed lead time on all operations on their installations which may have an adverse effect on the distribution system including any planned activities such as plant shutdown or scheduled maintenance.

21.6.3 The Distribution Licensee shall communicate network information as required for safe and reliable operation to the contact points designated by each User required.

21.6.4 The network information exchange shall be both electronic and paper based and within the time frame agreed upon between the Users.

21.7 Operational Communication and Data Retention Requirements

21.7.1 Adequate communication facilities and procedures shall be established between the Distribution Licensee and each User to allow the timely transfer of information.

21.7.2 The communication facilities standards must be set and documented by the Distribution Licensee. Any changes to communication facilities standards impacting on a user's equipment must be brought to the attention of the User well in advance of the proposed change.

21.7.3 The communication facilities for voice and data that are to be installed and maintained between the Distribution Licensee and a User shall comply with the applicable IEC and ITU standards for SCADA and Communication equipment.

21.7.4 The communication facilities shall support data acquisition from Remote Terminal Units. The Distribution Licensee shall be capable of monitoring the state of the

distribution network via telemetry from the Remote Terminal Unit connected to plant or facility of a User plant and/or substation.

21.7.5 The Distribution Licensee and User may in place of the above systems adopt the use of new technologies and methodologies for communication of information, where there is a recognizable benefit in quality, reliability, and features and to do so would be reasonable in the circumstances.

21.7.6 Any back-up or emergency communication channels established by the Distribution Licensee and deemed necessary for the safe operation of the distribution system must be agreed upon by the Distribution Licensee and the affected User.

21.8 Scada Infrastructure

21.8.1 Users must establish a communication channel for exchange of information required for distribution operations which may include the installation of SCADA equipment of the Distribution Licensee at the customer installation or vice-versa to facilitate the flow of information and data to and from the distribution or transmission control facilities.

21.8.2 Where distribution network is connected to SCADA infrastructure for monitoring and control, each Distribution Network Node shall be accessible to the SCADA system which shall be used for storage, display, and processing of operational data.

21.8.3 All Users shall make available outputs of their respective operational equipment to the SCADA System, where applicable.

21.8.4 SCADA Remote Terminal Units shall be installed for the transmission of signals and indications to and from the Distribution Licensee. The required signals and indications must be provided by the User for transmission by SCADA equipment together with such other data or information as the Distribution Licensee may reasonably request from time to time, by notice to the User.

21.8.5 All SCADA, metering, computer and communications equipment and the data or information carried by the distribution network shall be secure from unauthorized access. Procedures governing security and access shall be agreed with Users but shall allow for adequate access to the equipment and information by the User and Distribution Licensee for the purposes of maintenance, repair, testing and recording of measurements.

21.9 Time Standard

The time standard used shall be the Coordinated Universal Time (UTC) Standard and all-time information shall be referenced to it. To maintain synchronization, each distribution network node shall be provided with a connection to GPS satellite receivers that enable all relevant devices to maintain time synchronization.

21.10 Data Retention and Archiving

21.10.1 The Distribution Licensee and every User shall maintain sufficient records to support audit and verification requirements and to support monitoring of compliance with the provisions of the Distribution Code. They shall also maintain adequate data and records, in sufficient detail, to support event diagnostics and trouble shooting.

21.10.2 The Distribution Licensee shall maintain a complete and accurate record of all Operational Data supplied or maintained under this Code.

21.10.3 All Operational Data shall be so maintained for a period of not less than five years, commencing from the date the Operational Data was first supplied or first created, if earlier.

21.10.4 The Distribution Licensee shall allow Users access to its records of Operational Data.

21.10.5 The obligations for data retention and archiving shall be the responsibility of the information owner.

21.10.6 The systems for the storage of data and information to be employed by the Distribution Licensee and Users shall be of their own choice and installed at own cost.

21.10.7 Despite sub-section 21.10.6, a Distribution Licensee must:

(a) use a voice recorder for historical recording of all operational voice communication with Users which must be available for at least three months except where there is an incident involved in which case the requirements of any applicable legislation must apply; and
(b) make the voice records of an identified incident in dispute available within a reasonable time period after a request to do so from a User or the LERC.

21.10.8 A User with own MV or HV network must keep proper written, or voice recorded records of all operations on its MV and HV networks.

21.10.9 An audit trail of all changes made to archived data must

(a) be maintained;
(b) identify every change made and the time and date of the change; and
(c) include both pre and post values of all content and structure changes.

21.10.10 The LERC may at any time audit the data retention and archiving systems of a Distribution Licensee.

21.10.11 A Distribution Licensee shall store operational information that is kept electronically for a period of at least **five years** or for the life of the plant or equipment concerned, whichever is the longer.

21.10.12 A Distribution Licensee shall ensure reasonable security against unauthorized access, use and loss of information. To this end, a Distribution Licensee shall, among other things, develop and implement a backup strategy for the information system equipment.

21.11 Distribution Network Performance Data Reporting

21.11.1 The following distribution network performance indicators and operational information shall be made available by the Distribution Licensee to LERC and upon request to Users:

(a) Daily – *(submitted by the close of the next following day)*:
  (i) Power and energy generation by each generating facility registered with the Distribution Licensee;
  (ii) Hourly actual demand of the previous day in MW;
  (iii) Reserve amounts during the morning and evening peaks of the previous day in MW.

(b) Monthly – *(submitted within 2 weeks after end of each month)*:
  (i) Energy balance indicating internal generation, imports, exports, energy available for sale and transmission distribution losses;
  (ii) Generating plant Availability (if applicable);
  (iii) Number and total duration of frequency excursions outside the statutory limits;
  (iv) Number and total duration of voltage excursions outside statutory limits;
  (v) Outage time at each distribution network node.

(c) Quarterly and Annually – *(submitted within 2 months after the quarter and 3 months after end of year respectively)*:
  (i) Energy balance for the period year;
  (ii) Peak demand in MW during the period, date and time;
  (iii) Minimum demand in MW during the period, date and time;
  (iv) Outage time at each distribution network node for the period.

21.11.2 A distribution network Asset Owner (where the operator is a different operating entity) shall also make available all information collected via recorders installed at substations to the Distribution Licensee for analysis. The Distribution Licensee shall make this information available to affected Users on request.

21.11.3 The Distribution Licensee shall publish by close of each Monday, a weekly report on the power distribution system performance for the previous week, including a report on Significant Incidents and operating conditions relevant to the operation of the distribution system.

21.12 Events Reporting

21.12.1 In the case of a Significant Incident, which has been notified by a User to the Distribution Licensee, the User shall provide a written report to the Distribution Licensee.

21.12.2 In the case of a significant incident which has been notified by the Distribution Licensee to a User, the Distribution Licensee shall provide a written report to all affected Users.

21.12.3 The reports referred to in sub-sections 21.12.1 and 21.12.2 shall, where applicable, include at least the following:

(a) time and date of Significant Incident;
(b) the location;
(c) plant and/or equipment involved;
(d) brief description of the Significant Incident;
(e) estimated time and date of return to service;
(f) supplies/generation interrupted and duration of interruption;
(g) generating unit – frequency response achieved;
(h) generating unit – MVar performance achieved;
(i) any other information that the Distribution Licensee or User reasonably considers may be required in relation to the Significant Incident

21.13 Significant Incident

21.13.1 Every case where either-or combination of the following happens shall be treated as a ***Significant incident***:

(a) malfunctioning of Equipment, Apparatus connected to the Distribution Network;

(b) a person, or animal receives an electric shock, whether mild or serious or suffers an injury or burn, directly or indirectly due to electrical causes.

21.13.2 The personnel of the Distribution Licensee in charge of the concerned Equipment, Apparatus or area shall report the incident immediately to the highest responsible officer of the Distribution Licensee in charge within 12 hours. A designated officer from the affected Distribution Licensee should reach the spot within 24 hours and assess the situation and probable cause of the accident, losses to consumers, and damage to Equipment, Apparatus of the Distribution Licensee, or the User(s).

21.14 Confidentiality Obligations

21.14.1 A Distribution Licensee shall use all reasonable endeavors to keep as confidential any information classified as such and which comes into the possession or control of that Distribution Licensee or of which the Distribution Licensee becomes aware.

21.14.2 The information owner may request the recipient of the information to enter into a confidentiality agreement before information established to be confidential is provided.

21.14.3 A Distribution Licensee shall not:

(a) disclose confidential information to any third party without the written consent of the owner or provider of the information.
(b) use or reproduce confidential information for any purpose other than that for which it was disclosed or for purposes contemplated by this Code; and
(c) permit unauthorized persons to have access to confidential information.

21.14.4 A Distribution Licensee shall use all reasonable endeavors to prevent unauthorized access to confidential information which is in the possession or control of that Distribution Licensee.

21.14.5 A Distribution Licensee shall ensure that any person to whom it discloses confidential information observes the provisions for confidentiality in relation to that information.

21.14.6 A Distribution Licensee shall report any unauthorized disclosure of information that is governed by a confidentiality agreement as soon as practicable after it has become aware of the unauthorized disclosure and shall provide all reasonable assistance to ensure recovery or destruction of that confidential information as may be deemed appropriate by the information owner or provider.

21.15 Exceptions

The confidentiality provisions in this section of the Distribution Code do not prevent the disclosure, use or reproduction of information:

(a) if the relevant information is at the time generally and publicly available other than because of breach of confidentiality by a Distribution Licensee or any person to whom the Distribution Licensee has disclosed the information;
(b) by a Distribution Licensee for the use of an employee or officer of the User or a related body corporate of the Distribution Licensee; or a legal or other professional adviser, auditor or other consultant which require the information for the purposes of this Code, or for the purpose of advising the Distribution Licensee;
(c) with the consent of the person or persons who provided the relevant information under this Code;
(d) to the extent required by law or by a lawful requirement of any government or governmental body, authority or agency having jurisdiction over a Distribution Licensee or its related bodies corporate;
(e) if required in connection with legal proceedings, arbitration, expert determination, or other dispute resolution mechanism relating to this Code;
(f) if required to protect the safety of personnel or equipment; or
(g) of an historical nature in connection with the preparation and submission of reports under this Code.

21.16 Disclosure of Confidential Information

A Distribution Licensee that needs to disclose confidential information shall consult with the provider of the information prior to its release and inform those affected by the information disclosure.

SECTION 22: COMPLAINTS AND DISPUTE RESOLUTION

22.1 Complaints Handling Process

22.1.1 The Distribution Licensee's Customer Charter must include information on its complaint handling processes which must be in accordance with the LERC's Complaints Handling Guidelines and the Customer Service and Quality of Supply Regulations issued by LERC.

22.1.2 When a Distribution Licensee responds to a customer's complaint, the Distribution Licensee must inform the customer that the customer has a right to raise the complaint to LERC if not satisfied with the licensee's remedy.

22.1.3 A Distribution Licensee must include information about the disconnection procedures in the Customer Service and Quality of Supply Regulations and including any disconnection warning issued by the Distribution Licensee.

22.2 Special Dispute Resolution Procedure

Despite the provisions under section 22.1, Distribution Licensees and Users shall comply with the special dispute resolution procedures specified in the Micro Utility Licensing Regulations, if applicable, and shall be exempt from this section.

SECTION 23: BREACH OF THE DISTRIBUTION CODE

23.1 Distribution Licensee's Obligation to Remedy

If a Distribution Licensee breaches this Code, it must remedy that breach as soon as practicable.

23.2 Notification to Other Users

23.2.1 If a Distribution Licensee becomes aware of its failure to comply with any obligation under the Code, which can reasonably be expected to have a material, adverse impact on the other User, it must:

(a) notify each customer likely to be adversely affected by the non-compliance within 3 business days;
(b) undertake an investigation of the non-compliance as soon as practicable but in any event within twenty (20) business days; and
(c) advise the other User of the steps it is taking to comply.

23.2.2 If a Distribution Licensee becomes aware of a breach of this Code by other Users, which is not of a trivial nature, the Distribution Licensee must notify the other Users, in writing, of:

(a) details of the non-compliance and its implications, including any impact on the Distribution Licensee and other Users;
(b) actions that the other Users could take to remedy the noncompliance;
(c) a reasonable period in which compliance must be demonstrated;
(d) any consequences of non-compliance; and
(e) the Distribution Licensee's procedure for handling complaints.

23.3 Other Users Obligation to Remedy

A User must use best endeavors to remedy any non-compliance with this Distribution Code within the period specified in any notice of non-compliance sent by a Distribution Licensee in accordance with sub-section 23.2.2 or other Users.

23.4 Disconnection for Non-Compliance

A Distribution Licensee may disconnect supply to a customer's location address if:

(a) the customer has not fulfilled an obligation to comply with this Code as notified under sub-section 23.2.2;
(b) the Distribution Licensee has given the customer '5 business days' written notice of disconnection (such notice to be in addition to the notice referred to in sub-section 23.2.2); and
(c) the customer fails to comply with the notice or enters an arrangement to comply but fails to comply with that arrangement.

PART E: RENEWABLE ENERGY PROVISIONS

Introduction

Part E constitutes the Renewable Energy Sub-code (for Distribution) which provides the basic technical performance requirements that a VRPP needs to comply with in order to connect its generating facility directly to a distribution network or system in the Republic of Liberia. This Part defines the rules and minimum standards that the Distribution Licensee shall consider when connecting a VRPP to the distribution network for ensuring safe, reliable, and secure operations and also where the distribution network is connected to the transmission system, taking cognizance of its technical requirements and obligations under the LGTC to ensure an efficient and healthy operation of the LITS.

SECTION 24: RENEWABLE ENERGY SUB-CODE

24.1 Background, Purpose, and Scope

24.1.1 The ELL provides for the policy to promote the development of renewable energy resources in the electricity generation mix of the country using appropriate RETs. However, some RETs such as wind and solar PV present variable resource availability that should be harnessed and this requires the establishment of guidelines to facilitate the connection of these variable renewable generating facilities to the distribution network without degrading system operations, performance, and security.

24.1.2 The capability to withstand disturbances which result in temporarily depressed voltages on a distribution network is critical in maintaining power system stability and in preventing exacerbation of disturbances leading to the risk of cascading outages. It is in this area that more stringent requirements have been applied for these RETs (Wind power and solar PV).

Purpose

24.1.3 This Section 24 of the Distribution Code specifies minimum connection, technical and design conditions for a Variable Renewable Power Plant (VRPP) with Wind or Solar PV resource harnessing technology that is connected to or seeking connection to a distribution network, in accordance with international best practices and standards so that they will be able to contribute to stability of the power system.

Scope

24.1.4 The requirements in this Renewable Energy Sub-Code shall apply to all wind and solar photovoltaic RETs referred to as VRPPs with a design capacity of 2 MVA or larger (up to 5 MVA -recommended) connected or seeking connection to the distribution system at a voltage less than 36kV.

24.1.5 The provisions in the Sub-code constitute the basic technical performance requirements that a VRPP User needs to comply with to connect its generating facility to the distribution network and covers the following:

(a) the definition of rules and standards that the Distribution Licensee shall follow when connecting VRPPs to the distribution system; and

(b) the provision of guidance and basis for both the Distribution Licensee and the VRPP User to cooperate through supply of necessary data and information about their systems to ensure safe, reliable, and secure operation of the power system and the connected VRPPs.

24.1.6 A VRPP User seeking connection to the distribution network shall comply with this Sub-Code in addition to all other applicable requirements in the other sections of the Distribution Code and including any other directions that may be issued from the Transmission System Operator (TSO), through the Distribution Licensee, where necessary and applicable.

24.2 Technical Connection Conditions

General

24.2.1 As a general rule in implementing this Sub-code, a VRPP User shall at all times comply with all applicable requirements and conditions of connection for generating units in the other sections of the Distribution Code and in accordance with its Connection Agreement with the Distribution Licensee.

Frequency range of operation

24.2.2 A VRPP shall be capable of remaining connected to the distribution network within the frequency ranges and for the specified periods in Table 1.

Table 1: Frequency Ranges of Operation (Must remain connected conditions)

Frequency range (Hz)	**Minimum operation period**
47.5 ≤ F < 48.75	90 minutes
48.75 ≤ F < 51.25	Unlimited (Continuous range)
51.25 < F ≤ 51.5	90 minutes
51.5 < F ≤ 52	15 minutes

24.2.3 A VRPP shall be allowed to disconnect from the distribution network when it operates outside the frequency and for the time ranges specified in Table 1.

24.2.4 There shall be no technical restriction regarding the delivery of active power or reactive power within the frequency range of 49 Hz to 51 Hz and a VRPP shall be permitted unrestricted operation within this frequency range, except that high frequency response effects set in at frequencies >50.2Hz thus limiting active power output as shown in Figure 1 and in accordance with sub-section 24.4.7.

24.2.5 The minimum active power output that a VRPP shall be capable of delivering *(at various prevailing frequencies at the PoC)* is as shown in Figure 1. The frequency dependent power limits according to Figure 1 relate to the technical capability under the condition that sufficient primary energy of the RET (i.e., wind speed, solar irradiation) is available. Additional limits due to limited primary energy may apply but these limits are not frequency dependent.

Voltage Range of Operation

24.2.6 There shall be no disconnection of any unit of a VRPP module if voltage at the PoC remains within plus or minus ten percent (±10%) of the nominal voltage or within IEC-voltage limits for continuous operation *(referred to as the Continuous Voltage Range)*, whichever is the narrower voltage range.

24.2.7 There shall be no restrictions regarding the provision of active or reactive power when the VRPP is operating with voltage at the PoC between plus or minus five percent (±5%) of the nominal voltage, referred to as the *Unrestricted Voltage Range.*

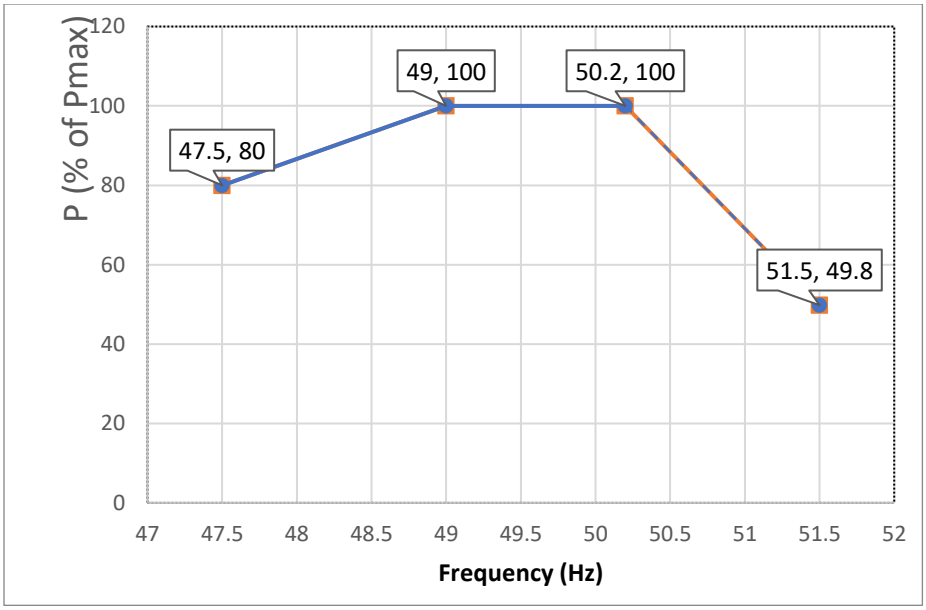

Figure 1: Maximum Active Power Capability as a Function of Frequency

Power Quality

24.2.8 The power quality of a VRPP shall be determined in terms of measurement of the following parameters at the PoC:

(a) Voltage variation and voltage unbalance

(b) Flicker and

(c) Harmonics

24.2.9 A VRPP shall ensure that the power it injects into the distribution network is within the limits prescribed in the subsequent provisions for each of the parameters listed in sub-section 24.2.8.

Voltage variations and Voltage unbalance

24.2.10 Voltage variations at the PoC resulting from regular switching operations *(such as switching operation on a wind turbine within a wind farm or switching of a shunt reactor/capacitor)* within the VRPP shall not deviate more than two percent (≤2%) of the nominal voltage.

24.2.11 The maximum permitted voltage change at any point within the VRPP's network (or system) shall be limited to five percent (5%) of the nominal voltage in respect of changes resulting from:

(a) switching of several units within a VRPP,

(b) connection of a complete VRPP, or

(c) disconnection of a complete VRPP.

24.2.12 A VRPP shall not cause phase voltage unbalance exceeding one percent (≤1%) in the Unrestricted Operation Range and two percent (≤2%) when in the Continuous

Operation Range and shall also be capable of withstanding the same in the distribution network.

24.2.13 Voltage unbalance shall be measured in terms of negative sequence voltage in percent of nominal voltage.

Flicker

24.2.14 The Distribution Licensee shall, through its system operator, apportion flicker emission limits to each VRPP using the methodology specified in IEC 61000-3-7 and based on flicker planning levels according to –

(a) sub-section 15.1.14 of the Distribution Code,

(b) existing background flicker levels,

(c) possible future installations, and

(d) the total size of a VRPP to be connected.

24.2.15 In the absence of any flicker limits apportioned by the Distribution Licensee, flicker caused by a VRPP shall not exceed the emission limits specified in Table 2.

Table 2: Flicker limits to be applied

Planning Level	Emission Limit
Pst	0.4
Plt	0.4

Harmonics

24.2.16 The Distribution Licensee shall, through its system operator, apportion individual harmonic distortion limits (HD) and total harmonic distortion (THD) to each VRPP using methodology specified in IEC61000-3-7 and based on a planning level for THD according to –

(a) Technical Schedule TS-C of the Distribution Code,

(b) existing background flicker levels,

(c) possible future installations and

(d) the total size of a VRPP to be connected.

24.2.17 In the absence of any apportioned limits issued by the Distribution Licensee, harmonic voltage distortion limits at the PoC as prescribed in Table 3 shall apply.

Reactive Power Capability

24.2.18 A VRPP shall operate within a power factor range of 0.95 leading to 0.95 lagging, measured at the PoC.

Table 3: Harmonic Voltage Distortion limit for Distribution Network connected generators

Individual Voltage Distortion - (IHD) - Odd (%))	Individual Voltage Distortion - (IHD) - Even (%)	Total Voltage Distortion -THD (%)
2.0	1.0	3.0

24.2.19 A VRPP shall be capable of varying power factor continuously in the entire range of 0.95 under-excited to **0.95** over-excited during operation with maximum active power output and voltage within the Unrestricted Voltage Range of operation.

24.2.20 A VRPP shall be capable of varying reactive power at the PoC within its reactive power capability range as defined by Figure 2, when operating within the Unrestricted Voltage Range (i.e. 0.95pu≤ V ≤1.05pu) and at an active power output level between five percent (5%) and a hundred percent (100%) of the rated power.

24.2.21 The VRPP module shall be designed in such a way that when operating under conditions specified in sub-section 24.2.20, the operating point can lie anywhere within its maximum and minimum capability (within the blue boundaries) according to Figure 2. [*These reactive power limits will be reduced pro rata to the amount of plant in service.]*

24.2.22 If voltage is outside the Unrestricted Voltage Range but within the Continuous Voltage Range the reactive power capability limits of a VRPP shown in Figure 2 can be adjusted to the voltage dependent limits according to Figure 3.

24.2.23 The voltage dependent limits adjustment requirement in sub-section 24.2.22 applies once automatic tap changer(s) of the grid transformer(s) or any switched shunts in the VRPP module have operated. In the period(s) that the automatic tap changer is not functional the VRPP module is required to reduce active power export so that reactive power capability can be provided.

24.2.24 In the case of operation with active power below five percent (5%) of P_n, there is no reactive power capability requirement but, in this range, reactive power must be within the tolerance range of plus-or-minus five percent (±5%) of P_n, specified by points A, B, C and D in Figure 2. Points **A and C** are equivalent (in MVar) to minus five percent (–5%) of rated output and points **B and D** are equivalent (in MVar) to plus five percent (+5%) of rated output.

24.3 Reactive Power Control Requirements

General

24.3.1 A VRPP shall be equipped with the following functions using set points and gradients to execute, upon instruction from the Distribution Licensee in accordance with the Systems Operational Manual:

(a) reactive power Q control, and

(b) Power factor control

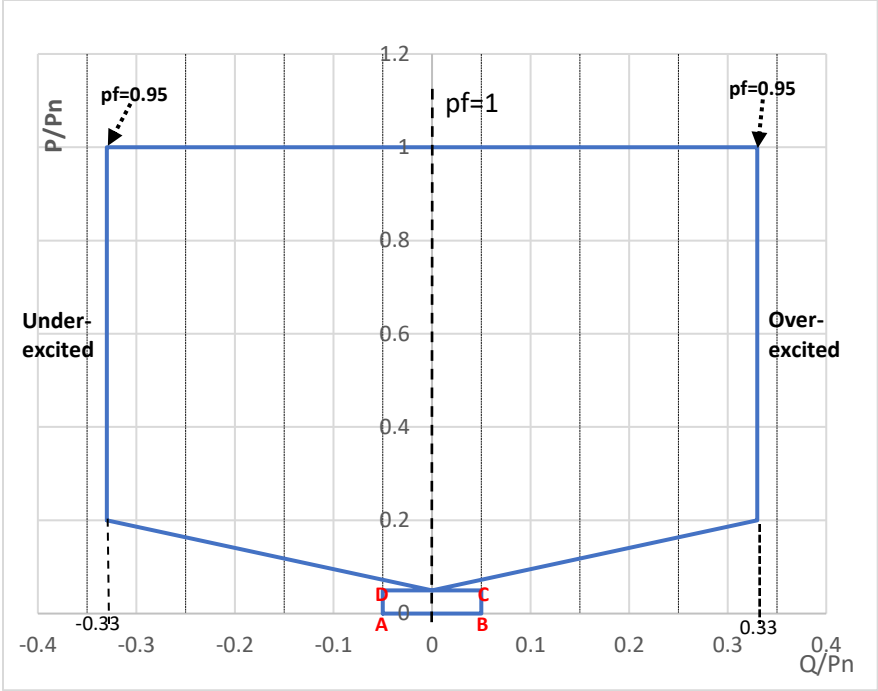

Figure 2: Reactive power requirements for Distribution Network connected VRPPs at Full and partial active power output conditions

[Note: Pn in MW corresponds to the rated installed capacity of a VRPP minus the sum of the installed capacity of all units being temporarily out of service (e.g. on maintenance).]

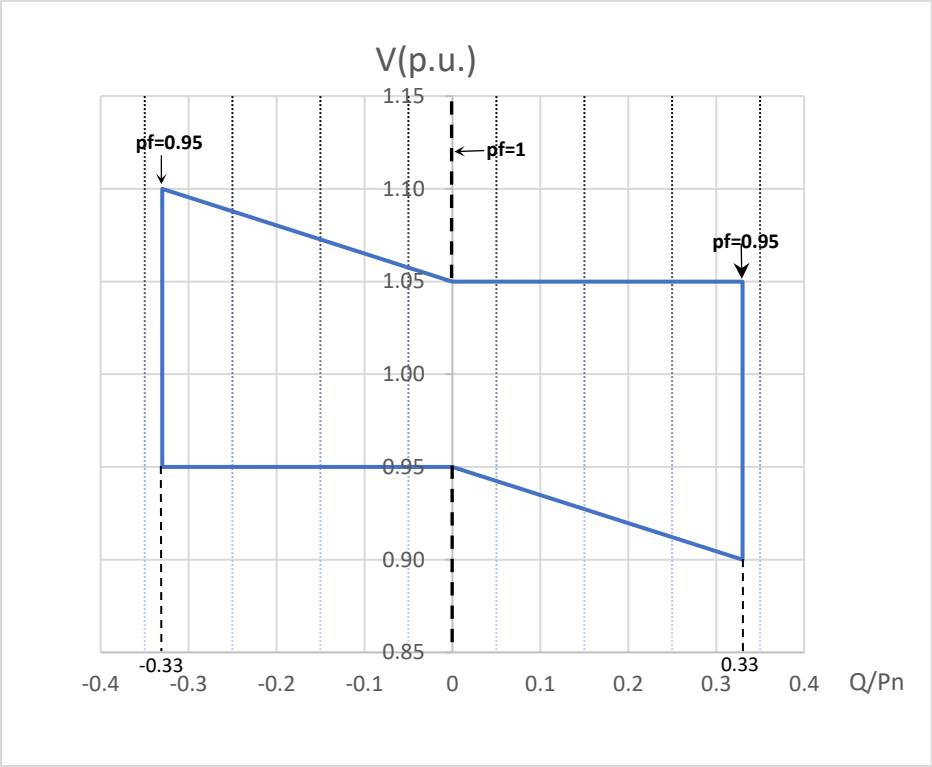

Figure 3: Reactive power requirements for Distribution Network-connected VRPPs corresponding to voltage

24.3.2 The control function and applied parameter settings (or target values) for reactive power and power factor control functions shall be determined by the Distribution Licensee and implemented by the VRRP User.

24.3.3 The agreed control functions and initial parameters together with possible range of target values shall be documented in the Connection Agreement.

Reactive power control (Q control)

24.3.4 A VRPP shall be capable of controlling reactive power at the PoC (Q control) either to a constant reactive power target (Q-target) or an active power dependent reactive power target [Q(P)] as illustrated in Figure 4 where the vertical, light-blue line (independent of active power) represents an example of Q-target control, or the green line (in function of active power) represents an example of the Q(P) control.

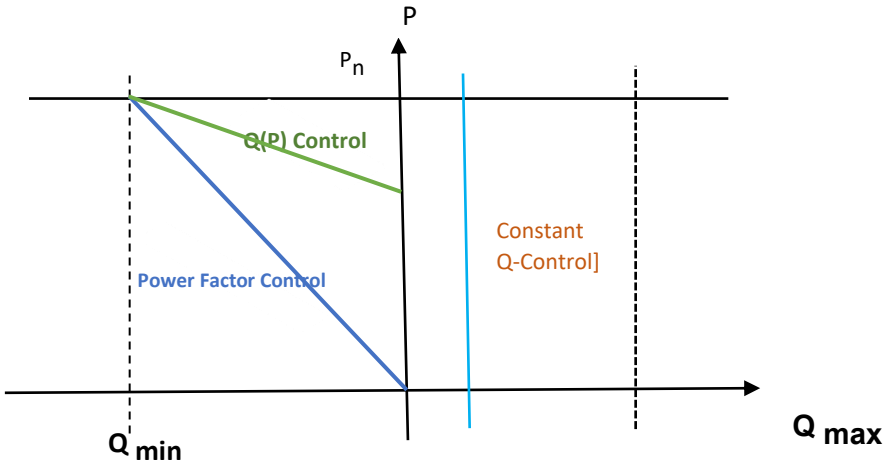

Figure 4: Reactive Power & Power Factor Control functions for the VRPP module connected to a Distribution Network

24.3.5 The Distribution Licensee shall define the actual settings of the Q-target or Q(P) control characteristic (target values or shape of the Q(P)-characteristic,) which will always start from unity power factor (i.e. zero MVar).

24.3.6 If the control target is changed by the Distribution Licensee, such change shall be completed within the 2 minutes after receipt of the new target value.

24.3.7 The maximum permitted deviation of actual reactive power from the Q-target shall be no greater than two percent (2%) of rated power, that is 0.02 p.u., beyond which the automatic control system should act to restore the operating point on to the characteristic within two (2) minutes after change of Q-target during steady state system conditions.

Power factor control (cosφ-control)

24.3.8 Power factor control is a control function controlling the reactive power to maintain a constant power factor at the PoC.

24.3.9 A VRPP shall be capable of controlling power factor at the PoC either to a constant power factor target (cosφ-target) or an active power dependent power factor target (cosφ(P)) as illustrated by the blue line in Figure 4.

24.3.10 The Distribution Licensee shall define the actual settings of the cosφ or cosφ(P) control characteristic [cosφ-target or the shape of cosφ(P)-characteristic].

24.3.11 If the control target is changed by the Distribution Licensee, such change shall be completed within two (2) minutes after receipt of the new target value.

24.3.12 The maximum permitted deviation of actual power factor from the cosφ-target shall be no greater than $\Delta\cos\varphi=0.005$, beyond which the automatic control system should act to restore the operating point on to the characteristic set cosφ-target within two minutes after change of cosφ -target during steady state system conditions.

24.4 Active Power Curtailment of a VRPP Output

24.4.1 It may be necessary for the Distribution Licensee to curtail a VRPP's active power output for system security reasons or for other reasons in compliance with instructions of the TSO where the distribution network is connected to the transmission system.

24.4.2 A VRPP module shall be capable of setting an active power curtailment set point in MW to limit active power following receipt of an instruction from the Distribution Licensee.

24.4.3 If the Distribution Licensee issues an instruction to a VRPP User to set an active power curtailment set-point, the User shall begin to respond to the new set-point within two (2) minutes and should ramp to the new active power curtailment set-point at the ramp rate agreed with the Distribution Licensee within plus-or-minus one percent (±1%) accuracy of deviation from the rated power set-point.

24.4.4 Any active power curtailment set-point shall apply until such times as the Distribution Licensee releases the active power curtailment set-point.

24.4.5 The type of communication between the Distribution Licensee and a VRPP User must be agreed between the parties and specified as part of the Connection Agreement.

High frequency active power reduction requirement for VRPPs

24.4.6 During high frequency operating conditions within the power system each VRPP shall be required to operate at a mandatory reduced active power output to stabilize the system frequency.

24.4.7 When the power system frequency exceeds 50.2Hz, each VRPP connected to the distribution system shall be required to reduce active power as a function of change in frequency as illustrated in Figure 5.

24.4.8 High frequency response must operate with a minimum ramp rate of 100% of rated power per minute as provided by the primary frequency control time scales.

. Primary and secondary frequency control

24.4.9 A VRPP is exempted from primary or secondary frequency control capabilities except for high frequency response according to sub- sub-sections 24.4.6 to 24.4.8.

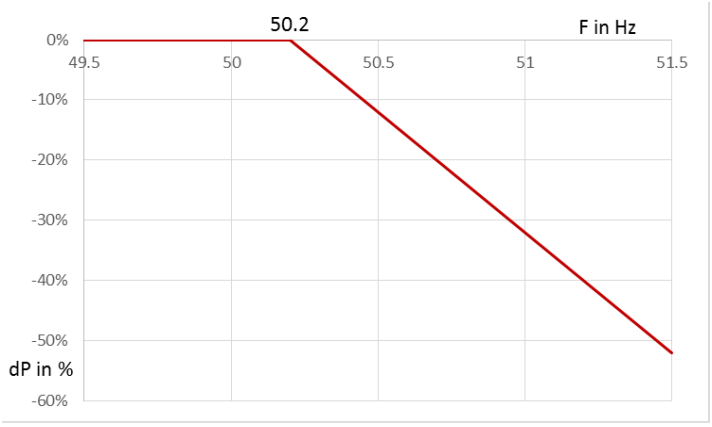

Figure 5: Mandatory high frequency response for all LITS connected VRPPs

24.5 Behavior of VRPP During Abnormal Voltage Conditions

Fault Ride-through Requirements

24.5.1 Fault ride-through refers to the ability of a VRPP to remain connected to the distribution network during a system voltage disturbance. Four main characteristics typically provide the requirements for VRPPs in the event of a voltage disturbance:

(a) Conditions for which the VRPP must remain connected;

(b) Active power provision during a fault;

(c) Restoration of active power after the fault has been cleared.

Remain-connected voltage conditions

24.5.2 A wind or solar PV VRPP shall remain connected to the distribution network for voltage disturbances on any or all phases, where the system phase voltage measured at the PoC remains within a specified level for a specified length of time.

24.5.3 The remain-connected requirements take the form of a 'voltage verses time' profile as illustrated in Figure 6 which dictates the level of voltage drop or increase that a VRPP must be capable of withstanding along with the time for which the voltage drop or increase should be endured.

24.5.4 A VRPP shall be designed to operate for up to one minute within a voltage range of plus-or-minus fifteen percent (±15%) of nominal voltage in the transient state according to Technical Schedule TS-B.

24.5.5 For all voltages at the PoC, which are between the HVRT (yellow) and the LVRT (blue) lines *and marked as Area A (that is A1 and A2)* according to Figure 6, no disconnection of a VRPP or of individual units within a VRPP shall be permitted.

24.5.6 The voltage at PoC is defined to be the lowest of the three line-line or line-earth voltages.

24.5.7 In the *Area A2,* the continuous voltage range, the VRPP shall be able to operate continuously between voltages of 0.9 p.u. and 1.1 p.u. and shall stay connected to the network and uphold normal production.

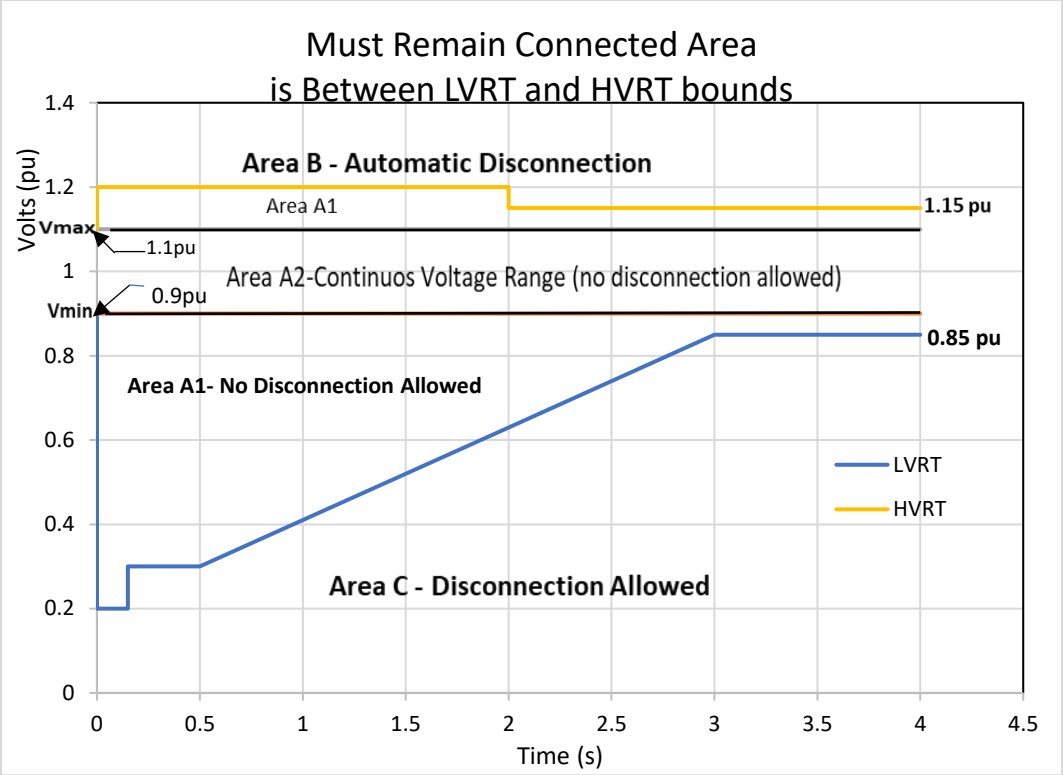

Figure 6: LVRT and HVRT capability for distribution network connected VRPPs

24.5.8 *Area B* (the area above the HVRT Bound) and *Area C* (the area below the LVRT Bound) are the areas of operation where disconnection of the VRPP is allowed.

24.5.9 If the voltage reverts to the Continuous Voltage Range, between Vmin and Vmax, during a fault sequence (e.g. resulting from reclosing), subsequent voltage drops or voltage spikes shall be regarded as new LVRT or HVRT condition. If several successive fault sequences occur and the voltage remains outside of the normal voltage operating range, the successive series of faults shall be considered as one continuing fault condition.

Active power provision and reactive current flows during fault

24.5.10 During a voltage dip the controllable VRPP shall provide active power in proportion to retained voltage and maximize reactive current to the LITS without exceeding its declared limits.

24.5.11 The maximization of reactive current during a fault shall continue for at least six hundred milliseconds (600 ms) or until the voltage recovers to within the normal operational range of the LITS, whichever is the sooner.

Reactive current support of voltage during LVRT/HVRT situations

24.5.12 During LVRT and HVRT situations, both symmetrical and asymmetrical, all the units of a VRPP having its terminals connected directly to the secondary side of the substation shall support the distribution network voltage by injecting or absorbing additional reactive current ΔIq at the generator terminals proportional to the change of the unit's terminal voltage ΔV_t, as shown in Figure 7.

24.5.13 The factor of proportionality between additional reactive current and voltage deviation is named K ($\Delta Iq=K\Delta V_t$) and the factor K must be settable in the range of $0 \leq K \leq 10$.

24.5.14 The absolute value of current (I) in each of the three phases of the unit's terminals may be limited to rated current (1 p.u.).

24.5.15 During dynamic performance, after sixty (60) milliseconds the additional current must have settled, meaning that it shall remain within a tolerance band of plus-or-minus twenty percent (±20%) around the value according to Figure 7.

24.5.16 During a LVRT situation, a VRPP having a connection on a distribution feeder shall control active and reactive power according to a "zero current" strategy, meaning that both, active and reactive current shall be reduced to zero.

24.5.17 During a HVRT situation, a VRPP having a connection on a distribution feeder shall maintain normal active and reactive power control modes.

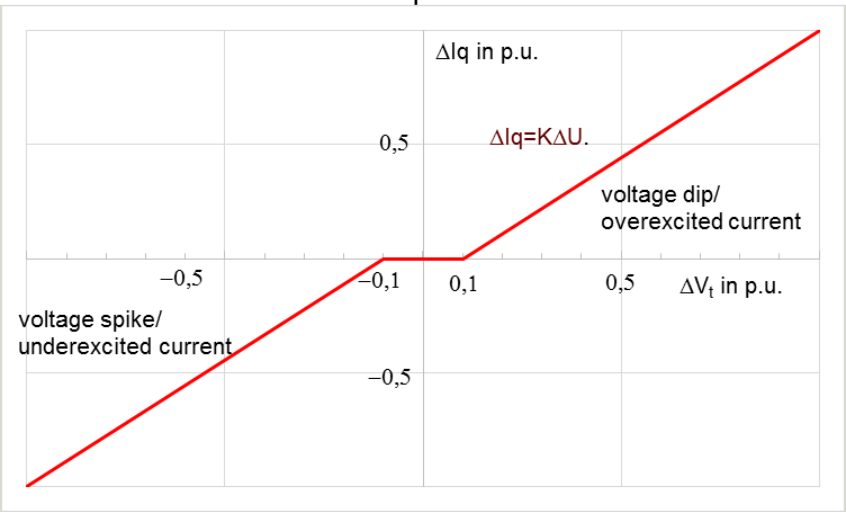

Figure 7: Reactive current support ΔIq during LVRT and HVRT situations at the unit's terminals

Active and reactive power recovery after fault

Notes:

1. Voltages and currents in this Section 24.5 are defined to be positive sequence components of fundamental frequency value of voltages and currents respectively. This applies to pre-fault and post-fault voltages and currents.
2. The additional reactive current ΔIq shall be injected in addition to the pre-fault voltage.
3. The positive sign of ΔIq in Figure 8 is voltage supporting injection of reactive power.
4. The voltage deviation, ΔV_t is defined by the difference between the pre-fault and the post-fault voltage.
5. The pre-fault current and pre-fault voltage are defined by the one-minute average of current and voltage respectively.

24.5.18 The controllable VRPP shall provide at least ninety percent (90%) of its maximum available active power as quickly as possible and in any event within one second (1s) of the voltage recovering to the normal or transient operating range of plus-or-minus fifteen percent (±15%) of nominal voltage according to Technical Schedules TS-A or TS-B.

24.5.19 During voltage recovery, a VRPP shall not absorb more reactive power than prior to the LVRT situation.

24.6 Automatic Synchronization Capability

24.6.1 A VRPP User shall install an automatic synchronization device and automatic close equipment that enables the connection of a VRPP to the distribution network automatically, with a delay of five (5) minutes if the following system conditions exist:

(a) Voltage at the PoC is within the Steady State Range of plus-or-minus ten percent (±10%) of nominal voltage, as specified in the Technical Schedule TS-A of the Distribution Code.
(b) System frequency (F) is within the range of 49.8 Hz ≤ F ≤ 50.2 Hz.

24.6.2 During automatic connection or synchronization, a VRPP User must ensure compliance with "rapid voltage change" requirements as prescribed in sub-sections 24.2.10 and 24.2.11 of this Sub-code.

24.7 Protection and Fault Levels

24.7.1 A VRPP User shall design, implement, coordinate, and maintain its protection system to ensure the desired speed, sensitivity and selectivity in clearing faults on the VRPP's side of the PoC.

24.7.2 Protection functions required for protecting the distribution network from getting out of normal operating ranges will be specified by the Distribution Licensee (in consultation with the TSO, where applicable), including trip-settings, response times for over- or under-voltage protection, and over- or under-frequency protection.

24.7.3 A VRPP shall be equipped with effective detection of islanded operation in all system configurations and shall have the capability to shut down generation of power in such condition within two (2) seconds.

24.7.4 The islanded operation of a VRPP with part of the distribution network is not allowed unless specifically agreed with the Distribution Licensee.

24.7.5 The coordination among protections at the Connection Point must be agreed between the Distribution Licensee, (in consultation with the TSO, where applicable) and the VRPP User.

24.7.6 The circuit breaker used for connection switching of a distribution network connected VRPP shall be equipped with a disconnection system to ensure safe operation during re-connection or re-synchronization to the distribution system.

24.7.7 The Distribution Licensee may request that the set values for protection functions of a VRPP be changed following commissioning if it is deemed to be of importance to the operation of the distribution system (or the LITS, where applicable) except that, such a change shall not result in a VRPP being exposed to negative impacts from the distribution network falling outside of the design requirements.

24.7.8 The Distribution Licensee shall inform a VRPP User of the highest and lowest short-circuit current that shall be expected at the PoC as well as any other information about the distribution network as may be necessary to define the VRPP's protection functions.

24.7.9 Where a VRPP's protection equipment is required to communicate with the Distribution Licensee's protection equipment it must meet the communications interface requirements specified by the Distribution Licensee and in accordance with this Sub-code and other relevant sections of the Distribution Code.

24.8 Communication and Control

24.8.1 A VRPP shall be equipped to receive target values for control purposes from the Distribution Licensee such as voltage or reactive power control according to Section 24.3 and other control functions as may be applicable.

24.8.2 A VRPP User shall be responsible for providing data relating to MW forecast and availability estimates of a VRPP, at least for prediction intervals of 2 days-ahead, 1 day-ahead and 4 hours-ahead of real-time to enable the Distribution Licensee to meet its periodical planning and reporting obligations under its License.

24.8.3 The data mentioned in sub-section 24.8.2 shall be made available to the Distribution Licensee by a VRPP User in accordance with the reasonable requirements prescribed under Section 21 of this Distribution Code.

24.8.4 All additional requirements regarding exchange of information shall be agreed upon between the Distribution Licensee and the VRPP User in the bilateral Connection Agreement.

24.9 Testing, Inspection and Compliance Monitoring

24.9.1 A VRPP User shall demonstrate compliance with all applicable requirements specified in this Sub-Code and any other applicable code or standard approved by Distribution Licensee (in consultation with TSO, where applicable), before being allowed to connect to the distribution network for commercial operations.

24.9.2 A VRPP User shall review and confirm to the Distribution Licensee, compliance with every requirement of this Sub-Code and the VRPP User shall do so according to Section 3.4 of the Distribution Code and violations shall be subject to the provisions under Section 5.9 of the Distribution Code.

24.9.3 A VRPP User shall conduct tests or studies to demonstrate that the VRPP complies with each of the requirements of this Sub-Code and submit such test reports to the Distribution Licensee.

24.9.4 A VRPP User shall continuously monitor its compliance in all material respects with all the connection conditions of this Sub-Code.

24.9.5 The Distribution Licensee may issue an instruction requiring a VRPP User to carry out a test to demonstrate that the VRPP is in compliance with the requirements of the Sub-Code and a VRPP User shall not refuse such an instruction.

24.9.6 A VRPP User shall keep records relating to the VRPP's compliance with each section of the Sub-code, or any other codes applicable to that VRPP, setting out such information that the Distribution Licensee reasonably requires for assessing power system performance, including the actual VRPP performance during abnormal or continuous operating conditions.

24.9.7 All records generated under this Section 24.9 shall be kept for a minimum of five (5) years unless otherwise specified in the Distribution Code commencing from the date the information was generated.

PART F: DEFINITIONS

Introduction:

The Definitions, provides meanings and definitions for special words and technical terms used in the text to bring out the meanings in the context that they have been used in the Distribution Code.

In this Code:

+50%	means 1.5 times the relevant voltage
-100%	means 0 Volts
+20%	means 1.2 times the relevant voltage
+80%	means 1.8 times the relevant voltage
acceptable identification in relation to	**a) a domestic customer** includes one of the following: a driver's license, a current passport issued by the Government of Liberia (GoL) or other form of photographic identification, or a birth certificate; or **b) a business customer** which is a sole trader, a partnership or company includes one of the forms of identification for a domestic customer for each of the individuals that conduct the business.
Accident	means any unplanned event that results in damage to property, the natural environment or affect the distribution network operation's relationship with the community,
Law	means Electricity Law of Liberia, 2015
active energy	means the time integral for the product of voltage and the in-phase component of current flow measured in units of Watt-hours or standard multiples thereof: i.e. 1000Watt-hours = 1 Kilo Watt-hour (kWh) 1000 Kilo Watt-hour = 1 Mega Watt-hour (MWh) 1000 Mega Watt-hour = 1 Giga Watt-hour(GWh) 1000 Giga Watt-hour = 1 Tera Watt-hour (TWh
active power	means the rate at which active energy is supplied measured in units of watts and standard multiples thereof, for example: 1000 Watt = 1 Kilo Watt (kW) 1000 Kilo Watt = 1 Mega Watt (MW) 1000 Mega Watt = 1 Giga Watt (GW) 1000 Giga Watt = 1 Tera Watt (TW)
apparent power	means the square root of the sum of the squares of the active power and the reactive power,
augmentation in relation to the transmission connection assets or the Distribution	means the process of upgrading the transmission connection assets or the distribution system by replacing or enhancing existing plant and equipment or by adding new plant or

Licensee's distribution system	equipment and includes modifying any of the Distribution Licensee's distribution fixed assets
business day	means a day, other than a Saturday or Sunday, or a Public Holiday
AMR system	means an automatic meter reading device that creates a one-way connection channel between a business customer and the electric energy supplier ensuring accurate billing
business customer	means a customer who is not a domestic customer
CAIDI	means the '*Customer Average Interruption Duration Index*' which is the average time taken for supply to be restored to a customer when an unplanned interruption has occurred, calculated as the sum of the duration of each customer interruption (in minutes), divided by the total number of customer interruptions (SAIDI divided by SAIFI). Unless otherwise stated CAIDI excludes momentary interruptions.
Commission	means LERC
Complaint	means a written or verbal expression of dissatisfaction about – (a) an action, (b) a proposed action, (c) a failure to act or (d) a failure to observe published practices or procedures, by – (i) a Distribution Licensee, (ii) its employees or (iii) contractors.
confidential information	means any information about a customer or information provided to the Distribution Licensee under an obligation of confidence
Connect	means the making and maintaining of contact between two electrical systems allowing for the supply of electricity between the two systems and includes energization unless expressly excluded; and reconnect has a corresponding meaning
Customer	unless the context otherwise permits or requires, means a person whose electrical installation is connected to the Distribution Licensee's distribution system or who may want to have its electrical installation connected to the Distribution Licensee's distribution system, and includes an embedded generator
Customer Charter	means a code of practice instituted to improve access to an organization's services and to promote quality by telling the customer the standards of service to expect and what to do if something goes wrong;

Date of receipt in relation to a notice given by a Distribution Licensee	means if the Distribution Licensee: (a) hands the notice, or sends a facsimile of the notice, or forwards the notice by email to the customer, the date the Distribution Licensee does so; (b) leaves the notice at the customer's supply address, the date the Distribution Licensee does so; or (c) gives the notice by post, a date 2 business days after the date the Distribution Licensee posts the notice.
deemed distribution contract	means the contract deemed to have been entered between the Distribution Licensee and each "retail customer"
Demand	means the active power or apparent power consumed by a customer in respect of an electrical installation integrated over a fifteen or thirty-minute period
Distribution Company	means a person licensed under the Law to distribute and sell electricity without discrimination to consumers in an area or zone designated by the LERC
Distribution Licensee	means electricity Distribution Company licensed by LERC
distribute (in relation to electricity)	means to distribute electricity using a distribution system
distribution area	means the area in which a Distribution Licensee is licensed (or exempt from the requirement to hold a license) to distribute and supply electricity
distribution fixed assets	means any fixed assets used by a Distribution Licensee to supply electricity including those which have been allocated to the Distribution Licensee even though they may be located in another Distribution Licensee's distribution area
distribution license	means a license to distribute and supply electricity granted under the Law
distribution losses	means electrical energy losses incurred in distributing electricity over a distribution system,
distribution system (in relation to a Distribution Licensee)	means a system of electric lines and associated equipment (generally at nominal voltage levels of 36kV or below) which that Distribution Licensee is licensed to use to distribute electricity for supply under its distribution license excluding public lighting assets
domestic customer	means a customer who purchases electricity principally for personal, household, or domestic use at the relevant supply address

drills	means a situation in which an emergency is simulated to test the preparedness to respond
electrical installation	means any electrical equipment at a customer's site that is connected to, but not part of, a distribution system
embedded generating unit	means a generating unit which is connected to a distribution system
embedded generator	means a generator whose embedded generating units are connected to a distribution system
emergency	means an emergency due to the actual or imminent occurrence of an event which in any way endangers or threatens to endanger the safety or health of any person or which destroys or damages, or threatens to destroy or damage any property
Emergency Response Team (ERT)	means full time employees dedicated to responding to and coordinating emergency situations 24/7 which involves electric distribution network employees, contractors, properties, equipment, and plant
Emergency Response Plan (ERP)	means a comprehensive document that plans for probable emergencies which involves electric distribution network employees, contractors, properties, plants, and equipment and prescribes appropriate response or actions
energization	means the act of the insertion of a fuse or the operation of switching equipment which results in there being a non-zero voltage beyond a point of supply
energy	means active and reactive electrical energy
excitation control system (in relation to an embedded generating unit)	means the automatic control system that provides the field excitation for the embedded generating unit (including excitation limiting devices and any power system stabilizer)
Feeder	means an electric line (overhead conductor or underground cable) and associated equipment at a normal voltage level between 11kV and 33kV which a Distribution Licensee uses to distribute electricity
force majeure breach	means a breach by a Distribution Licensee or a customer of their deemed distribution contract which, the Distribution Licensee or the customer would commit arising only through a force majeure event
force majeure event	means an event outside the reasonable control of a Distribution Licensee or a customer (as the case may be)

generating unit	means an electricity generator and related equipment essential to its operation, which together function as a single unit
generation license	means a license to generate electricity for supply and sale granted under the Law
Generator	means a person who holds (or is exempt from holding) a generation license under the Law
Geographic Distribution Licensee	means the service provider that has been granted the license to provide distribution services in a demarcated area
governor system	means the automatic control system which regulates energy input (for example, steam, gas or water) into the turbine of an embedded generating unit
impulse voltage	means a wave of voltage which, without appreciable oscillations, rises rapidly to a maximum value and falls, usually less rapidly, to zero with small, if any, loops of opposite polarity,
incident	means any unplanned event that has the potential to damage property, the natural environment or affect the electric distribution network operations
interruption	means the temporary unavailability of supply from the distribution network to a customer, but does not include disconnection
interval meter	means a meter that is capable of recording energy consumption in intervals of 30 minutes or less
Large customer	means a large consumer that purchases electricity in bulk.
load	means a customer's demand for electricity at a supply point
Load transfer customer	means a customer *(of a Physical Distribution Licensee)* that is provided with distribution services through a Geographic Distribution Licensee
MAIFI	means the *'Momentary Average Interruption Frequency Index'* which is the total number of momentary interruptions that a customer could, on average, expect to experience in a period, calculated as the total number of momentary interruptions, divided by the total number of connected customers averaged over the period;
major incident	means any forced outage, malfunction or fault of an equipment or apparatus that results in 10% or more customers losing electricity supply from the distribution system;

Metering Code	means the set of requirements made up of standards, procedures, and guidelines for metrology applicable to a particular customer;
momentary interruption	means an interruption continuing for a period of less than one minute;
Person	includes an individual, a company, partnership or any association of individuals, whether incorporated or not;
Physical Distribution Licensee	means a service provider that owns distribution facility(ies) located in the service area of another Licensee (i.e. Geographic Distribution Licensee)
point of common coupling	means the nearest point in a Distribution Licensee's distribution, system that connection is made between: (a) the Distribution Licensee's distribution system and another Distribution Licensee's distribution system; or (b) two or more customers' electrical installations
point of connection (in relation to an embedded generating unit)	means the point at which the embedded generating unit is connected to the Distribution Licensee's distribution system
point of supply (In relation to:) (a) in relation to a low voltage electric line (b) in relation to a high voltage electric line	means: (i) **for an underground line** (unless sub-paragraph (iii) applies), the point at which that line crosses the boundary of the land; and (ii) **for an overhead line** (unless following sub-paragraph applies), the first point of connection of that line on the land, being either: A) if the line is carried onto the land by one or more poles, the first pole on the land carrying that line; B) if the line is connected directly to premises on that land, that connection to the premises; or C) if it is not possible to determine a point of supply in accordance with sub-sub-paragraph (A) or (B), the point at which the line crosses the boundary of the land; and (iii) **for a line connected to a Distribution Licensee's assets**, the point at which the line is connected to a Distribution Licensee's assets; and means the point agreed between the relevant Distribution Licensee and the customer supplied by that electric line,
power factor	means the ratio of active power to apparent power
price determination	means the LERC's Electricity Distribution Price Determination (as re-determined from time to time) or any other price determination in force

Prudent Utility Practice	Means any practice, method and act engaged in or approved by a significant portion of electric utility industry during a relevant time period or any practice, method or act that in the exercise of reasonable judgment in the light of facts known at the time of the decision, could have been expected to accomplish the desired result at a reasonable cost, consistent with good business practices, reliability, safety and expedition;
public holiday	means a public holiday appointed
public lighting assets	means all assets of a Distribution Licensee which are dedicated to the provision of public lighting including lamps, luminaries, mounting brackets and poles on which the fixtures are mounted, supply cables and control equipment (for example, photoelectric cells and control circuitry) but not including the Distribution Licensee's protection equipment (for example, fuses and circuit breakers)
quality of supply	means the measure of the ability of the distribution system to provide supply that meets the voltage quality requirements of this Code
reactive energy	means the time integral of the product of voltage and the out-of-phase component of current flow
reactive power	means the rate at which reactive energy is supplied
reliability of supply	means the measure of the ability of the distribution system to provide supply to customers
redundant load	means a load connected to the distribution system that is planned to be permanently disconnected
retailer	means a person who holds (or is exempt from holding) a retail license under the Law
retail license	means a license granted under the Law to sell electricity otherwise than through the wholesale electricity market
rural area	means an area supplied electricity by an electric line which: (a) forms part of a distribution system; and (b) is a single feeder the length of which measured from the relevant zone substation is at least 15 km
SAIDI	means the *'System Average Interruption Duration Index'*, which is the total minutes, on average, that a customer could expect to be without electricity over a specific period, calculated as the sum of the duration of each customer interruption (in minutes), divided by the total number of connected customers averaged over the period

SAIFI	means the '*System Average Interruption Frequency Index'* which is the number of occasions per period when each customer could, on average, expect to experience an unplanned interruption, calculated as the total number of customer interruptions, divided by the total number of connected customers averaged over the period (Unless otherwise stated, SAIFI excludes momentary interruption)
small embedded generator	means an embedded generator meeting either or both of the following conditions: (a) the embedded generator has or proposes to have embedded generating units at a point of connection with power transfer capability of not more than 2kW; (b) the embedded generator has or proposes to have embedded generating units that meet the standards for the grid connection of energy systems via inverters.
supply (in relation to electricity)	means the delivery of electricity
supply address	means the address where the customer is being supplied with electricity
sustained interruption	means an interruption of duration longer than one minute
System	means the network for the generation, transmission, and distribution of electricity in Liberia
time of use network tariff	means a distribution tariff as determined in accordance with the LERC's prevailing distribution determination or transmission tariff as determined in accordance with the LERC prevailing transmission determination that has varying components for the time that electricity consumption occurs
total harmonic distortion	means the ratio of the root-mean-square of the harmonic content to the root-mean-square of the fundamental quantity, expressed as a percent of the fundamental
transmission connection	means those parts of an electricity transmission network which are dedicated to the connection of customers at a single point, including transformers, associated switchgear and plant and equipment
urban feeder	means a feeder with load density greater than 0.3 MVA/km
user	includes a customer, a retailer, an embedded generator, or Distribution Licensee that is connected to the network of a Distribution Licensee
voltage	means (except in the case of impulse voltage) the root mean square (RMS) of the phase to phase voltage

TECHNICAL SCHEDULES

Technical Schedule TS-A: STANDARD NOMINAL VOLTAGE & STEADY STATE VARIATIONS

Nominal Supply Voltages ($V_{nominal}$)	**Steady State Voltage Limits**	
	Allowed variation (%)	**Voltage variation limits**
Low Voltage: i) 230 Volts ii) 415 Volts	$V_{nominal}$ ±10%	i) 207.0 – 253.0 volts ii) 373.5 – 456.5 volts
Medium/High Voltage: i) 33kV ii) 22 kV iii) 11kV		i) 29.70 – 36.30 kilovolts ii) 19.80 – 24.20 kilovolts iii) 9.90 – 12.10 kilovolts

Technical Schedule TS-B: TRANSIENT STATE VOLTAGE VARIATIONS

Nominal Supply Voltages ($V_{nominal}$)	**Transient State Voltage Variation within:**	
	Less than 1 minute	**Less than 10 seconds**
Low Voltage (< 1kV) (including): i) 230 Volts ii) 415 Volts	$V_{nominal}$ ±15%	Phase to Earth: +50% to 100% Phase to Phase: +20% to 100&
Medium/High Voltage (including): i) 33kV ii) 22 kV iii) 11kV		Phase to Earth: +80% to 100% Phase to Phase: +20% to 100%

Technical Schedule TS-C: HARMONIC CONTENT DISTORTION LIMITS

TS-C_1
Maximum Voltage Harmonic limits @ PoC

Voltage @ Poc	THD	Odd	Even
≤ 1kV	5.0%	4%	2%
>1kV & ≤36kV	3.0%	2%	1%

TS-C_2
Maximum Current Harmonic limits @ PoC (in %age of I_L)

Isc/I_L	**<11**	**11<h<17**	**23< h<35**	**17< h< 35**	**35<h**	**THD**
<20*	4.0%	2.0%	1.5%	0.6%	0.3%	5.0%
20<50	7.0%	3.5%	2.5%	1.0%	0.5%	8.0%
50<100	10.0%	4.5%	4.0%	1.5%	0.7%	12.0%
100<1000	12.0%	5.5%	5.0%	2.0%	2.0%	15.0%
≥1000	15.0%	7.0%	6.0%	2.5%	1.4%	20.0%

Notes:

1. Even harmonics are limited to 25% of the odd harmonics listed above.
2. Current distortions that result in a DC offset, e.g., half-wave converters, are not allowed.
3. *All power generation equipment are limited to these values of current distortion, regardless of actual Isc/IL.
4. Isc=maximum short-circuit current at Point of Common Coupling.
5. IL=maximum demand load current (fundamental frequency component) at Point of Common Coupling.
6. THD =Total Harmonics Distortion
7. h = Odd harmonics order

Technical Schedule TS-E: RELIABILITY OF SUPPLY STANDARDS - INDICES/TARGETS

Service measure	Standard	Performance Target
Maximum duration of planned interruption for all voltage levels and network	Specify 8 hrs. max period without supply (Urban/Rural or UG cable /OH conductor)	95%
Notification of customer following an unplanned interruption & continuous update of progress towards supply restoration	Within 1 hr. after incident and subsequently every 3 hrs. progress update	95%
Frequency and duration of planned interruptions per year – reported by type of Feeder (exclude MEDs)	Duration Hrs/yr. / Frequency No./cust/yr. Cable Feeder 18 hrs: 3 Urban o/h Feeder 36hrs: 8 Rural Feeder (o/h) 48hrs: 8	100%
Timeliness of rectification of faults and restoration of supply *(By type of affected area) - MEDs excluded*	**Minor Fault** / **Major Fault*** Rural area: 24 hrs / 240 hrs County capital: 12 hrs / 120 hrs Urban/Industrial area: 8 hrs / 80 hrs *** Major fault (requires capital equipment)**	
Frequency and duration of unplanned interruptions per year (exclude unplanned major event days-MEDs)	**Urban/ County Capital / Rural** Frequency 6 / 6 / 6 (periods per year) Duration 8 / 12/ 24 (hrs per period) Total Dur 48/ 72/ 144 (hrs per year)	85%
Frequency and duration of unplanned interruptions per customer per year – reported by type of Feeder (exclude MEDs)	**Duration Hrs/yr.** / **Frequency No./cust /yr.**	**80%**

	Cable Feeder 6 32 hrs Urban o/h Feeder 12 32hrs Rural Feeder (o/h) 24 120hrs	
Distribution System Failure	Definition: Unplanned interruption @ Connection Point lasting for more than **2 Hours (ref sub-section 16.12.1 of DC)**	
Service measure	**Standard**	**Performance Target**
Average no. of Interruptions @ PoC	SAIFI (max-specify) 52_times	Annually (100%)
Average duration of Interruptions @ PoC	SAIDI(max-specify) (a) 144hrs in Monrovia grid (b)216hrs in county capital (c)432hrs in other localities	Annually (100%)
Average Customer Average Interruptions Frequency Index @ PoC	CAIFI (max-specify)	
Average Customer Average Interruptions Duration Index @ PoC	CAIDI (max-specify)	
Timeliness of rectification of faults and restoration of supply following safety alert (by type of fault)	(i) LV minor fault: Within 24hrs (ii) LV major fault: Within 48hrs (iii) MV minor fault: Within 48hrs (iv) MV major fault: Within 72hrs	90%
Load shedding period	(a) triggered by **Distribution transformer** overload shall not exceed 10 days (b) Triggered by forced outage of generating unit shall not affect a customer or category of customers for more than 15days	75% /year
Power factor limits @PoC	Power Factor ≥ 0.96	95%/year
Distribution system total losses	Average system total loss calculated as %age	LERC to set annually
Distribution system technical losses	Average system technical losses calculated as %age	LERC to set annually
Distribution system non-technical losses	Average system non-technical losses calculated as %age	LERC to set annually

Technical Schedule TS-F: POWER FACTOR LIMITS AT CONNECTION POINT

Supply Voltage (kV)	Power factor range for customer Maximum Demand & Voltage		
	Steady state	**Transient**	
	Up to 100kVA	**Between 100kVA-2MVA**	**Over 2 MVA**
	Minimum Lagging Leading	Maximum Lagging Leading	Minimum Lagging Leading
<1.0	0.95 0.95	- -	- -
11	0.95 0.95	0.95 0.95	0.96 0.96
22	0.95 0.95	0.95 0.95	0.96 0.96
33	0.95 0.95	0.95 0.95	0.96 0.96
34.5	0.95 0.95	0.95 0.95	0.96 0.96

Technical Schedule TS-G: CUSTOMER SERVICE PERFORMANCE STANDARDS/INDICES/TARGETS

Service measure	Standard	Performance Target
Notification of customer in advance of a planned interruption	At least 3 business days written notice ahead of the interruption specifying expected date, time, and duration of interruption.	95% of the time
Maximum duration of planned interruption for all voltage levels and network	Specify 8 hrs. max period without supply (Urban/Rural or UG cable /OH conductor)	95% of the time
Telephone services	24 hrs. fault receiving and emergency service Seven days a week	100%
Time to respond to telephone calls	85% within 30 seconds	95% of the time
Time to respond to written enquiries	95% within 5 business days	95% of the time
customer bill contestation complaint	(a) Response within 5 business days (b) Resolution within 5 business days.	100%
Time to respond to voltage complaints	1. LV reply within 12hrs. 2. MV reply within 12hrs.	1. 90% 2. 95%
Timeliness of rectification of faults and restoration of supply following voltage complaints	Within 24 hrs.	90%
Timeliness of appointment to visit customer premises	No later than 60 minutes of agreed time	95% of the time
Response to customer initial request for connection application (Provision of guidelines for application)	Within 24 hrs.	100% of the time
Timeliness of provision of new connection estimates to customer	**Description of service** **Urban** **Rural** Meter installation and supply only – 1 day 1wk Service Connection on existing LV network – 1 wk. 2wks Connection requiring LV works – 2 wks. 3wks Connection requiring MV works – 4 wks. 6 wks.	95% of the time
Timeliness of connection and	**Description of service** **Urban** **Rural**	95% of the time

activation of new service after payment	Meter installation and supply only - 1 week 3 weeks Service Connection on existing LV – 2 weeks 4 weeks Network Connection requiring LV works – 6 weeks 8 weeks Connection requiring MV work – 3 months 6 months	
Service measure	**Standard**	**Performanc e Target**
Maximum period allowed for estimated billing used for customer	Not more than 6 **months** *(NB: Estimate based on historical consumption)*	100%
Disconnection for meter tampering or illegal connection (Power Theft)	Immediately following detection	100%
Request for disconnection by customer (Voluntary)	**2** weeks as of dated notice.	99%
Disconnection due to other reason aside of health/safety or emergency	5 days **2** weeks as of dated notice.	99%
Timeliness of resolving vending faults reported	Within 48 hours	95%
Timeliness for repositioning customer service line/meter request.	(a) Within 5 business days to submit assessments/charges (b) Within 5 business days to rectify upon payment of charges.	90%
Timeliness for the replacement of active operational meters over 25 yrs old.	Within 36 months	90%
Credit Meter reading cycle	Once every month.	100%
	Once in 3 months (guaranteed)	100%
Timing of Credit meter Billing and bill delivery	Time from billing to due date : 14 days	95%
	Billing cycle: once per month	100%
Bill payment	Within 14 days after due date (within which bill should have been delivered)	95%
Notice of disconnection due to non-payment	1. Notice of warning: 14 days after due date for payment.	80%

	2. Notice of disconnection - Disconnection effected after 7 days. 3. Disconnection not to be carried out: - after 2hrs before normal closing time of pay-point; and - over the weekend - day before public holidays	
Timeline for response to meter accuracy check service request	Within 15 days after receipt of payment of related charges for service	95%
Service measure	**Standard**	**Performanc e Target**
Notice of Meter inspection by Licensee	The Licensee reserves the right to conduct spot checks as deemed expedient where tampering or theft is detected.	100%
Customer Meter Installation location	Customer meter must be enclosed and located at a designated area readily accessible for reading and maintenance by the Licensee and readily accessible for reading and security by the customer.	100%
Availability of prepayment meter credit vending facility	At least: (a) Within 2-5 Km radius of prepayment meter customer, (b) Sufficient to reduce queuing time to less than 10 minutes, or (c) Minimum of 8 hrs. daily for six days each week	90%
Timeliness of reconnection of disconnected service **due to non-payment**	**City/industrial Urban Rural** Within a maximum of: 6hrs 12hrs 18hrs [after settlement of bill (plus any charges)]	**(i)70%:** ≤ 60km radius distance **ii) 50%:** > 60km radius distance **from district or regional office**
Timeliness of reconnection of disconnected service due to tampering or illegal connection (Power Theft)	Not later than 2 days following regularization of connection and settlement of penalties/charges.	80%
Timeliness of response to account query request	Within 5 working days following the request.	90%

Timeliness of response to a faulty meter complaint	i) Within 48 hours maximum where customer has not lost supply to premises. (ii) Within 24 hours maximum where customer has lost supply to the premises	95%
Timeliness of replacement of defective meter following establishment of a Faulty meter complaint	Within 48 hours	75% /year
Service measure	**Standard**	**Performanc e Target**
Timeliness of isolation of faulty part of the network upon awareness of fault at location within various distances from district/regional office	(i) Within 2 hours for faults within 30km radius (ii) within 4 hours for faults within 60km radius (iii) within 5 hours for faults within radius of >60km	75%
Timeliness of rectification of faults and restoration of supply following safety alert (by type of fault)	(i) LV minor fault: Within 24hrs (ii) LV major fault: Within 48hrs (iii) MV minor fault: Within 48hrs (iv) MV major fault: Within 72hrs	90%
Time to respond and resolve customer complaints	General complaints received: a) by telephone, internet or in person – should be handled without referral within 3 days. b) in writing – respond within 3 days and resolve in 5 days.	90% /year
Time to respond to customer enquiries	Enquiries for information/advice received: a) by telephone, internet or in person – should be handled without referral within 1 day. b) and requiring investigative work – respond within 3 weeks	90% /year

Technical Schedule TS – S: Standard Planning Data

General Information

1. For each new connection for a User, the following information is required:
   (a) load build-up curve (in the case of a new connection);
   (b) supply date start (start of load build-up);
   (c) load type (residential, commercial, factory, etc);
   (d) annual load factor;
   (e) power factor;
   (f) special requirements (e.g. Quality of supply);
   (g) other information required to enable the Licensee to provide a User with an appropriate supply.

Historical Energy and Power Demand

2. A User shall provide its actual monthly energy and demand consumption at each Connection Point for the immediate past year.

3. A User shall also provide the hourly load profiles for a typical Weekday, Saturday, Sunday and holiday.

Energy and Power Demand Forecast

4. The User shall provide its energy and power demand forecast at each Connection Point for five (5) successive years. Where the User is connected to the distribution network at multiple connection points, the demand data shall also include the coincident peak active demand at each connection point.

5. The forecast data for the first two years shall include monthly forecast for energy and power demand, while the remaining three years shall include only one annual energy and power demand forecast as follows

   (a) Active power (MW)
   (b) Reactive power (MVAr)
   (c) Energy per day/month/year (kWh)

6. The User shall provide the Distribution Licensee with forecast hourly load profiles for typical Weekday, Saturday and Sunday and holiday with clear specification of –

   (a) Measured Demand Data, for the latest year
   (i) Active and reactive power taken from the distribution network;
   (ii) Active and reactive power self - produced (if existing).
   (iii) Monthly energy consumption and production of the latest years.

   (b) **5 years forecast of demand:** A User is required to provide –

   (i) daily load curve forecast in peak day and peak-off day of every month for each of the 5 succeeding years from the official date of operation indicating separately the forecast MW and MVar received from the distribution network and from self-supply.
   (ii) Monthly energy consumption for next 5 years with clear specification of how much is expected from the distribution network and the amount from self-supply (if any).

(c) The document on which above forecasts are based (if existing)

7. A Distribution Licensee's forecast demand shall provide the net values of energy and power demand forecast apportioned for supply from the Grid and the demand to be fed from embedded generating plants (or self-supply plants).

8. Embedded generation plants shall submit to the Distribution Licensee with the projected energy and power to be generated by each generation plant for both self-use and injection into the distribution network).

[NB: Energy and power demand forecast shall be accompanied by a short description setting out the basis for the forecast]

Embedded Generating Unit Data

9. Each Embedded Generation User shall provide the Distribution Licensee with data relating to its generating units, including

(a) a brief description of the configuration of the generation facilities,
(b) power station name and location,
(c) type of facilities (combined cycle, gas turbine, hydro, etc), number for each type,
(d) Approximate period of construction,
(e) Commissioning Date, and
(f) single line diagram.

10. The following information shall be provided for generating units of each generating plant:

(a) Rated capacity (MVA and MW);
(b) Rated voltage (kV);
(c) Maximum available output in MW;
(d) Minimum stable load (MW)
(e) Type of generating unit and expected running mode(s);
(f) Direct axis transient reactance (% on MVA rating)
(g) Direct axis sub-transient reactance (% on MVA rating);
(h) Frequency Response Table
(i) Reactive Power capability (MVAr) in the range 0.95 leading and 0.85 lagging.
(j) Rated capacity, voltage and impedance of the generating unit's step-up transformer
(k) Short Circuit Ratio (% on MVA rating)
(l) Auxiliary Power requirement

11. For Hydropower plant the following additional information is required:

(a) Submerged Area - Furnish information on area of villages submerged, forestland, agricultural land etc.
(b) Operating Head (In Mtr) – Maximum, Minimum, and Average
(c) Turbine type and capacity
(d) Annual Generation: expected water flow, expected Energy, annual load factor
(e) Step up voltage for connection in kV

System Data for Users

12. Each User shall provide the electrical diagrams and connection point drawings of the User's system and the Connection Point. The diagrams and drawings shall indicate the quantities, ratings, and operating parameters of the following:

(a) Equipment (e.g. Generating units, transformers, circuit breakers, motors and drives, etc);
(b) Electrical circuits (e.g. Overhead lines and underground cables);
(c) Substation bus arrangements;
(d) Grounding arrangements;
(e) Phasing arrangements;
(f) Switching facilities.

13. The User shall provide the data on reactive power compensation equipment at the connection point and/or at the substation of the User. This shall include the following information:
    (a) rated capacity (MVar)
    (b) rated voltage (kV);
    (c) type (e.g. shunt capacitor, shunt reactor, static var compensator, etc);
    (d) resistance/reactance/susceptance of all components of the compensation device; and
    (e) operation and control details (fixed or switched, automatic or manual)

14. If a significant portion of the User's demand may be supplied from alternative connection point(s), the relevant information on the demand transfer capability shall be provided by the User, including the:
    (a) alternative connection point;
    (b) demand normally supplied from each alternative connection point;
    (c) demand which may be transferred from or to each alternative connection point;
    (d) control (manual or automatic) arrangements for transfer including the time required to implement the transfer for forced outage and planned maintenance conditions.

Standard Planning Data for VRPPs

General:

15. Site:
    (a) Furnish location map to scale showing roads, Railway lines, Transmission lines, Rivers, and reservoirs if any.
    (b) Environmental (State whether forest, lands mining clearance areas are affected).

16. Site Map: (To scale) Showing area required for VRPP module, main Plant, buildings, and location of VRPP Units.

17. Approximate period of construction.

18. Estimated Plant Load Factor.

19. Estimated Annual Generation.

Connection:

20. Connection Point: Furnish Single Line Diagram of the proposed connection with the system.

21. Step up voltage for connection in kV

Station Capacity:

22. Total VRPP module capacity (MW).

23. Ancillary Services provided - State the total installed capacity (in MW) of VRPP Units, and the total export capacity (in MW) at the Connection Point

24. No. of VRPP Units and Unit size MW & State whether development will be carried out in phases and if so, furnish details.

25. VRPP module and VRPP Unit Data:
    (a) Generator (Unit data):
        (i) Type
        (ii) Rating (MVA)
        (iii) Terminal Voltage (kV)
        (iv) Rated Power Factor
        (v) Frequency Response Table (where applicable)
        (vi) Reactive Power capability chart (MW/MVAr) at the VRPP Unit Terminals.
    (b) VRPP (module data):
        (i) Module capability chart (MW/MVAr) at the Connection Point
        (ii) Grid Transformer(s)
            - Rated Capacity (MVA)
            - Voltage Ratio (HV/LV)
            - Tap change range (+% to - %)
            - On-load or off-load tap change
            - Percentage Impedance (Positive Sequence at Full load).

Technical Schedule TS – T: Detailed Planning Data

System Data for Users <u>(For submission on request by Distribution Licensee)</u>

1. The User shall provide the values of the following circuit parameters of overhead lines and/or underground cables from the User's substation to the connection point with the distribution network:
    (a) Rated and operating voltage (kV);
    (b) Positive sequence resistance and reactance;
    (c) Positive sequence shunt susceptance;
    (d) Zero sequence resistance and reactance;
    (e) Zero sequence susceptance.

2. If the User is connected to the distribution network through a transformer, the following data for the power transformer shall be provided:
    (a) Rated MVA;
    (b) Rated voltages, HV, LV, Tertiary (kV);
    (c) Winding arrangement;
    (d) Positive sequence resistance and reactance (at maximum, minimum and nominal tap);
    (e) Zero sequence reactance for three-winding core transformer;
    (f) Tap changer range, step size and type (on-load or off-load); and
    (g) Basic lightning impulse insulation level (kV).

3. The User shall provide the following information for the switchgear, including circuit breakers and disconnect switches at the substation of the User:
    (a) Rated voltage (kV);
    (b) Rated current (A);
    (c) Rated symmetrical RMS short circuit current (kA); and
    (d) Basic lightning impulse insulation level (kV).

4. The User shall provide the details of its system grounding. This shall include the rated capacity and impedances of the grounding equipment.

<u>Detailed Planning Data for VRPPs: (For submission on request by Distribution Licensee)</u>
General:

5. Detailed Project report.

6. Status Report:
    (a) Land
    (b) Fuel type
    (c) Environmental clearance
    (d) Rehabilitation of displaced persons.

7. Approval by Liberia Electricity Regulatory Commission (LERC)

8. Financial tie-up in place.

9. Connection Agreement and Use of System Agreement in place

Connection:

10. Report of studies of parallel operation with Distribution System:
    (a) Load flow studies (including Reactive Power capability)
    (b) Stability studies (Fault Ride Through)
    (c) Short Circuit studies

11. Proposed connection with Distribution System:
    (a) Voltage
    (b) Number of circuits
    (c) Connection Point

THE COMMON SEAL OF
LIBERIA ELECTRICITY REGULATORY COMMISSION

Was affixed pursuant to the ORDER OF THE COMMISSION

On this 13th day of June 2022.

Dr. Lawrence D. Sekajipo, CPA, CFE, DBA
CHAIRMAN
BOARD OF COMMISSIONERS

APPENDICES

APPENDIX A: INFORMATION IN A CONNECTION AGREEMENT WITH A CUSTOMER

A Connection Agreement must conform to this Code and the Distribution Licensee's Conditions of Service. A Connection Agreement between a Distribution Licensee and a customer connected to the Distribution Licensee's distribution system, excluding embedded generators and connection with distribution network of another licensee, should include the following information (examples provided in italics):

Contact Information

- Date
- Account Number
- Date Customer's Responsibility Commences
- Name
- Service Address
- Mailing Address
- Home Phone No.
- Business Phone No.
- Mobile Phone No.
- Type of Business
- SIC Code

The following clauses are suggested as examples:

The Customer agrees to abide by the Distribution Licensee's Conditions of Service, in effect and as amended from time to time. The Customer further agrees to:

1. pay the Distribution Licensee for the distribution services used by the customer at the location covered by this connection agreement from the date herein until such time as the customer no longer requires the service; and

2. to commence payment in accordance with the approved rates prescribed attributed to the appropriate class rating to which the service applies, on or before the due date shown on the first account rendered and to pay all accounts either monthly or bimonthly or as specified, thereafter.

Signature of Customer _____ (after reading the above and the General Conditions)

Witness _____

Signature of Distribution Licensee _____ (upon accepting the contract)

Date _____

General Conditions:

1. Space and Access

The customer agrees to provide suitable space for the Distribution Licensee's meters, wires and where necessary poles, transformers and all other appliances and equipment on the said premises and further agrees that no one who is not an agent of the Distribution Licensee shall be permitted to remove, inspect or tamper with same, including seals and that the properly authorized agents of the Distribution Licensee shall have reasonable access to the said premises for the purpose of reading, examining, preparing or removing their meters, wires, poles, cables, transformers and other appliances, equipment of the Distribution Licensee and for the inspection of all the customer's appliances and wiring.

2. Responsibility for Equipment

Meters, wires, poles, cables, transformers and all other appliances, equipment of the Distribution Licensee on the said premises shall be in the care and at the risk of the customer and if destroyed or damaged by fire or any other cause whatsoever other than established to be from ordinary wear and tear or natural causes of damage, the customer shall pay to the Distribution Licensee the value of such meters, wires, poles, cables, transformers, appliances and equipment, or the cost of repairing or replacing same.

3. Disconnection

The customer hereby expressly authorizes and empowers the Distribution Licensee at the Distribution Licensee's option to remove the meter, wires, poles, cables, transformers and all other appliances and equipment installed at the Distribution Licensee's expense and discontinue the supply of electricity and terminate this agreement whenever any bills for the said service are in arrears or upon violation by the customer of any of the terms and conditions of this agreement.

4. Reliability

The Distribution Licensee agrees to use reasonable diligence in providing a regular and uninterrupted service but does not guarantee a constant service or the maintenance of unvaried frequency of voltage and will not be liable in damages to the customer by reason of any failure in respect thereof. It is the customer's responsibility to provide for the protection of his equipment. From voltage variations, transient operations, and single phasing.

5. Conditions of Service

The building must be supplied with electrical energy according to the Distribution Licensee's Conditions of Supply.

6. Binding

This agreement shall not be binding upon the Distribution Licensee until accepted by it through a designated officer and shall not be modified or affected by any promise, agreement or representation by any agent or employee of the Distribution Licensee unless incorporated in writing into this agreement before such acceptance.

7. Maintenance Requirements

The customer shall maintain the installation in efficient condition with proper devices, according to the requirements and rules in respect of Electrical Safety. If the electrical installation is found

to be inadequate, the supply of electricity shall be suspended until such a time as the above requirements are complied with.

8. Security Deposit

The Distribution Licensee reserves the right to require security for payment of future charges.

9. Termination

This agreement shall continue in force until terminated by notice in writing given by either party hereto thirty days in advance of termination.

10. Successors

It is agreed that the signatures of the parties hereto shall be binding upon their successors or assigns and that the vacating of the premises herein named shall not release the customer from this agreement except at the option and by written consent of the Distribution Licensee.

11. Approval of Equipment

All electrical and mechanical equipment such as motors and welders used by the customer shall be subject to the reasonable approval of the Distribution Licensee and the customer shall so take and use the electrical energy as not to endanger the apparatus of the Distribution Licensee or cause any wide or abnormal fluctuations of its line voltage. Where practical, equipment with the highest power factor should be chosen and motors should be sized to match the load. Equipment performance characteristics shall be in accordance with the Distribution Licensee's Conditions of Service.

12. Fire or Other Casualty

In case fire or other casualty occurs in said premises, rendering the premises wholly unfit for occupancy, the supply of electricity shall thereupon be suspended until such time, within said contract period, as the wiring shall have been repaired and approved in accordance with the Wiring Regulations.

APPENDIX B: METHODOLOGY AND ASSUMPTIONS FOR AN ECONOMIC EVALUATION

B.1 Common Elements of the Discounted cash flow Model

To achieve consistent business principles for the development of the elements of an economic evaluation model, the following parameters for the approach are to be followed by all Distribution Licensees. The discounted cash flow (DCF) calculated for individual projects will be based on a set of common elements and related assumptions listed below.

Revenue Forecasting

The common elements for any project will be as follows:

(a) Total forecasted customer additions over the Customer Connection Horizon, by class as specified below;

(b) Customer Revenue Horizon as specified below;

(c) Estimate of average energy and demand per added customer (by project) which reflects the mix of customers to be added – for various classes of customers, this should be carried out by class;

(d) Customer additions, as reflected in the model for each year of the Customer Connection Horizon; and

(e) Rates from the approved rate schedules for the particular Distribution Licensee reflecting the distribution (wires only) rates.

Capital Costs

Common elements will be as follows:

(a) An estimate of all capital costs directly associated with the expansion to allow forecast customer additions.

(b) For expansions to the distributed system, costs of the following elements, where applicable, should be included:

- ✓ Bulk Supply Points (BSPs)
- ✓ Primary/Secondary sub-stations;
- ✓ Distribution lines/network;
- ✓ Transformers
- ✓ Ring Main Units;
- ✓ Services; and
- ✓ Land and land rights.

Note that the *"Owner Demarcation Point"* as specified in the Distribution Licensee's Conditions of Service would define the point of separation between a customers' facilities and Distribution Licensee's facilities.

(c) Estimate of incremental overheads applicable to distribution system expansion.

Expense Forecasting

(a) Attributable incremental operating and maintenance expenditures – any incremental attributable costs directly associated with the addition of new customers to the system would be included in the operating and maintenance expenditures;

(b) Income and taxes based on tax rates underpinning the existing rates schedules.

(c) Municipal property taxes based on projected levels.

Specific Parameters/Assumptions

Specific parameters of the common elements include the following:

(a) A maximum customer connection horizon of five (5) years.

(b) A maximum customer revenue horizon of twenty-five (25) years, calculated from the in-service date of the new customers.

(c) A discount rate equal to the incremental after-tax cost of capital, based on the prospective capital mix, debt and preference share cost rates, and the latest approved rate of return on common equity.

(d) Discounting to reflect the true timing of expenditures. Up-front capital expenditures will be discounted at the beginning of the project year and capital expended throughout the year will be mid-year discounted. The same approach to discounting will be used for revenues and operating and maintenance expenditures.

B.2 Discounted Cash Flow (DCF) Methodology

Net Present Value ("NPV")	= Present Value ("PV") of Operating Cash Flow + PV of CCA Tax Shield - PV of Capital
1. PV of Net Operating Cash Flow	= PV of Net Operating Cash (before taxes) PV of Taxes
a) PV of Net Operating Cash	= PV of Net Operating Cash Discounted at the Company's discount rate for the customer revenue horizon. Mid-year discounting is applied. Incremental after tax weighted average cost of capital will be used in discounting.
Net (Wires) Revenue Cash	= (Annual(Wires) Revenues – Annual (Wires) O & M)
. Annual (Wires) O&M =	Customer Additions* (Appropriate (Wires) Rates* Rates Determinant)
Annual (Wires) O&M =	Customer Additions* Annual Marginal (Wires) O&M Cost/customer
b) PV of Taxes =	PV of Municipal Taxes + PV of Capital Taxes + PV of Income Taxes (before interest tax shield)

Annual Municipal Tax =	Municipal Tax Rate * (Total Capital Cost)
Total Capital Cost =	Distribution Capital Investment + Customer Related Investment + Overhead at the project level
Annual Capital Taxes =	(Capital Tax Rate) * (Closing Un-depreciated Capital Cost Balance)
	Annual Capital Taxes = (Capital Tax Rate) * (Net Operating Cash – Annual Municipal Tax – Annual Capital Tax)

The Capital Tax Rate is a combination of the Provincial Capital Tax Rate and the Large Corporation Tax (Grossed up for income tax effect where appropriate).

Note: Above is discounted, using mid-year discounting, over the customer revenue horizon.

2. PV of Capital =	PV of Total Annual Capital Expenditures
a) PV of total Annual Capital Expenditures	Total Annual Capital Expenditures over the customer's revenue horizon discounted time zero
Total Annual Capital =	(for New Facilities and/or Reinforcement Investments + Expenditure customer Specific Capital + Overheads at the project level).
	This applies for implicated system elements at the Licensee side of the "Ownership Demarcation Line"

Note: Above is discounted to the beginning of year one over the Customer addition horizon

3. PV of CCA Tax Shield (Total Annual Capital)

The PV of the perpetual tax shield may be calculated as:	PV at time zero of : (Income Tax Rate) x Annual Total Capital / (CCA Rate + Discount Rate) or,
	Calculated annually and present valued in the PV of Taxes calculation.

Note: An adjustment is added to account for the ½ year CCA rule

4. Discount Rate:	PV is calculated with an incremental, after-tax discount rate

APPENDIX C: MINIMUM INSPECTION REQUIREMENTS
C.1 DISTRIBUTION INSPECTION STANDARDS

Inspection Cycles

1. A Distribution Licensee should ensure that only persons qualified under the *Occupational Health and Safety Act* are involved in inspection activities. Since some inspections can expose inspectors to energized lines or high voltage circuits and equipment, and may include inspection repair, a qualified person should be assigned to this work. This assumes that they are both properly trained to protect both themselves and the public, and to respond to those emergencies, which may arise during inspections.

2. In developing the standards for facilities inspections, the patrol inspection is defined as follows:
   Patrol or simple visual inspections consists of walking, driving, or flying by equipment to identify obvious structural problems and hazards such as leaning power poles, damaged equipment enclosures, and vandalism. In cases where a patrol notices that a problem exists or identifies a condition that warrants a more thorough or rigorous inspection, patrol may then include situations where structures are opened as necessary, and individual pieces of equipment carefully observed and their condition noted and recorded, and a summary document prepared in the Distribution Licensee's annual reports as part of their rates or licensing submissions.

3. In all cases, a Distribution Licensee is responsible to ensure that appropriate follow up and corrective action is taken regarding problems identified during a patrol.

4. The Board or a Board-designated party reserves the right to conduct random audits of inspection reports to ensure that appropriate follow up and corrective action is taken regarding problems identified during a patrol.

5. It is expected that Distribution Licensees will file both annual summary reports of detailed patrol inspection activities that have taken place during the previous year as well as an outline of inspection plans ("compliance plan") for the forthcoming year.

6. Inspection cycles are categorized by the following major distribution facilities:

   - ✓ Bulk Supply Points
   - ✓ Primary/Secondary Substations
   - ✓ Transformers
   - ✓ Secondary Substation transformers
   - ✓ Customer Specific Substations
   - ✓ Protection and Control equipment
   - ✓ Regulators
   - ✓ Capacitor banks
   - ✓ Conductors, cables, cable joints and lugs
   - ✓ Data and system control equipment
   - ✓ Vegetation
   - ✓ Poles/Supports
   - ✓ Civil Infrastructure

7. For each of these facilities, the Distribution Licensee shall further distinguish between overhead facilities and underground facilities. The Distribution Licensee shall also separate according to the facilities' location and the relative population density in the locale.

   - **Urban** (metropolitan/County capital/industrial area) means an operational area with a customer population of over five thousand or a demand above **10MW** and the overhead and underground facilities pose safety and reliability consequences to greater numbers of people.
   - **District Capital** means the administrative capital of a district.
   - **Rural** means an operational area with a customer population of under five thousand or a demand below **10MW** and the overhead and underground facilities pose safety and reliability consequences to fewer number of people.

8. The following description provides a list of the requirements to be expected from a typical distribution line patrol inspection in terms of the types of defects that may be detected visually. Clearly, the list will vary depending on the equipment specifics and locations, thus this should be viewed as a 'generic' patrol expectation.

   - ✓ Transformers and Switchgears
   - ✓ Distribution Pillars Paint condition and corrosion
   - ✓ Transformer platform (pad or vault mounted)
   - ✓ Check for lock and holding/anchor bolt in place
   - ✓ Grading changes
   - ✓ Access changes (Shrubs, trees, etc.)
   - ✓ Phase indicators and unit numbers match operating map (where used)
   - ✓ Leaking oil
   - ✓ Flashed or cracked insulators
   - ✓ Pad mounted – lid damage, missing bolts, cabinet damage, public security lock damage

A. Substation **-** May consist of one or all types of equipment listed above.

B. Switching/Protective Devices

C. Overhead pole mounted
   - Bent, broken bushings and cut-outs,
   - Damaging lightening arresters,
   - control boxes, current and potential transformers

D. Pad mounted substations – Security condition of enclosure
   - Voltage Regulators
   - Condition of bushings
   - Tank corrosion/leaks
   - Damaged disconnect switches or lightening arresters

E. Capacitors
- Condition of bushings
- Tank corrosion/leaks
- Damaged switches, disconnects or control cabinet

F. Conductors and Cables
- Low conductor clearance
- Broken /frayed conductors or tie wires
- Tree conditions,
- exposed broken ground conductors
- Broken strands,
- bird caging, and
- excessive or inadequate sag.
- Insulations fraying on secondary especially open wire

G. Poles/Supports:
- Bent, cracked or broken poles
- Excessive surface wear or scaling
- Loose, cracked or broken cross arms and brackets
- Woodpecker or insect damage, or bird nests
- Loose or unattached guy wires or stubs
- Guy guards out of position or missing
- Grading changes, or washouts Indications or burning

H. Hardware and attachments
- Loose or missing hardware
- Insulators unattached from pins
- Conductor unattached from insulators
- Insulators flashed over or obviously contaminated/cracked (difficult to see)
- Tie wire unraveled
- Ground wire broken or removed
- Ground wire guards removed or broken

I. Equipment Installations (includes transformers and Ring Main Units)
- Contamination/discoloration of bushing
- Oil leaks
- Rust
- Ground lead attachment
- Ground wires on arrestors unattached
- Bird or animal nests
- Vines or brush growth interference
- Evidence of bushing flashover
- Accessibility compromised

J. Vegetation and Right of Way:
- Leaning or broken “danger” trees

- Growth into line of “climbing “trees
- Unapproved/unsafe occupation or secondary use

K. Civil Infrastructure – For example, buildings that house the equipment may need attention (cracking, fire hazards, etc.). In addition, cable chambers, underground vaults and tunnels crossing the rail track or water are also included in this category. These inspections would likely be conducted in the patrol of the equipment, which they are “associated”

L. Underground systems –

With respect to underground systems, riser poles should be checked as with an overhead patrol, with a visual check of cable, cable guards, terminators, and arrestors. While it is not possible to inspect underground cable directly, the system may be checked for exposed cable and or grade changes that may indicate that the cable has been brought too close to the surface. Patrol inspection of cable chambers is not required since a visual inspection will not reveal faults because the failure mechanism for underground cable (e.g. voids, water trees) is not visually detectable.
Cable is hard to check, but the system can be checked for exposed cable and/or grading changes that may have brought cable or wire too close to the surface.

TABLE C - 1
Electric Distribution system inspection cycles
(Minimum number of inspection/patrols in a year)

Major/Substantial Distribution Facility	**Patrol / Inspection**		
	Urban	**District**	**Rural**
Bulk Supply Point			
- Switchgear	4	5	6
- Cables, terminations & lugs	4	5	6
- Protection & control equipment	4	5	6
- Busbars	4	5	6
- Circuit breakers	4	5	6
- Metering	4	5	6
- Station service transformer	4	5	6
Primary distribution substation			
- Transformers	4	5	6
- Switchgear	4	5	6
- Voltage regulators & Surge arrestors	4	5	6
- Cables, terminations & lugs	4	5	6
- Protection & control equipment	4	5	6

- Busbars	4	5	6
- Circuit breakers	4	5	6
Secondary distribution substation			
- Distribution transformers	4	5	6
- Distribution pillars	4	5	6
- Pad-mounted transformers	4	5	6
- Pole-mounted transformers	4	5	6
- Package transformer substations	4	5	6
- Standalone transformer substations	4	5	6
- Customer specific substation	4	5	6
Overhead lines & associated equipment			
- Conductors, cables, terminations & lugs	4	5	6
- Switchgear (Ring main units, circuit breakers etc.)	4	5	6
- Capacitor banks	4	5	6
- Voltage regulators	4	5	6
- Poles	2	3	4
- Line vegetation/undergrowth	2	3	4
- Civil works / Infrastructure / Gantry	2	3	4

Notes to Table C-1

1. The above distribution system patrol cycles form part of the regulatory framework and are minimum inspection requirements for each major or substantial distribution component and related hardware.

2. A Distribution Licensee may determine that more frequent inspections may be required due to local conditions such as geographic location, climate, environmental conditions such as air pollution or highway salt spray, technologies available to perform the inspection, type and vintage of distribution technology in place, manufacturer specifications, systems design, or relative importance to overall system reliability of a particular piece of equipment or portion of the Distribution Licensee's distribution system.

   The burden of proof is on the Distribution Licensee to demonstrate that it does not have to comply with these inspection schedules or requirements in **Table C-1**. To demonstrate that it does not have to comply with these inspection schedules, the Distribution Licensee would have to present a comprehensive and detailed case establishing:

   Revised inspection cycles, which may be allowed when justified by:

(a) documented historical good utility maintenance and inspection practices, including a program to manage reliability;

(b) alternative or additional maintenance activities that are practiced by the Licensee and can be demonstrated as being practiced.

(c) achieved reliability performance – i.e. submission of both the current and historic reliability statistics over five years which must all be verifiable. This will be measured by the following:

- Once the data is available over the courses of the first and second rounds of the Performance-Based Regulatory (PBR) regime. The reliability indices that are better than the average of distribution networks which are comparable in size and type. The reliability indices to be used are those that are defined over time in the PBR regime, including initially SAIDI, CAIDI and SAIFI averaged over the previous three-year period, and;

- The reliability indices over time for the individual Licensee that are at least as good, if not better, than the average of the indices over the previous five-year period. Again, the reliability indices to be used are those that are defined over time in the PBR regime, including initially SAIDI, CAIDI and SAIFI averaged over the previous five-year period.

3. The method by which inspection cycles are structured and the work carried out is at the discretion of the Distribution Licensee. Table C-1 is organized according to major classification of equipment; however, Distribution Licensees may choose to conduct and record the inspections on some other basis such as:

- Circuit feeder basis
- Overhead & underground
- System voltage
- Dividing its service area into geographical areas
- Other

It is intended that if the inspections are organized by one of the above approaches, all major equipment categories identified in the table and related hardware along the line or within the area will be inspected. However, the Licensee shall provide an explanation of any deviation in their annual submission. For clarity, the equipment shall be inspected on a cyclical basis, and the cyclical interval shall be specific to a particular region or portion of plant, and not on the system.

4. “Civil Infrastructure”: Refers to facilities and structures such as tunnels, duct suspended from or attached to bridges. Underground chambers and hand holes, towers supporting distribution plant, communication towers, buildings that house substation equipment. It is intended that civil infrastructure will be inspected as part of patrol of the distribution system or while doing normal, routine utility work. It is recognized that there may be instances where it will be extremely difficult to perform a visual inspection (e.g. where access is restricted due to energized equipment in cable chambers), and therefore the civil infrastructure associated with this would be inspected while doing normal utility work which would require entrance to the chamber, which would require the Licensee to de-

energize the equipment. In other words, the equipment should not be de-energized simply to comply with this scheduled inspection routine.

5. "Patrol/Inspection": Visual Inspection of major distribution system components to identify problems and hazard such as leaning poles, damaged equipment enclosures, and vandalism. This will include an inspection of all related peripheral equipment, hardware, connections, all supports and attachments (e. g cross arms, braces, guys, and anchors). This would also include an assessment of vegetation encroachment on rights-of-way.

   The patrol may highlight that a problem exists or may identify conditions that warrant a more thorough or rigorous inspection or the need for specific maintenance. The specific follow up or corrective action shall be according to the best judgement of the Distribution Licensee considering best industry practices. To further clarify the nature of problems detected during the inspection, the Distribution Licensee may choose to utilize diagnostic tools such infrared thermography, ultrasonic testing or other technologies that may emerge. Several technologies are also available for wood pole testing. Distribution Licensees may choose, (as post inspection follow up or ongoing maintenance), to conduct test of major distribution system components on a sample basis. Issues such as the age, equipment design, exposure to adverse conditions, manufacturer specifications, and relative impact on overall system reliability may influence a Distribution Licensee's decisions regarding corrective action and application of these diagnostic technologies following a patrol. In all cases, a Distribution Licensee is responsible to ensure that appropriate follow up and corrective is taken regarding problems identified during a patrol. This may entail upgrade or replacement of specific components or equipment.

   Maintenance activities and schedules are not specified in the table and are left to the discretion of the Distribution Licensee. It is not practical to attempt to establish a regulatory regime for literally hundreds of maintenance activities that range from insulator washing, cable replacement, C02 cleaning of switchgear ,to gas-in-oil testing of station transformers, etc. The absence of more detailed inspection or maintenance criteria in the table in no way reduces the Distribution Licensee's obligation to maintain the distribution system in a safe and serviceable condition.

   The Board or a Board-designated party reserves the right to conduct random audits of inspection reports to ensure that appropriate follow up and corrective action is taken regarding problems identified during a patrol.

6. Definition of terms used in the Table C-1 are as follows:

(a) Urban(metropolitan/County capital/industrial area) means an operational area with a customer population of over five thousand or a demand above fifteen megawatts and by definition the overhead and underground facilities pose safety and reliability consequences to greater numbers of people.

(b) District Capital means the administrative capital of a district.

(c) Rural means an operational area with a customer population of under five thousand or a demand below fifteen megawatts and the overhead and underground facilities pose safety and reliability consequences to fewer number of people.

(d) “Substations”: means a station within a distribution network where voltage is transformed from one level to another

(e) “Bulk Supply Points (BSP): means the tie-in between the transmission network and the distribution network

(f) “Primary Distribution Sub-Station: A transformation facility with the primary operating at a sub transmission or distribution voltage (33kV or 22kV) and the secondary operating at lower distribution voltage (e.g., 0.43KV). The upstream transformation facility will typically be a Transformer Station. A distribution Station supplies main feeders for wide area distribution.

(g) “Customer-Specific Substation” A transformation facility supplying a specific industrial/ commercial customer.

(h) “Outdoor Open” Typically refers to a station surrounded by a locked security fence. Within the station fence bare energized components operating at distribution voltage levels or higher are readily accessible. More frequent inspections are required for public safety considerations and to ensure integrity of the station fence.

(i) “Outdoor Enclosed” : Like (h) above however all bare live components are enclosed in locked metal enclosures. Due to reduced accessibility to energized components less frequent inspections are appropriate.

(j) “Indoor”: Typically refers to a station located within a secure building. Access by the public to bare energized components within the station is prevented by the building enclosure. Due to reduced exposure to unauthorized public access less frequent inspections are appropriate.

(k) “Conductors and Cables: Underground”: It is not possible to inspect underground cable directly, however, the system can be checked for exposed cable and or grade changes that may indicate that the cable has been brought too close to the surface. Patrol inspection of cable chambers is not required since a visual inspection will not reveal faults because the failure mechanism for underground cable (e.g., voids, water trees) is not visually detectable.

(l) “Vegetation”: Refers to encroachment of vegetation upon distribution lines on any rights-of-way; either public road allowance or private property. It is intended that vegetation will be inspected as part of the regular patrol of distribution equipment.

TABLE C-2 Sample annual Inspection Summary Report

Name of Distribution Licensee					
Reviewed by:		**Name:**		**Position/Title**	
Date:			**Signature:**		
Description of target distribution system facility for inspection: (specify for each relevant item in Table C-1 and classify as for – Urban, District or Rural) in following format :		Percentage of Distribution System Scheduled for Patrol (%)	Percentage of Distribution System Actually patrolled (%)	Reason why patrol was not completed	Date when patrol will be completed
BSP	Urban etc.				
1. 2. etc					
BSP	District etc.				
1. 2. etc					
BSP	Rural				
1. 2. etc					
Primary Distribution Station	Urban etc.				
1. 2. etc					
Primary Distribution Station	District etc.				
1. 2. etc					
Primary Distribution Station	Rural				
1. 2. etc					

Notes to Table C-2: MINIMUM INSPECTION REQUIREMENTS

(a) This report provides a summary of the patrols scheduled and carried out during the year as well as the target dates for completion of patrols, which were not completed as planned.
(b) This format is a sample of report for patrols carried out on a geographical, system characteristic (overhead or underground) basis.
(c) Major equipment categories need not be reported separately however, all categories of equipment within the area or circuits shall be inspected.
(d) Civil infrastructure is intended to be inspected as part of the patrol of the distribution system or while doing normal routine utility work.
(e) This report is to be submitted to the LERC on an annual basis.

Table C-3: Sample Patrol Deficiency Record
Region/District Date
Substation Name/ID Inspection/Patrol Team_____
Feeder Name/ID _____ Page no.____ of _____

Location	Equipment ID No.	Equipment classification	Repair required/ Problem	Corrective action priority		Assigned to / Work Order No.	Date repair completed or scheduled
				Grade 1	Grade 2		
No. of deficiencies for the circuit or service area is:							

Notes to Table C-3

(a) The format of this record is to be determined by the Distribution Licensee based on their own system data input forms. This format is a sample for inspections done on a geographical or circuit basis and indicates the information that is expected to be collected.
(b) Deficiencies and corrective action for all major equipment classifications for the area or circuit would be recorded.
(c) Distribution Licensees are required to retain this information and make it available to the LERC upon request.
(d) **Corrective Action Grade 1** is defined as a condition requiring urgent and immediate response and continued action until the condition is repaired or no longer presents a potential hazard.
(e) **Corrective Action Grade 2** is defined as a condition requiring timely corrective action to mitigate an existing condition which, at the time of identification, does not present an immediate hazard to the public, Distribution Licensee employee, or property.

APPENDIX D:
CONTRACTS AND APPLICATIONS FOR CONNECTING A GENERATOR TO THE LOCAL DISTRIBUTION SYSTEM

INFORMATION IN A CONNECTION AGREEEMNT WITH A GENERATOR

A. General

A Connection Agreement between a Distribution Licensee and a generator shall contain terms and conditions relating to connection and access to the Distribution Licensee's system. Such terms and conditions include, but are not limited to the following:

1) Requirements for the inspection and testing of equipment.
2) Requirements for maintenance of the equipment,
3) Worker protection and safety considerations and measure to protect the public and the environment.
4) Requirements for protection systems associated with the connection and the need for periodic maintenance and testing.
5) Requirements for reporting any change affecting connected equipment of the configuration of this equipment.
6) Protocols for the provision of load forecast or forecast of information.
7) Terms and conditions for disconnection and reconnection, including as to the responsibility for the payment of costs/charges associated with reconnection.
8) Requirements for coordinating maintenance and operations.
9) Duration and termination conditions.
10) Details of the connection point, including the ownership of the facility.
11) Connection service charges and payment conditions.
12) Requirements for reporting changes affecting access to metering, monitoring and telemetry equipment.
13) Circumstances that would require re-negotiation of the Connection Agreement.
14) Exchange procedures for information requirements.
15) Communication and operating protocols between Distribution Licensee and generator for routine day-to-day operating matters and under emergency conditions.
16) Access to connection facilities.
17) Assignment of Controlling Authority.
18) Work Protection.

B. Micro-Embedded Load Displacement Generator

The Connection Agreement for a micro-embedded load displacement generator would be in the form set out as follows.

In consideration of the **Distribution Licensee** agreeing to allow a person to connect a 10KW nameplate rated capacity or smaller generation facility to the Distribution Licensee's distribution system, the person shall agree to the following terms and conditions.

1.0 Eligibility

1.1 The person agrees that the generation connection shall be subject to all applicable laws and bound by the terms and conditions of the Distribution Licensee's Conditions of Service as amended from time-to-time, which have been filed with the LERC and are available on request.

1.2 The person agrees that the power produced by this generation facility shall be only for that person's own use.

2.0 Technical Requirements

2.1 The person represents and warrants that the person has installed or will install prior to the connection of the facility to the Distribution Licensee's distribution system, an isolation device and agrees to allow the Distribution Licensee's staff access to and operation of this as may be required for the maintenance and repair of the distribution system.

2.2 The person agrees to perform regular scheduled maintenance to the generation facility as outlined by the manufacturer to assure that connection devices, protection systems, and control systems are maintained in good working order and in compliance with all applicable laws.

2.3 The person agrees that during a power outage on the distribution system, generation facility will shut down unless the person has installed special transfer and isolating capabilities on the connected generation facility. The person agrees to the automatic disconnection of the generation facility from the Distribution Licensee's distribution system, as per the generator protective relay settings set out in this Agreement, in the event of a power outage on the Distribution Licensee's distribution system or any abnormal operation of the Distribution Licensee's distribution system.

2.4 The person covenants and in agreement that the design, installation, maintenance, and operation of the generation facility are conducted in a manner that ensures the safety and security of both the generation facility and the Distribution Licensee's distribution system.

2.5 Due to the Distribution Licensee's obligation to maintain the safety and reliability of its distribution system, the person acknowledges and agrees that in the event the Distribution Licensee determines that the generation facility

(i) causes damage to and/or

(ii) is producing adverse effects affecting other distribution system customers or the Distribution Licensee's assets,

the person will disconnect the generation facility immediately from the distribution system upon direction from the Distribution Licensee and correct the problem at the person's own expense prior to reconnection.

3.0 Liabilities

3.1 The person and the Distribution Licensee will indemnify and save each other harmless for all damages and/or adverse effects resulting from either party's negligence or willful misconduct in the connection and operation of the generation facility or the Distribution Licensee's distribution system.

3.2 The Distribution Licensee and the person shall not be liable to each other under any circumstances whatsoever for any loss of profits or revenues, business interruptions losses, loss of contract or loss of goodwill, or for any indirect, consequential, incidental, or special damages, including but not limited to punitive or exemplary damages, whether any of the said liability, loss or arise in contract, tort or otherwise.

4.0 Compensation and Billing

4.1 Subject to any applicable law, the person agrees that the Distribution Licensee will not pay (that person) for any excess generation that results in a net delivery of energy to the Distribution Licensee between meter reads.

4.2 Subject to any applicable law, the person acknowledges and agrees that there will be no carryover of excess generation from one billing period to the next unless the person is, at the relevant time, a net-metered generator.

5.0 Termination

The person understands that person has the right to terminate this Agreement at any time, and that by doing so the person is required to disconnect the generation facility and notify the Distribution Licensee of such action.

6.0 Assignment

A person may assign his/her rights and obligations under this Agreement with the consent of the Distribution Licensee, which shall not withhold its consent unreasonably. The Distribution Licensee shall have the right and obligations under this Agreement without the person's consent.

I, the person, understand, accept, and agree to comply with and be bound by the above terms and conditions governing the connection of my generation facility to the Distribution Licensee's distribution system.

Signed ……. Date: ……

Print Name _____

Distribution Utility (DU) Account No.: _____

I confirm that the following information is true and accurate.

Nameplate Rating of Generator _____kW

Total Installed generation _____kW

Type of Generator:	Tick
Solar PV	
Wind Turbine	

Fuel Cell	
Hydraulic Turbine	
Other	

Inverter Utilized? Yes ☐ No ☐

If Yes, Provide Inverter Certification documentation

For Office use ONLY: Station_____ Feeder _____ Date Connected_____

Generator Protective Relay setting

Inverter-based Generator setting

Table D-1 shows recommended relay settings for an inverter-based embedded generator for successful connection to and safe operation of a Distribution Licensee's system. Applies to inverters built based on CSA Standard **(Source: CSA C22.2 No. 107.1-01 Table 16; Alternative standards that could also be relied upon are the UL 1741 & IEEE P1547)**

Table D-1: Inverter-based Generator setting

System Voltage Vn =Vnominal	Frequency, f (Hz)	Maximum no. of cycles to disconnect	
		Time (seconds)	No. of cycles
Voltage < 0.5Vn	50	0.1	5
0.5Vn ≤Voltage < 0.88Vn	50	2	100
1.11Vn ≤Voltage < 1.37Vn	50	2	100
Voltage ≥1.37	50	0.033	2
Voltage = Vn	*f* < 49.8	0.1	5
Voltage = Vn	*f* < 50.2	0.1	5

Non-Inverter Generator setting

Table D-2 shows recommended minimum requirements for relay settings for other embedded generator connections and operation requirements of the Distribution Licensee to ensure safe connection and operation of the Distribution Licensee's system.

Table D-2: Non-inverter Generator setting

System Voltage Vn =Vnominal	Frequency, f (Hz)	Maximum no. of cycles to disconnect	
		Time (seconds)	No. of cycles
Voltage < 0.5Vn	50	0.16	8
0.5Vn ≤Voltage < 0.88Vn	50	2	100
1.1Vn ≤Voltage < 1.2Vn	50	1	50
Voltage ≥1.2	50	0.16	8
Voltage = Vn	*f* < 59.3	0.16	8
Voltage = Vn	*f* < 60.5	0.16	8

- Clearing time is between the start of the abnormal condition and the generation ceasing to energize the Distribution Licensee system
- If a person is uncertain about the generation equipment's protection relay setting that person should contact the supplier of the generation equipment.
- Automatic reconnect setting time for the generator shall be after 5 minutes of the Distribution Licensee system returning to normal operation at nominal voltage and frequency.

Table D-3: Other Potential contracts/ Agreements

Contact Name	Parties	Purpose
Construction Agreement	Distribution Licensee, Generator	Describe obligations of generator and the Distribution Licensee to complete connection, including terms for cost recovery.
Construction Agreement	Distribution Licensee, Transmission Licensee	Where modification of the transmission system is required for connection of the generator, this document will describe the obligations of the Distribution Licensee and Transmission Licensee, including terms for cost recovery
Conditions of Service	Distribution Licensee, Transmission Licensee	Where the generator is a load customer of the DU, document describes the rates applicable
Connection Agreement	Distribution Licensee, Generator	Document describes the language or protocol to be used during normal and emergency situations, installed protection equipment, ownership and operating control of equipment, boundaries, expected levels of maintenance and testing by both parties, contact names, telephone numbers, definitions, and all necessary schematic diagrams for effective communication between the parties.
Additional Operations[1] Agreement (If required)	Distribution Licensee, Transmission Licensee	(To be specified as when required)

[1]Additional Operations Agreement or Construction Agreements may be required where other parties are likely to be affected by the connection of the generator.

APPENDIX E

E. 1.1 CONNECTION PROCESS FOR MICRO-EMBEDDED LOAD DISPLACEMENT GENERATION FACILITY

A Micro-Embedded Load Displacement Generation Facility of the size ≤ 10kW for Load Displacement or Emergency Back-up Generation purposes shall have the following Connection Process :

Step 1:
Request for Information – Customer proposing the installation of a micro-embedded load displacement generation facility contacts the Distribution Licensee or Local Distribution Licensee.

Step 2.
Provision of Information – The Distribution Licensee shall make the information available to the proponent in a timely manner. The Information package shall include:

(a) Description of the connection process (basis is in The National Electricity Distribution Code – this incorporates the Distribution Licensee's specifics; contact numbers etc. and reiterates/stresses the need for Distribution Licensee authorization to connect);

(b) Approvals needed by the Distribution Licensee for connection; • Technical requirements including metering;

(c) Contractual requirements (Micro- Embedded Load Displacement Connection Agreement); and

(d) Application forms Distribution Licensee provided information on Electricity Safety Requirements

The Distribution Licensee shall advice the generator to also contact the LERC for direction on possible application for an Authorization or Permit to support the operations.

Step 3:
Generator Develops Plan – Generator reviews relevant information from Distribution Licensee, on project, and puts together installation plan detailing:

(a) Size/type of generation facility;

(b) Load displacement/net metering/isolated from distribution network; and

(c) Project plan indicating who needs to be included and when.

Step 4:
Application Process – Generator submits application to the Distribution Licensee. Information required includes the following:

(a) the name-plate rated capacity of each unit of the proposed generation facility and the total name-plate rated capacity of the proposed generation facility at the connection point;

(b) the fuel type of the proposed generation facility;

(c) the type of technology to be used; and

(d) the location of the proposed generation facility including address and account number with the Distribution Licensee where available.

Steps 5 & 6:
Distribution Licensee Electrical Inspection Application Note in Step 5 and the review of application for generator at existing site in Step 6 run in parallel as follows:

(a) Generator to submit plans and specific information to Distribution Licensee for inspection.

(b) Distribution Licensee must review and respond to the generator's application and make an offer to connect approved generation or refusal to connect with reasons within 15 calendar days;

- Typical requirement is new meter only;
- Check for service upgrade requirement;
- Check for significant amount of other generation on feeder;
- Inform generator of requirements specified to the connection (typically requirements for metering) and costs, timing to implement, etc.; and
- Offer to connect shall be good for 30 days and the generator must indicate acceptance and intent to proceed within this timeframe

Steps 7 & 8
Decision to Proceed and Install – If generator decides to proceed the generator must :

(a) commit to paying the Distribution Licensee for upgrades (metering);

(b) begin to install;

(c) work closely with the Distribution Licensee, and any other organization from which work, inspections, approvals, or licenses are required to prevent delays;

(d) ensure that activities are planned in coordination with project milestones, and it is up to the generator to initiate actions at the required times; and

(e) apply for Electrical Inspection.

Steps 9 & 10
Final Inspection and Authorization to Connect – The generator will contact the Distribution Licensee after completion of the installation works for a final inspection and testing process in preparation to receive to receive an Authorization to Connect and may involve the following processes where the Distribution Licensee will:

(a) respond within 5 days to change the meter (if necessary) or;

(b) check to ensure generator commitments have been satisfied including

- issue and receipt of Distribution Licensee Authorization to Connect; and
- Signed Agreement.

E.1.2 CONNECTION OF SMALL EMBEDDED GENERATION FACILITIES

Embedded generation in this group are in two categories

(a) Embedded generation with size up to 500kW for connection at a voltage < 15kV; and

(b) Embedded generation of size up to 1MW for connection at a voltage ≥ 15kV.

The connection process for both categories (a) and (b) respectively shall be similar except for differences in the timelines specified for the various stages of the connection process.

The identical connection process followed for the two categories are as follows:

- Small (a) – No distribution network reinforcement or expansion required to facilitate generator connection.
- Small (b) – Distribution network reinforcement or expansion is required to facilitate connection.

Step 1:
Initial Contact – Customer proposing the installation of a generation facility contacts the Distribution Licensee and requests for relevant information.

Step 2:
Provision of Information – The Distribution Licensee provides the relevant information to the proponent in a timely manner which information shall include the following:

(a) Description of the connection process (based on the requirements of the Distribution Code and elaboration of the Distribution Licensee's specific requirements, timing, contact numbers etc. and emphasizing the need or requirement for the Distribution Licensee's authorization to connect);

(b) Approvals needed by the Distribution Licensee for connection;

(c) Technical requirements including metering

(d) Contractual requirements (Connection Agreement);

(e) Application forms

(f) Generator informed of the potential need to contact the LERC further direction as to clarity of enterprise and applicable regulatory framework; and

(g) Notification of the potential involvement of the Transmission Licensee

(h) Provision of information relating to Electrical Safety Requirements and approval process of the proposed safety Plan

The Distribution Licensee shall advice the generator to also contact the LERC for direction on possible application for an Authorization or Permit to support the operations.

Step 3:
Generator Develops Plan – Generator reviews relevant information supplied by the Distribution Licensee on technologies, and puts together an installation plan made up of the following essential elements:

(a) Size and type of generation facility;

(b) Load displacement/net metering /isolated from the distribution network; and

(c) Project plan indicating who needs to be included and when

Step 4:
Initial Consultation (No Charge) – Generator requests preliminary meeting and submits basic information which must include the following:

(a) The nameplate rated capacity of each unit of the proposed generation facility and the total nameplate rated capacity of the proposed generation facility at the connection point;

(b) The fuel type of the proposed facility;

(c) The type of technology to be used; and

(d) The location of the proposed generation facility including the address and account number with the Distribution Licensee where available.

(e) Within 15 days of receipt of basic information and request for meeting, the Distribution Licensee must meet with the generator to review the plans at basic level touching on issues such as:

- Location of existing distribution facilities in reference to proposed generation facility;
- Rough estimate on time and costs which could be associated with project; and
- Basic feasibility of project.

Step 5:
Application for Impact Assessment – The generator shall apply for an impact assessment to be carried out by the Distribution Licensee and makes associated payment with the application together with the following information required by the Distribution Licensee for the assessment:

(a) Size of generation facility (each unit and total at connection point);

(b) Type of generation facility;

(c) Type and details of technology;

(d) Type of fuel;

(e) Single line diagram;

(f) Location (address, account number); and

(g) Preliminary generator/consultant design of proposed interface protection.

Impact assessment report should provide Generator with information on

- the Connection feasibility and cost;
- Metering requirements; and
- the Distribution Licensee requirements

Step 6:
Offer to Connect (Impact Assessment and Distribution Licensee Approval Process) – The Distribution Licensee shall perform impact assessment of the proposed generation facility on the distribution network and customers, including the following considerations:

(a) Voltage impacts;

(b) Current loading;

(c) Fault currents; and

(d) Connection feasibility identification of line/equipment upgrades required, distribution or transmission system protection modifications/requirements, metering requirements, detailed cost estimate and offer to connect.

Timing – Time to review and inform generator after receipt of payment and application for:
- Small (a) – up to 60 days; and
- Small (b) – up to 90 days

Steps 7 & 8:
Decision to Proceed and Install – If the generator decides to revise the original plans based on result of impact assessment, the plans must be re-submitted for another review by going back to Step 5. Any change in design, equipment or plans requires notification to the Distribution Licensee.
If the generator feels that the offer to connect is not fair and reasonable, the generator should request Distribution Licensee review using the dispute resolution process as defined in the Distribution Licensee's Conditions of Service.

If the generator decides to proceed then:

(a) Both parties shall proceed to sign Connection Agreement;

(b) the Generator shall commit to payments;

(c) Both parties shall commit to schedules, information exchange, scope of work of the generator and that of the Distribution Licensee;

(d) the Distribution Licensee shall initiate the works to be done to facilitate the connection;

(e) the Generator initiates the required activities; and

(f) the Generator must work closely with the Distribution Licensee and any other organizations from which work, inspections, approvals, or licenses are required to prevent delays.

Steps 9 & 10:
Implementation – Both parties shall commit to obtain required approvals:

(a) Generator prepares detailed engineering drawings;

(b) Generator submits all detailed plans to the Distribution Licensee for Plan Approval process (includes detailed single line programme, interfaces protection); and

(c) Submits information to Distribution Licensee for design review (including detailed single line diagram, interface protection and metering details).

It is recommended that generators provide this information to the Distribution Licensee within 30 days of signing to allow for timely design review. The Distribution Licensee shall perform design review to ensure detailed engineering is acceptable and shall inform the generator on:

(a) Interface protection design review

(b) Distribution Licensee reviews detailed single line diagram and interface protection to ensure acceptability; and

(c) Recommendation that this review be completed before equipment purchase by generator.

Generator receives interface protection design review from the Distribution Licensee:

(a) Generator tenders and awards contracts for equipment

(b) Build – including Distribution Licensee and other approvals;

(c) Connect work; and

(d) Line/equipment upgrades are completed.

Generator constructs facility and applies for Distribution Licensee Electrical Inspection to receive Authorization to Connect.

Step 11:
Authorization to Connect – The generator arranges for and receives Authorization to Connect from the Distribution Licensee.

Step 12 :
Connection Agreement – The generator and the Distribution Licensee agree to, and sign Connection Agreement. Note: A temporary connection agreement for the purpose of connection for Commissioning and Verification may be signed at this point while negotiating final Connection Agreement.

Step 13 & 14:
Commissioning & Verification – Generation facility commissioning and testing shall be as follows:

(a) Generator arranges for commissioning and testing of the generation facility; and

(b) Distribution Licensee witnesses and verifies the commissioning process.

Timing – Time for completion of step 9 to final connection for:

- Small (a) – up to 60 days; and
- Small (b) – up to 180 days.

Step 15

Completion Process Completed – Generation facility fully connected and operational.

E.1.3 CONNECTION OF MID-SIZED EMBEDDED GENERATION FACILITY

Mid-sized Embedded Generation Facility Connection Process for generators with sizes:

- **Greater than 500 kW Connected to network voltage < 15 kV and**
- **Greater than 1 MW but Less than 10 MW Connected to network voltage ≥ 15 k V**

Step 1:
Initial Contact – Customer proposing the installation of a generation facility shall contact the Distribution Licensee for information. The Distribution Licensee may also guide the generator to contact the Transmission Licensee or additional connection information. The Distribution Licensee shall advise the generator to also contact the LERC for direction on possible application for an Authorization or Permit to support the operations.

Step 2:
Provision of Information – The Distribution Licensee shall make the information available to the proponent in a timely manner including the following:

(a) Description of the connection process (based on the requirements of the Distribution Code and elaboration of the Distribution Licensee's specific requirements, timing, contact numbers etc. and emphasizing the need or requirement for the Distribution Licensee's authorization to connect);

(b) Approvals needed by the Distribution Licensee for connection;

(c) Technical requirements including metering

(d) Contractual requirements (Connection Agreement);

(e) Application forms

(f) Generator informed of the potential need to contact the LERC further direction as to clarity of enterprise and applicable regulatory framework; and

(g) Notification of the potential involvement of the Transmission Licensee

(h) Provision of information relating to Electrical Safety Requirements and approval process of the proposed safety Plan

Step 3.
Generator Develops Plan – Generator reviews relevant information supplied by the Distribution Licensee on technologies, and puts together an installation plan made up of the following essential elements:

(a) Size and type of generation facility;

(b) Load displacement/net metering /isolated from the distribution network; and

(c) Project plan indicating who needs to be included and when.

Step 4:

Initial Consultation (No Charge) – Generator requests preliminary meeting and submits basic information which must include the following:

(a) The name-plate rated capacity of each unit of the proposed generation facility and the total name-plate rated capacity of the proposed generation facility at the connection point;

(b) The fuel type of the proposed facility;

(c) The type of technology to be used; and

(d) The location of the proposed generation facility including the address and account number with the Distribution Licensee where available.

(e) Within 15 days of receipt of basic information and request for meeting, the Distribution Licensee must meet with the generator to review the plans at basic level touching on issues such as:

- Location of existing distribution facilities in reference to proposed generation facility;
- Rough estimate on time and costs which could be associated with project; and
- Basic feasibility of project.

Step 5:
Application for Impact Assessment – The generator shall apply for an impact assessment to be carried out by the Distribution Licensee and makes associated payment with the application. In addition to information supplied under Step 4, the following information shall also be required by the Distribution Licensee for the assessment:

(a) Single line diagram

(b) Location (address, account number); and

(c) Preliminary generator/consultant design of proposed interface protection.

Step 6:
Impact Assessment – The Distribution Licensee shall perform an impact assessment of proposed generation facility on the distribution network and customers covering the following issues:

(a) Voltage impacts;

(b) Current loading;

(c) Fault currents; and

(d) Connection feasibility and identification of line/equipment upgrades required, requirements, and an overview of cost implications.

Timing – Time to review and inform generator after receipt of payment and application shall be up to 60 days.
The Distribution Licensee shall request and receive an impact assessment of proposed generation facility on the Transmission Licensee or host distribution network (as the situation

demands) and customers. Transmission Licensee or host Distribution Licensee must prepare impact assessment as may be required. The geographic Distribution Licensee shall only be responsible for timely delivery of information specific to its distribution network.

Impact assessment report should provide Generator with information on

- the Connection feasibility and cost;
- Metering requirements; and

It is assumed that the generator/consultant will design generation facility, including interface protection to achieve the required functionality. The Distribution Licensee will review the design within 1 month of signing the Connection Cost Agreement (CCA) (ref. Step 10). The generator shall also provide the Distribution Licensee with information for inspection in order to begin the Plan Approval process.

Steps 7 & 8:
Decision to Proceed and Install – If the generator decides to revise the original plans based on result of impact assessment, the plans must be re-submitted for another review by going back to Step 5. Any change in design, equipment or plans requires notification to the Distribution Licensee.
If the generator feels that the results of the impact assessment are manageable, the generator will request a meeting to develop a scope so that the Distribution Licensee can prepare an estimate and an Offer to Connect.

If the generator decides to proceed:

(a) Both parties proceed to agree to and sign off on the agreed scope of project; and

(b) Generator pays for preparation of the estimate by the Distribution Licensee, host distribution network and Transmission Licensee as required.

Steps 9,10 &11:
Prepare Estimate and Present Offer to Connect – The Distribution Licensee must notify the Transmission Licensee and/or host distribution network (as required) within 10 days of receiving payment and notification that a generator has decided to proceed, and an estimate is to be prepared. The Distribution Licensee shall prepare a detailed estimate of the project based on the scope defined in step 8.

The Distribution Licensee must prepare their portion of the Offer to Connect within 90 days of receipt of payment from the generator. In any event, the Distribution Licensee has up to 30 days from the date of receipt (from the Transmission/or host DU) to incorporate the estimate of the Transmission Licensee or host distribution network.

If the generator decides to proceed after reviewing the Offer to Connect, then:

(a) All parties shall agree to, and sign, the Connection Cost Agreement (CCA) (ref step 6);

(b) The generator shall agree to the payment schedule for work required by the Distribution Licensee and/or Transmission Licensee/host distribution network;

(c) All parties must commit to schedules, information exchange and the scope of work; and

(d) The generator must work closely with the Distribution Licensee, and any other organizations from which work, inspections, approvals, or licenses are required to prevent delays

Steps 12, 13, 14 :

Implementation Timing – Implementation timing shall comprise of the following:

(a) Time from commitment to proceed to final connection to be negotiated in Connection Cost Agreement;

(b) Distribution Licensee shall initiate the works to be done to facilitate the connection;

(c) Generator shall also initiate the activities identified as it's responsibility; and

(d) Transmission Licensee and/or host Distribution Licensee shall initiate the works to be done to facilitate connection.

Implementation – Both parties shall commit to obtain required approvals:

(a) Generator prepares detailed engineering drawings;

(b) Generator submits all detailed plans to the Distribution Licensee for Plan Approval process (includes detailed single line programme, interfaces protection); and

(c) Submits information to Distribution Licensee for design review (including detailed single line diagram, interface protection and metering details).

It is recommended that generators provide this information to the Distribution Licensee within 30 days of signing the CCA to allow for timely design review. The Distribution Licensee shall perform design review to ensure detailed engineering is acceptable and shall inform the generator on:

(a) Interface protection design review

(b) Distribution Licensee reviews detailed single line diagram and interface protection to ensure acceptability; and

(c) Recommendation that this review be completed before equipment purchase by generator.

Generator shall receive the reviewed interface protection design from the Distribution Licensee and then proceed to:

(a) Generator tenders and awards contracts for equipment

(b) Build – including Distribution Licensee and other approvals;

(c) Connect work; and

(d) Line/equipment upgrades are completed.

Generator shall construct the facility and apply for Distribution Licensee Electrical Inspection to receive Authorization to Connect.

Step 15:

Connection Agreement – The generator and the Distribution Licensee agree to, and sign Connection Agreement. The Distribution Licensee and Transmission Licensee/host distribution network shall review existing agreements for required revisions. *Note: A temporary connection agreement for the purpose of connection for Commissioning and Verification may be signed at this point while negotiating final Connection Agreement.*

Step 16:
Commissioning & Verification – Generation facility commissioning and testing shall be as follows:

(a) Generator arranges for commissioning and testing of the generation facility;

(b) Distribution Licensee witnesses and verifies the commissioning process; and

(c) Transmission Licensee/host Distribution Licensee witnesses and verifies the commissioning process as required.

Step. 17:
Completion Process Complete – generation facility fully connected and operational

E.1.4 CONNECTION OF A LARGE EMBEDDED GENERATION FACILITY

Large Embedded Generation Facility Connection Process Greater than 10 MW

Step 1:
Initial Contact – Customer proposing the installation of a generation facility shall contact the Distribution Licensee for information. The Distribution Licensee may also guide the generator to contact the Transmission Licensee or additional connection information. The Distribution Licensee shall advise the generator to also contact the LERC for direction on possible application for an Authorization or Permit to support the operations.

Step 2:
Provision of Information – The Distribution Licensee shall make the information available to the proponent in a timely manner including the following:

(a) Description of the connection process (based on the requirements of the Distribution Code and elaboration of the Distribution Licensee's specific requirements, timing, contact numbers etc. and emphasizing the need or requirement for the Distribution Licensee's authorization to connect);

(b) Approvals needed by the Distribution Licensee for connection;

(c) Technical requirements including metering

(d) Contractual requirements (Connection Agreement);

(e) Application forms

(f) Generator informed of the potential need to contact the LERC further direction as to clarity of enterprise and applicable regulatory framework; and

(g) Notification of the potential involvement of the Transmission Licensee

(h) Provision of information relating to Electrical Safety Requirements and approval process of the proposed safety Plan

Step 3:
Generator Develops Plan – Generator reviews relevant information supplied by the Distribution Licensee on technologies, and puts together an installation plan made up of the following essential elements:

(a) Size and type of generation facility;

(b) Load displacement/net metering /isolated from the distribution network; and

(c) Project plan indicating who needs to be included and when.

Step 4:
Initial Consultation (No Charge) – Generator requests preliminary meeting and submits basic information which must include the following:

(a) The name-plate rated capacity of each unit of the proposed generation facility and the total name-plate rated capacity of the proposed generation facility at the connection point;

(b) The fuel type of the proposed facility;

(c) The type of technology to be used; and

(d) The location of the proposed generation facility including the address and account number with the Distribution Licensee where available.

(e) Within 15 days of receipt of basic information and request for meeting, the Distribution Licensee must meet with the generator to review the plans at basic level touching on issues such as:

- Location of existing distribution facilities in reference to proposed generation facility;
- Rough estimate on time and costs which could be associated with project; and
- Basic feasibility of project.

Step 5:
Application for Impact Assessment – The generator shall apply for an impact assessment to be carried out by the Distribution Licensee and makes associated payment with the application. Impact assessment may also be required from Transmission Licensee and/or host distribution network. Projects greater than 10 MW will also require a System Impact Assessment. The Distribution Licensee will collect payment from generator and forward both payments and application information on behalf of generator to Transmission Licensee and host distribution network.
In addition to the information provided in step 4, the following information shall also be required by the Distribution Licensee for the assessment:

(a) Single line diagram of the proposed connection; and

(b) A preliminary design of the proposed interface protection.

Step 6.
Impact Assessment – The Distribution Licensee shall perform an impact assessment of proposed generation facility on the distribution network and customers covering the following issues:

(a) Voltage impacts;

(b) Current loading;

(c) Fault currents; and

(d) Connection feasibility and identification of line/equipment upgrades required, requirements, distribution, or transmission system protection modifications, etc. and an overview of cost implications.

Timing – Time to review and inform generator after receipt of payment and application shall be up to 90 days.
The Distribution Licensee shall request and receive an impact assessment of proposed generation facility on the Transmission Licensee or host distribution network (as the situation demands) and customers. Transmission Licensee or host Distribution Licensee must prepare impact assessment as may be required. The geographic Distribution Licensee shall only be responsible for timely delivery of information specific to its distribution network.

Impact assessment report should provide Generator with information on

- the Connection feasibility and cost;
- Metering requirements; and
- Distribution Licensee requirements.

It is assumed that the generator/consultant will design generation facility, including interface protection to achieve the required functionality. The Distribution Licensee will review the design within 1 month of signing the Connection Cost Agreement (CCA) **(ref. Step 10).**

Steps 7 & 8 :
Decision to Proceed and Establish Scope of Project – If the generator decides to revise the original plans based on result of impact assessment, the plans must be re-submitted for another review by going back to Step 5. Any change in design, equipment or plans requires notification to the Distribution Licensee.
If the generator feels that the results of the impact assessment are manageable, the generator will request a meeting to develop a scope so that the Distribution Licensee can prepare an estimate and an Offer to Connect.

If the generator decides to proceed:

(a) Both parties proceed to agree to and sign off on the agreed scope of project; and

(b) Generator pays for preparation of the estimate by the Distribution Licensee, host distribution network and Transmission Licensee as required.

Steps 9, 10, 11:
Prepare Estimate and Present Offer to Connect – The Distribution Licensee must notify the Transmission Licensee and/or host distribution network (as required) within 10 days of receiving payment and notification that a generator has decided to proceed, and an estimate should be prepared. The Distribution Licensee shall prepare a detailed estimate of the project based on the scope defined in step 8.
The Distribution Licensee must prepare their portion of the Offer to Connect within 90 days of receipt of payment from the generator. In any event, the Distribution Licensee has up to 30 days from the date of receipt (from the Transmission/or host DU) to incorporate the estimate of the Transmission Licensee or host distribution network.

If the generator decides to proceed after reviewing the Offer to Connect, then:

(a) All parties shall agree to, and sign, the Connection Cost Agreement (CCA) (ref step 6);

(b) The generator shall agree to the payment schedule for work required by the Distribution Licensee and/or Transmission Licensee/host distribution network;

(c) All parties must commit to schedules, information exchange and the scope of work; and

(d) The generator must work closely with the Distribution Licensee, and any other organizations from which work, inspections, approvals, or licenses are required to prevent delays

Steps 12, 13, 14 :
Implementation Timing – Implementation timing shall comprise of the following:

(a) Time from commitment to proceed to final connection to be negotiated in Connection Cost Agreement;

(b) Distribution Licensee shall initiate the works to be done to facilitate the connection;

(c) Generator shall also initiate the activities identified as its responsibility; and

(d) Transmission Licensee and/or host Distribution Licensee shall initiate the works to be done to facilitate connection.

Implementation – Both parties shall commit to obtain required approvals:

(a) Generator prepares detailed engineering drawings;

(b) Generator submits all detailed plans to the Distribution Licensee for Plan Approval process (includes detailed single line programme, interfaces protection); and

(c) Submits information to Distribution Licensee for design review (including detailed single line diagram, interface protection and metering details).

It is recommended that generators provide this information to the Distribution Licensee within 30 days of signing the CCA to allow for timely design review. The Distribution Licensee shall perform design review to ensure detailed engineering is acceptable and shall inform the generator on:

(a) Interface protection design review

(b) Distribution Licensee reviews detailed single line diagram and interface protection to ensure acceptability; and

(c) Recommendation that this review be completed before equipment purchase by generator.

Generator shall receive the reviewed interface protection design from the Distribution Licensee and then proceed to:

(a) Generator tenders and awards contracts for equipment

(b) Build – including Distribution Licensee and other approvals;

(c) Connect work; and

(d) Line/equipment upgrades are completed.

Generator shall construct the facility and apply for Distribution Licensee Electrical Inspection to receive authorization to Connect.

Step 15:
Connection Agreement – The generator and the Distribution Licensee agree to, and sign Connection Agreement. The Distribution Licensee and Transmission Licensee/host distribution network shall review existing agreements for required revisions. *Note: A temporary connection agreement for the purpose of connection for Commissioning and Verification may be signed at this point while negotiating final Connection Agreement.*

Step 16:
Commissioning & Verification – Generation facility commissioning and testing shall be as follows:

(a) Generator arranges for commissioning and testing of the generation facility;

(b) Distribution Licensee witnesses and verifies the commissioning process; and

(c) Transmission Licensee/host Distribution Licensee witnesses and verifies the commissioning process as required.

Step. 17:
Completion Process Complete – generation facility fully connected and operational

E.2 TECHNICAL REQUIREMENTS

LIST OF ACRONYMS [for Appendix E2]

CSA Canadian Standards Association

IEC International Electrical Code

IEEE Institute of Electrical and Electronic Engineers

OESC Ontario Electrical Safety Code166

LITS Liberia Interconnected Transmission System

LDC Licensed Distribution Company

Technical Requirements for Generator Connection

Point of Connection

The point of connection (also may be referred to as point of common coupling) will be identified in the design and on the single line diagram. The Distribution Licensee will coordinate design, construction, maintenance, and operation of the facilities on its side of the point of connection. The applicant is responsible for the design, construction, maintenance, and operation of the facilities on its side of the point of connection unless described otherwise in an interconnection agreement.

Note: On the generator's side of point of connection, the equipment shall be approved in accordance with rule 2-004 of the Ontario Electrical Safety Code (OESC).

1. Isolation at the Point of Isolation

A means of isolation must be provided by the generator and must be in compliance with the OESC. The Distribution Licensee's practice may require its own additional means of disconnection on the Distribution Licensee's side of the point of connection.

2. Interconnecting Grounding

Generation facilities and the associated interconnection systems must be grounded as per manufacturer's recommendations and the OESC, as well as considering the normal practices of the Distribution Licensee. Interconnection of three phase transformers, and transformer grounding systems on three phase distribution networks shall be co-coordinated with the Distribution Licensee and shall not cause voltage disturbances or disrupt coordination of distribution network ground fault protection.

3.Voltage Regulation, IEEE 1547,CSA Standard CAN3-C235-83 CSA Standard

CAN3-C235-83 provides general guidelines as to appropriate distribution system steady state service voltage levels. The generation facility must operate satisfactorily within the extreme voltage level variation limits shown in these standards. Voltage regulation is the responsibility of the Distribution Licensee.

3.1 Steady-State Voltage , CSA Standard CAN 3-C235 – Customers connected to the feeder must be supplied with adequate voltage levels, as per CSA Standards CAN3-C235 for the following situations: with and without the generation facility generating power for minimum and maximum feeder loading conditions.

3.2 Voltage Fluctuation, CSA CAN 3-325-83 – Requirements for Facilities of 10 MW and Larger

Adequate voltage regulation shall be maintained under a variety of operating conditions. During normal operation, and whenever possible, the generation facility shall be loaded and unloaded gradually to allow adequate time for regulating devices to respond.

3.3 Synchronization, IEEE 1547 Requirements for Facilities of 10 MW and Larger

The generator shall parallel with the distribution network without causing a voltage fluctuation of flicker greater than those specified by the above standards at the point of connection. *[Note: OESC rule 84-006 covers the synchronization of parallel generators.]*

3.4 Voltage Unbalance

Where the distribution network supplies single-phase loads, some unbalances are inevitable. The generation facility should be capable of operating under these conditions and shall not cause further deterioration of existing unbalance conditions.

4. Power Factor, IEEE 1547, CSA C107.1

The generator's system is not required to be capable of adjusting the power factor but shall operate in the preferred range of 0.9 lag to 0.95 lead. If the generation facility disturbs the distribution network voltage levels at the point of connection, then the generator may be required to operate its facility within a smaller range or take other compensatory measures. Field settable fixed and dynamic power factor correction techniques may be used if consultation with the Distribution Licensee reveals no adverse effect on the distribution network. For generators that are inactive, the reactive power compensation at the generating units should be sufficient so as not to cause any material increase in the reactive power requirements at the transmission system transformer station due to operation of the LITS, at any distribution feeder load conditions. For inverter-based generator facilities power factor limits will be as given under the Micropower Connection guidelines.

5. Equipment Ratings and Requirement

The generation facility interface equipment must be compatible with LDC equipment ratings at the connection voltage (maximum voltage, basic impulse limit, short circuit ratings, capacity, etc.) and the incorporation of the added generation facility must not result in any distribution network equipment operating beyond the distribution network operational rating. A Distribution Licensee shall review the equipment ratings for the purpose of assessing integration of the generation facility with the distribution network. The equipment ratings that shall be reviewed include but not limited to the following:

5.1 Equipment Thermal Loading – All existing Distribution Licensee's equipment in distribution and transmission stations shall not be overloaded beyond acceptable limits under all operating conditions of the generation facility. This equipment includes feeder conductor, line voltage regulators, regulating stations, reclosers, circuit breakers and transformers. Assuming that under existing operating conditions there is no overloaded equipment, the study will be conducted for minimum load conditions and maximum

generation including all existing generation facilities already existing on the feeder. The load flow study will identify the potential overload of the existing equipment.

5.2 Impact of Generation facility Fault Contribution on Equipment Rating – The generation facility will contribute to the total fault current. The distribution network's interrupting devices shall be able to interrupt the maximum fault current that will flow through the devices. All the distribution network's electrical equipment must be able to withstand the fault current passing through it for the required time for the protection to clear the fault. The fault interrupting rating of the existing interrupting devices and the fault withstanding rating of the electrical equipment shall be higher than the maximum fault current possible to flow through the equipment. Where the generator causes these limits to be exceeded, distribution network equipment replacement or fault current limiting devices may be required.

5.3 Voltage Regulating and Metering Devices – The Distribution Licensee's system has been designed for unidirectional flow of power from source (i.e., station) to the customer. Therefore, the voltage regulating, and metering devices are designed to correctly operate under these conditions. The connection of generating facilities to the distribution feeder could cause the power flow to be reversed through the power equipment, which will create difficulties to properly regulate the voltage or to measure the energy, respectively.

Where it is possible for power to flow in reverse through the existing voltage regulating devices and/or the metering points, the regulating devices and metering devices shall be suitable for such bi-directional flow.

The study will be conducted for minimum load and maximum generation condition. The direction of the power flow through voltage regulating devices connected between the generation facility and the transformer station will be verified including line voltage regulators, regulating stations and transformers' under load tap changer, at the distribution station and transformer station. Also, all metering devices, either for billing purpose or monitoring reasons will be verified.

6. Cease to Energize

The Distribution Licensee will review the generator's design to ensure that the facility will cease to energize automatically from the distribution network's supply under the conditions identified in this section. Important considerations in this design review:

As per IEEE 1547 – To maintain the reliability of the distribution network, the Distribution Licensee may use automatic re-closing. The applicant needs to be aware of line re-closing when designing the system protection schemes to ensure that it de-energizes the distribution network prior to automatic re-close of the distribution network's breakers or line reclosers. The Distribution Licensee must review to ensure that the generator's design will de-energize the generation facility prior to auto-reclose operation of feeder tripping devices

As per IEEE 1547 and OESC 84-008 (b) – After a disturbance on the distribution network, no reconnection shall take place until the distribution network voltages and frequency are within the limits specified in SCA CAN3-C235 standard.

The generator's interconnection system shall include an adjustable delay (or a fixed delay of 5 minutes) that may delay reconnection for up to 5 minutes after the distribution network's steady state voltage and frequency are restored to the ranges identified above.

6.1 Loss of LDC Supply Resulting in the Formation of an Island, IEEE 1547 CSA C22.2 N0. 107.1, OESC 84-008 (loss of Supply Authority Voltage)

6.1.2 Unplanned Islanding – The applicants system shall cease to energize the distribution network following the formation of an unintentional island.

6.1.3 Planned islanding – Where planned islanding is allowed; the generator and the Distribution Licensee will jointly agree to all requirements.

6.2 Over-Current Protection Coordination Due to Generation Facilities Fault Contribution IEEE 1547 and OESC 84-014 (System Protection Devices)

Any element of the interconnection system external to the generation facility, but ahead of the point of connection, should be installed in a fail-safe manner with self-checking features or redundant protection functions for large generators.

Equipment and conductors shall be provided with over-current protection from each source of supply. The generation facilities protection system shall be capable of automatically isolating the generator from the distribution network for the following:

- internal faults within the facility; and/or
- external faults within the distribution network.

The protective device selectivity and sensitivity must be maintained over the range of minimum to maximum fault currents with infeed from the generator.

Where the primary connection of the generation facility transformer is Wye- (Y) grounded, the sensitivity of the ground fault protections could become deficient, as zero sequence current will have an additional ground path through the transformer to the distribution network. The ground fault occurring within the protected zone must be seen by the ground fault protections with and without transformer connected.

6.5 System Voltage Changes Beyond the Over or Under Voltage Range, IEEE 1547

Over and under voltage and over and under frequency protection is required at the generation facilities interconnection point. The set points and clearing times for over or under voltages and over or under frequencies are dependent upon the magnitude of voltage and frequency variations and generator size. For details see relevant clause of IEEE 1547. Generator equipment should be approved to CSA 107.1 or other acceptable standard. *[Note: OESC rule 84-014 states that each parallel power generation facility installation shall be provided with such additional devices that are required for system stability and equipment protection.]*

7. Revenue Metering shall be in accordance with Canada's Electricity and Gas Inspection Act, R.S. 1985, C.E-4173

8. Feeder Relay Directioning

The existing over-current protections in the distribution network are typically designed to clear line and ground faults occurring downstream from their location, as the source feeding the fault is only the transformer station. Connecting a generation facility provides another source supplying the fault, and the fault contribution from the facility might cause protection to operate non-selectively for reverse faults, out of the protected zone.

If the maximum reverse fault current though a non-directional fault-interrupting device exceeds the setting of the device, the fault-interrupting devise shall be provided with a directional feature to prevent tripping for reverse fault current flow. The phase protection could be replaced with an impedance relay (21) if required.

The main concern is the infeed from the generation facility with Wye-(Y) grounded connection on the HV of the interface transformer for faults on the adjacent feeders. The generator may consider adding a reactor < 5 ohms in the neutral of the generator's transformer, within the constraints of the over-voltages.

9. Monitoring, IEEE 1547, OESC & Transmission Licensee Requirements for Facilities of 10 MW and Higher A generation facility connected to the point of connection, rated at greater than 250 kVA, shall have provision for monitoring connection status, real power output, reactive power output, and voltage either at the point of connection or aggregate connection, as required by the Distribution Licensee. The monitoring equipment shall either be installed, or there shall be adequate provision in the design, to allow future installation of such equipment if not required at the time of interconnection.

When the implementation of data telemetry is required, the Distribution Licensee and the generator will mutually agree upon communication media options. *[Note: At the generator's side of the point of connection, the equipment shall be approved as per rule 2-022 of the OESC.]* The installation shall be inspected as per rule 2-004 of the OESC.

10. Power Quality

The generator shall not significantly impact the power quality of the system. If there are negative impacts once the generation facility is in service, they will be required to disconnect until appropriate measures have been taken to prevent negative impacts to the distribution network and the customers it serves.

10.1 Flicker, IEEE 1547, IEC 61000-3-7 – The generation facility shall not cause objectionable flicker on the distribution network. It is recognized that flicker is a site dependent condition. Loss of synchronism protection may be required to be incorporated by the generator, if necessary, to limit flicker.

10.2 Harmonics, IEEE 1547, IEC 61000-3-6 – Inverter connected generation facilities are expected to comply with CSA 22.2 No 107.1 - current distortion limits. For inverters only capable of operating in voltage follower mode, voltage harmonic distortion limits are not specified, but may be addressed by the Distribution Licensee. Inverters certified to CSA 107.1 are considered to meet these requirements. The CSA standard excludes current harmonics due to voltage distortions in the distribution network.

10.3 Limits of DC Injection, IEEE 1547 – The generation facility shall not inject a d.c. current greater than 0.5% of the unit rated output current after a period of six cycles following energizing of the distribution network.

10.4 Protection from Electromagnetic Interference (EMI), IEEE 1547, C37.90 – The influence of EMI should not interfere with operation of the generation facility's interconnection system.

10.5 Surge Withstand Performance, IEEE 1547, C62.42.2 or C37.9.90, OESC 84-014 – The interconnection system shall have the capability to withstand voltage and current surges

10.6 Paralleling Device, IEEE 1547 – The interconnection system paralleling-device shall be capable of withstanding 220% of the interconnection system rated voltage

APPENDIX F: PROCESS FOR CONNECTING TO ANOTHER DISTRIBUTION NETWORK

EXAMPLE OF A PROCESS FOR CONNECTIONS BETWEEN NETWORKS OF TWO DISTRIBUTION LICENSEES

Step 1

Connection Request

• An embedded Distribution Licensee submits its request to the host Distribution Licensee, summarizing in writing the required initial and ultimate load requirements, the required in-service date, and any other specific requirements.

• The host Distribution Licensee carries out a preliminary review and determines the scope and estimated cost of preparing a System Impact Study.

• The host Distribution Licensee responds in writing within 30 days of receiving the Embedded Distribution Licensee's request.

Step 2

System Impact Study

• Upon receipt of a purchase order or equivalent from the embedded Distribution Licensee, the host Distribution Licensee, in cooperation of the applicant, studies in detail all options and recommends the preferred option. The results of the study are documented in a system impact study report. This report provides the embedded Distribution Licensee with preliminary information regarding the work required to provide the requested supply, the required capital contribution, and the expected lead-time.

• The host Distribution Licensee completes the system impact study within 60 days of receiving the embedded Distribution Licensee's purchase order to proceed. If, despite the host Distribution Licensee's best efforts, the 60 day target cannot be met, the host Distribution Licensee notifies the embedded Distribution Licensee in writing and provides a new target completion date.

Step 3

Connection Application

• The embedded Distribution Licensee reviews the system impact study report and decides whether to proceed.

• To proceed, the embedded Distribution Licensee submits a connection application, provides all necessary Registered Planning Information, and issues a purchase order or equivalent for preparation of detailed engineering specifications.

• The embedded Distribution Licensee submits a connection application to the host Distribution Licensee within 30 days of receiving the system impact study report.

Step 4

Engineering Specifications and Cost Sharing Arrangements

• Upon receipt of a purchase order or equivalent from the embedded Distribution Licensee, the host Distribution Licensee prepares detailed engineering specifications for required system enhancements, obtains cost estimates for the specified work, and determines cost sharing arrangements.

• The host Distribution Licensee provides, in writing, a project description and letter of intent that includes:

(a) A description of the proposed project;

(b) A summary of work to be performed by the host Distribution Licensee;

(c) A summary of work to be performed by the embedded Distribution Licensee;

(d) The host Distribution Licensee's capital investment in the project; and

(e) The embedded Distribution Licensee's financial contribution to the project.

• The host Distribution Licensee provides the required project description and letter of intent within 90 days of receiving the connection application from the embedded Distribution Licensee.

Step 5
Formal Approval and Agreement
• Upon receipt of a signed Letter of Intent from the embedded Distribution Licensee, the host Distribution Licensee seeks formal approval from its Executive and from the LERC (if necessary).

• The host Distribution Licensee prepares a Connection Agreement that outlines the obligations of the host Distribution Licensee and the embedded Distribution Licensee. This Agreement will serve as a legally binding and enforceable agreement between the two parties.

• The host Distribution Licensee obtains required approvals and drafts a Connection Agreement within 60 days (90 days if Regulatory approval is required) of receiving the signed Letter of Intent from the embedded Distribution Licensee.

Step 6
Construction
• Acquisition of any required property or property rights;
• Construction of the host Distribution Licensee's new or modified system facilities;
• Modification of up-stream transmission facilities (if necessary);
• Construction of embedded Distribution Licensee's approved connection facilities;
• Typical construction lead times include:

(a) New or upgraded distribution lines - 6 months

(b) Upgraded Distribution Substations - 12 months

(c) New Distribution Stations - 18 months for 22kV and 33kV;

(d) New or upgraded transmission facilities - 24 months.

• If construction lead times differ from above, the host Distribution Licensee will inform the embedded Distribution Licensee, in writing, of the actual lead time requirements for the specified work.

Step 7
Connection
• Commissioning and verification that all connection requirements have been met.