



Final v.1

**SYSTEM OPERATOR GUIDELINES
FOR OPEN ACCESS TO
TRANSMISSION AND DISTRIBUTION SYSTEMS**

[Date]

Contents

1.	GLOSSARY OF TERMS.....	6
1.1	DEFINITIONS	6
1.2	ABBREVIATIONS.....	12
2.	INTRODUCTION	13
2.1	SCOPE	13
2.2	REFERENCED DOCUMENTS	13
3.	ROLES AND RESPONSIBILITIES OF THE SYSTEM OPERATOR	14
3.1	STATUTORY DUTIES	14
3.2	OPERATIONAL RESPONSIBILITIES	14
4.	APPLICATION PROCESS FOR OPEN ACCESS	17
4.1	ELIGIBILITY CRITERIA	17
4.2	APPLICATION REQUIREMENTS.....	17
4.3	PROCESSING TIMELINES.....	17
4.4	APPROVAL AND REJECTION	18
4.4.1	<i>Approval</i>	18
4.4.2	<i>Rejection</i>	18
4.5	AMENDMENTS AND RESUBMISSION	18
4.6	APPEALS.....	18
4.7	PRIORITY ALLOCATION	19
5.	SCHEDULING AND DISPATCH PROCEDURES.....	20
5.1	SCHEDULING PROCEDURES	20
5.1.1	<i>Day-Ahead Scheduling:</i>	20
5.1.2	<i>Real-Time Scheduling:</i>	20
5.1.3	<i>Prioritisation of Nominations:</i>	20
5.2	REAL-TIME BALANCING.....	20
5.2.1	<i>Balancing Mechanism</i>	20
5.2.2	<i>Energy Imbalance Management</i>	21
5.3	ANCILLARY SERVICES	21
5.3.1	<i>Frequency Regulation:</i>	21
5.3.2	<i>Voltage Control:</i>	21
5.3.3	<i>Reserve Capacity:</i>	21
5.3.4	<i>Spinning Reserves:</i>	21
5.3.5	<i>Black Start Capability:</i>	21
5.4	TRANSMISSION CONSTRAINTS AND CONGESTION MANAGEMENT	21
5.4.1	<i>Transmission Capacity</i>	21
5.4.2	<i>Congestion Management</i>	22
5.5	OPERATIONAL COORDINATION	22
5.5.1	<i>Maintenance Coordination</i>	22
5.5.2	<i>Protection Systems</i>	22
5.6	EMERGENCY PROCEDURES	22

5.6.1	<i>Load Shedding</i>	22
5.6.2	<i>System Restoration</i>	22
5.7	REPORTING AND MONITORING	22
5.7.1	<i>Real-Time Monitoring</i>	22
5.7.2	<i>Incident Reporting</i>	23
6.	METERING AND DATA MANAGEMENT	24
6.1	METERING REQUIREMENTS	24
6.1.1	<i>Installation of Meters</i>	24
6.1.2	<i>Meter Specifications</i>	24
6.1.3	<i>Real-Time Communication:</i>	24
6.2	COMMISSIONING AND MAINTENANCE	24
6.2.1	<i>Commissioning</i>	24
6.2.2	<i>Maintenance</i>	24
6.2.3	<i>Auditing and Testing</i>	24
6.3	DATA MANAGEMENT	25
6.3.1	<i>Data Collection</i>	25
6.3.2	<i>Data Storage</i>	25
6.3.3	<i>Data Reporting:</i>	25
6.4	POWER FACTOR MANAGEMENT	25
6.4.1	<i>Power Factor Requirements</i>	25
6.4.2	<i>Reactive Power Compensation</i>	25
6.5	COMPLIANCE MONITORING	26
6.5.1	<i>Metering Compliance</i>	26
6.5.2	<i>Data Accuracy</i>	26
6.6	METERING DISPUTES	26
7.	CURTAILMENT AND GRID SECURITY	27
7.1	CURTAILMENT PRIORITY	27
7.2	NOTIFICATION	27
7.3	REASONS FOR CURTAILMENT	27
7.3.1	<i>Transmission Constraints</i>	27
7.3.2	<i>System Stability</i>	27
7.3.3	<i>Emergency Conditions</i>	28
7.4	LOAD SHEDDING	28
7.4.1	<i>Load Shedding Procedures</i>	28
7.4.2	<i>Automatic Under-Frequency Load Shedding (UFLS)</i>	28
7.5	GRID STABILITY MEASURES	28
7.5.1	<i>System Restoration</i>	28
7.5.2	<i>Protection Systems</i>	28
7.5.3	<i>Operational Limits</i>	28
7.6	EMERGENCY PREPAREDNESS	29
7.6.1	<i>Emergency Plans</i>	29
7.6.2	<i>Testing and Drills</i>	29
7.7	REPORTING AND ANALYSIS	29
7.7.1	<i>Incident Reporting</i>	29

7.7.2	<i>Incident Investigation</i>	29
7.8	COMPLIANCE AND LIABILITIES	29
8.	TRANSMISSION CAPACITY MANAGEMENT	30
8.1	CAPACITY ALLOCATION	30
8.1.1	<i>Priority Allocation</i>	30
8.1.2	<i>Available Spare Capacity (ASC)</i>	30
8.2	APPLICATION AND APPROVAL PROCEDURE	30
8.2.1	<i>Application Submission</i>	30
8.2.2	<i>System Impact Studies</i>	30
8.2.3	<i>Approval or Rejection</i>	31
8.3	TRANSMISSION UPGRADES AND MODIFICATIONS	31
8.3.1	<i>System Strengthening</i>	31
8.3.2	<i>Cost Allocation</i>	31
8.4	CONGESTION MANAGEMENT	31
8.4.1	<i>Congestion Identification</i>	31
8.4.2	<i>Congestion Relief</i>	31
8.5	CROSS-BORDER COORDINATION	32
8.5.1	<i>Regional Transmission Capacity</i>	32
8.5.2	<i>Harmonization of Grid Standards</i>	32
8.6	REPORTING AND TRANSPARENCY	32
8.6.1	<i>Capacity Reporting</i>	32
8.6.2	<i>Transparency</i>	32
8.7	COMPLIANCE WITH TRANSMISSION CAPACITY ALLOCATION PROCEDURE	32
8.7.1	<i>Compliance Monitoring</i>	32
8.7.2	<i>Audits and Inspections</i>	32
9.	COMPLIANCE AND MONITORING	34
9.1	REGISTER OF QUALIFYING PARTICIPANTS	34
9.1.1	<i>Maintenance of Register</i>	34
9.1.2	<i>Updates and Reporting</i>	34
9.2	COMPLIANCE MONITORING	34
9.2.1	<i>Monitoring Framework</i>	34
9.2.2	<i>Key Areas of Compliance</i>	35
9.2.3	<i>Monitoring Tools and Systems</i>	35
9.3	AUDITS AND INSPECTIONS	35
9.3.1	<i>Periodic Audits</i>	35
9.3.2	<i>Non-Compliance Identification</i>	35
9.3.3	<i>Corrective Actions</i>	36
9.4	DISPUTE RESOLUTION PROCEDURES	36
9.4.1	<i>General Dispute Resolution Procedures</i>	36
9.5	LIABILITIES FOR NON-COMPLIANCE	36
9.6	REPORTING AND TRANSPARENCY	36
9.6.1	<i>Compliance Reports</i>	36
9.6.2	<i>Transparency</i>	37
9.7	RECORD KEEPING	37

10.	FINANCIAL AND CONTRACTUAL MANAGEMENT	38
10.1	FINANCIAL SECURITY	38
10.1.1	<i>Financial Security Requirements</i>	38
10.2	BILLING AND PAYMENT	38
10.2.1	<i>Billing Procedures</i>	38
10.2.2	<i>Payment Timelines:</i>	38
10.2.3	<i>Billing Dispute Resolution</i>	38
10.3	CONTRACTUAL AGREEMENTS	38
10.3.1	<i>ERB Approval Requirements</i>	38
10.3.2	<i>MOU Registration</i>	39
10.3.3	<i>System Operator Coordination</i>	39
10.3.4	<i>Power Purchase Agreements (PPAs)</i>	39
10.3.5	<i>Power Supply Agreements (PSAs)</i>	39
10.3.6	<i>Balancing Agreements</i>	39
10.4	TARIFF APPROVAL AND ADJUSTMENT	39
10.4.1	<i>Tariff Approval</i>	39
10.4.2	<i>Tariff Adjustments</i>	40
10.5	RECORD KEEPING AND REPORTING	40
10.5.1	<i>Financial Records</i>	40
10.5.2	<i>Reporting</i>	40
11.	REGIONAL COORDINATION AND INTERCONNECTION	41
11.1	CROSS-BORDER ELECTRICITY TRADE (SOUTHERN AFRICAN POWER POOL)	41
11.1.1	<i>Transaction Scheduling</i>	41
11.1.2	<i>Energy Imbalance Management:</i>	41
11.2	TRANSMISSION CAPACITY MANAGEMENT	41
11.2.1	<i>Regional Transmission Capacity</i>	41
11.3	GRID CODE STANDARDS HARMONIZATION	41
11.3.1	<i>Alignment with SAPP Grid Code Standards</i>	41
11.3.2	<i>Interoperability</i>	42
11.4	OPERATIONAL COORDINATION	42
11.4.1	<i>Control Area Operations</i>	42
11.4.2	<i>Ancillary Services:</i>	42
11.5	EMERGENCY PREPAREDNESS AND SYSTEM RESTORATION	42
11.5.1	<i>Regional Emergency Coordination</i>	42
11.5.2	<i>Black Start Capabilities</i>	42
11.6	REPORTING AND TRANSPARENCY	42
11.6.1	<i>Regional Reports</i>	42
11.6.2	<i>Transparency Requirements:</i>	43
ANNEXURE A	PROCEDURES	44
A.1	PLANT AND EQUIPMENT OUTAGE PLANNING PROCEDURE	44
A.2	PROCEDURE FOR ASSESSING THE TRANSMISSION CAPACITY AVAILABLE FOR OPEN ACCESS TRANSACTIONS:	44
A.3	SCHEDULING AND DISPATCH PROCEDURE:	44

A.4	METERING AND DATA MANAGEMENT PROCEDURE:	44
A.5	CURTAILMENT AND GRID SECURITY PROCEDURE:.....	44
A.6	COMPLIANCE MONITORING AND AUDIT PROCEDURE:	44
A.7	EMERGENCY PREPAREDNESS AND RESTORATION PROCEDURE:	44
A.8	CROSS-BORDER TRANSACTION PROCEDURE:	44
ANNEXURE B	SAMPLE AGREEMENTS	45
B.1	PARTICIPATION AGREEMENT TEMPLATE	45
B.2	BALANCING AGREEMENT TEMPLATE:	45
ANNEXURE C	MAPS AND DIAGRAMS	46
C.1	TRANSMISSION NETWORK MAP:	46
C.2	REGIONAL INTERCONNECTION MAP:	46

1. Glossary of Terms

1.1 Definitions

- 1.1.1. Unless the context otherwise requires, relevant definitions stated specifically in these Guidelines are as set out in the Governing Documents. In the event that any definition in the Governing Documents is amended, such amended definition shall, from the effective date of the amendment, be deemed to apply to these Guidelines, until these Guidelines are expressly amended to reflect such change.
- 1.1.2. References in these Guidelines to any document (including these Guidelines) are references to that document as amended, consolidated, supplemented, novated or replaced from time to time, and to all annexes, schedules, attachments and supplements which form part of such document;
- 1.1.3. A term in these Guidelines that uses the singular includes the plural and vice versa, and a term that imports gender includes both the masculine and feminine.
- 1.4. In these Guidelines, headings are for reference purposes only and shall not affect the construction or interpretation of these Guidelines.

Ancillary Services	has the meaning assigned to this term in the Grid Code being, services supplied to the TS by generators, distributors or end-use customers necessary for the reliable and secure transport of power from generators to distributors and customers in order to maintain the short-term reliability of the IPS and includes: (a) Operating reserves; (b) Black start; (c) Reactive power supply; and Regulation and load following.;
Annual Outage Plan	means a consolidated plan prepared by a TNSP, DNSP or Generator of all Planned Outages of Equipment on that TNSP's, DNSP's or Generator's Power System in the coming calendar year;
Automatic Generation Control	has the meaning assigned to this term in the Grid Code being, the regulation of the power output of electric generators within a prescribed area in response to change in system frequency, tie-line loading, or the relation of these to each other, so as to maintain the scheduled system frequency or the established interchange with other areas within predetermined limits or both;
Available Spare Capacity (ASC)	means transmission capacity on the Transmission System that is available for allocation to new Open Access transactions after accounting for existing commitments and system reliability requirements;

Balance Responsible Party	means a Market Participant that assumes responsibility for maintaining real-time balancing at specified metering points by submitting day-ahead forecasts and trading nominations and is held accountable for any imbalances through the Balancing Mechanism.
Balancing Agreement	means the agreement between the System Operator and a Balance Responsible Party and or Balancing Party that establishes the terms and conditions for maintaining real-time balancing at specified metering points in the Zambian electricity grid, including the responsibilities, obligations, performance standards, and any applicable sanctions and remedies for a Balance Responsible Party and/or Balancing Party.
Balancing Mechanism	has the meaning assigned to this term in the Market Guidelines, being the operational framework tool used by the System Operator to balance electricity supply and demand in real-time by calling upon additional generation or consumption, or reducing generation or consumption, in order to maintain system balance on a minute-by-minute and second-by-second basis.
Black Start	has the meaning assigned to this term in the Grid Code being, the provision of generating equipment that, following a total system collapse (black out), is able to: (a) start without an outside electrical supply and (b) energise a defined portion of the TS so that it can act as a start-up supply for other capacity to be synchronised as part of a process of re-energising the TS;
Business Day	means any day other than a Saturday, Sunday, or public holiday in the Republic of Zambia;
Contestable Consumer	means a Market Participant who is eligible to purchase electricity from any Eligible Seller and includes an Embedded Consumer, Mining Consumer, Industrial Consumer, End-use Consumer, Commercial Retailer, Exporter, Battery Energy Storage System Operator and Intermediary Power Trader.
Control Area	has the meaning assigned to the words in the SAPP Agreement Between Operating Members ;
Control Area Operator	has the meaning assigned to the words in the SAPP Agreement Between Operating Members ;
Day	has the meaning assigned to this term in the Grid Code being a period of 24 consecutive hours commencing at 00:00 hours;
Dispatch	means the action by the SO to issue specific instructions to Participants to achieve designated active and reactive power outputs within registered data parameters or declared availability and by stated times;

Distribution Network Service Provider (DNSP)	has the same meaning assigned to this term in the Electricity Act being a licensee responsible for operating, maintaining and developing a distribution system in an area and, where applicable, the distribution system's interconnection with other systems;
Electricity Act	means the Electricity, Act No. 11 of 2019;
Eligible Seller	has the same meaning assigned to this term in the Market Guidelines, being a Supplier or licensee that holds a Licence to trade in electricity as defined in the Electricity Act, including but not limited to an independent power producer, importer, embedded power producer, battery energy storage system operator and intermediary power;
Emergency	has the meaning assigned to the word in the Electricity Act being, an occurrence where an unplanned loss of generation or transmission facilities, or an occurrence beyond a licensee's control that impairs or affects the licensee's ability to supply that licensee's system demand;
Energy Regulation Act	means the Energy Regulation Act No. 12 of 2019;
Energy Regulation Board (ERB)	means the Energy Regulation Board continued under section 3 of the Energy Regulation Act;
Equipment	has the meaning assigned to this term in the Electricity Act being, machinery, appliances, meters, fittings, apparatus and other equipment owned by, or under the control of, a licensee and used for conducting the licensed activity;
Forced Outage	means an Unplanned Outage which must be effected immediately and for which notification in line with timelines specified in these System Operator Guidelines cannot be met;
Generator	has the meaning assigned to this term in the Grid Code being, means an entity operating a generating unit or power station;
Governing Documents	means, collectively, the Electricity Act, the Energy Regulation Act, the Open Access Regulations, the Market Guidelines, the Grid Code, the System Operator Guidelines, and any other rules, procedures, or codes issued by the ERB;
Grid Code	means the Electricity (Grid Code) Regulations, Statutory Instrument No. 79 of 2013;
IEC Metering Standard	means the IEC 62053 (Electricity Metering) Standard published by the International Electrotechnical Commission;
Inadvertent Energy Flow	has the meaning assigned to the words in the SAPP Agreement Between Operating Members;

Information	has the meaning assigned to this term in the Grid Code being, a type of knowledge represented by some data, which can be exchanged, stored or processed electronically or otherwise;
Interconnected Power System	has the meaning assigned to this term in the Electricity Act being, means a number of transmission and distribution lines, and includes associated power generation systems that are linked together for the purpose of transmitting or distributing electricity;
Islanding	has the meaning assigned to this term in the Grid Code being, the capability of generating units to settle down at nominal speed, supplying own auxiliary load after separation from the grid, at up to full load pre-trip conditions;
Long-term Open Access	Has the meaning assigned to this term in the Open Access Regulations being, the right to use a transmission system or distribution system for a period exceeding five years;
Market Guidelines	means the Open Access Market Guidelines for the Electricity Sub-Sector 2025;
Market Operator Unit (MOU)	means the ringfenced unit under the System Operator which shall be responsible for the operations of the markets in accordance with the Market Guidelines and shall act as the single operator of the markets;
Market Participant	has the meaning assigned to this term in the Market Guidelines, being an Open Access User who has met the conditions of regulation 16 of the Open Access Regulations and includes a Contestable Consumer or Public Service Trader (PST) that is registered or admitted in accordance with the Market Guidelines to participate into the Market;
Medium-term Open Access	has the meaning assigned to this term in the Open Access Regulations being, the right to use a transmission system or distribution system for a period of more than three months but not exceeding five years;
Meter	has the meaning assigned to the word Meter in the Grid Code being, Equipment used in measuring supply parameters installed at supply points;
Metering Installation	has the meaning assigned to the word in the Grid Code being, an installation that comprises an energy meter that is interrogated and has a communication link as defined in the Grid Code
Net Metering Regulations	means the Electricity (Net Metering) Regulations, Statutory Instrument No. 38 of 2024;
Open Access	has the meaning assigned to this term is the Electricity Act being, the availability of spare transmission or distribution capacity to any qualifying participant on non-discriminatory terms and conditions; ;
Open Access Management System	means the System Operator's electronic communication system for the publication of Information by the System Operator and the submission of Information to the System Operator by Participants ;

Open Access Regulations	means the Electricity (Open Access) Regulations, Statutory Instrument No. 40 of 2024;
Open Access User	has the meaning assigned to this term in the Open Access Regulations being, a person who is granted access to a transmission system or distribution system by a transmission network service provider or distribution network service provider in accordance with the Electricity Act or the Open Access Regulations
Outage Confirmation	means a notice to a Participant from the SO confirming the details of a Planned Outage by the Participant .
Outage Notification	means a notification of a Planned Outage by a Participant submitted to the SO in the approved form;
Participant	<u>means;</u> an Eligible Seller or Contestable Consumer ; · a Generator; · a Trader; · the Public Service Trader (PST); · a Distributor; · a Supplier; · an Energy Storage Operator; an Importer ; and/or · an Exporter;
Party	means a current or future participant;
Planned Outage	has the meaning assigned to this term in the Grid Code being, a scheduled outage of equipment that is on a yearly maintenance schedule for any year
Point of Connection	has the meaning assigned to this term in the Grid Code being, the electrical node in a transmission substation or distribution substation where a customer's assets are physically connected to the TNSP's or DNSP's assets ;
Point of Injection	means a metered point where electrical energy a Generator is injected s power into a Transmission System or a Distribution System ;
Point of Withdrawal	means a metered point where electrical energy is uplifted a Contestable Consumer withdraws power from a Transmission System or a Distribution System ;
Power Purchase Agreement (PPA)	has the meaning assigned to this term in the Electricity Act being, a contract entered into between or among enterprises for the sale and purchase of electricity ;
Power Supply Agreement (PSA)	has the meaning assigned to this term in the Electricity Act being, a contract entered into between an enterprise and a non-retail consumer for the sale of electricity ;
Power Systems	has the meaning assigned to the words in the Electricity Act ;

Qualifying Participant	has the meaning assigned to this term in the Open Access Regulations being a person who is eligible to apply for open access in accordance with regulation 5 of the Open Access Regulations;
Regulation	has the meaning assigned to this term in the Grid Code being the provision of generation and load response capability, including capacity, energy and manoeuvrability, that respond to automatic control signals issued by the System Operator;
SAPP Agreement Between Operating Members	means the Agreement Between Operating Members of the Southern African Power Pool;
SAPP Coordination Centre	means the body within SAPP responsible for coordinating power flows across the SAPP network;
Scheduling	has the meaning assigned to this term in the Grid Code being, a process to determine which unit or equipment will be in operation and at what loading;
Senior Authorised Person	means a competent person possessing the requisite technical knowledge and experience who is duly appointed in writing by a Participant to issue, receive, clear and cancel outage communications between that Participant and the System Operator in accordance with the terms of their appointment;
Short-term Open Access	has the meaning assigned to this term in the Open Access Regulations being the right to use a transmission system or distribution system for a period not exceeding three months;
System Impact Study	means a study to assess the impact of a proposal on the reliability of the IPS, including power flow and transient stability analysis;
System Operator (SO)	has the meaning assigned to the word in the Electricity Act being, an entity responsible for the short term reliability of an interconnected power system, which is in charge of controlling and operating the transmission system and dispatching generation or balancing the supply and demand in real time in a non-discriminatory manner;
System Operator Guidelines	means these SO Guidelines;
Trading Period	has the meaning assigned to this term in the Market Guidelines being, an hour.
Transmission Network Service Provider (TNSP)	has the meaning assigned to this term in the Electricity Act being, a licensee responsible for operating, maintaining and developing a transmission system and, where applicable, the transmission system's interconnection with other system

Unplanned Outage	means the unscheduled removal from service of an item of Equipment caused by immediate and unforeseen failure of the Equipment or a forced outage for operational reasons; and
Yearly Maintenance Schedule	means the schedule of Equipment outages for a calendar year prepared and updated monthly by the SO in accordance with the Grid Code ;
Zambian Metering Standards	means Zambian standards series ZS640 to ZS647 and ZS387 published by the Zambia Bureau of Standards.

1.2 Abbreviations

ASC	Available Spare Capacity
DNSP	Distribution Network Service Provider
ELACT	Electricity Act
ERB	Energy Regulation Board
ISO	System Operator
kVA	Kilovolt-Ampere
kVAR	KiloVolt-Ampere Reactive
kVARh	KiloVolt-Ampere Reactive Hour
kW	Kilowatt
kWh	Kilowatt-hour
OAMS	Open Access Management System
OAREG	Open Access Regulations
SAPP	Southern African Power Pool
SCADA	Supervisory Control and Data Acquisition
SO	System Operator
TNSP	Transmission Network Service Provider
UFLS	Under-frequency Load Shedding
GC	Grid Code
GC Ch1	Grid Code , Chapter 1, Governance
GC Ch2	Grid Code , Chapter 2, Network
GC Ch3	Grid Code , Chapter 3, Metering
GC Ch4	Grid Code , Chapter 4, System Operation
GC Ch5	Grid Code , Chapter 5, Information Exchange

2. Introduction

These System Operator Guidelines (“**SO Guidelines**”) establish a transparent, non-discriminatory, and efficient framework for Open Access to transmission and distribution systems, in line with the **Open Access Regulations**. They aim to:

- a. promote competition in the electricity market by enabling multiple **Participants** to access the grid;
- b. ensure reliable and secure grid operations through structured management of Open Access transactions; and
- c. facilitate fair access for all **Qualifying Participants**, fostering innovation, efficiency, and cost-effectiveness in the electricity sector.

2.1 Scope

These **SO Guidelines** apply to all transmission and distribution systems forming part of the Interconnected Power System within the Republic of Zambia.

- a. **All Qualifying Participants**, as defined in the Open Access Regulations and further detailed in Clause 4.1 of these SO Guidelines.
- b. The **System Operator**, in its capacity as the entity responsible for implementing and enforcing these SO Guidelines in accordance with the Governing Documents.

2.2 Referenced Documents

These **SO Guidelines** are prepared in accordance with, and are subject to, the Governing Documents.

In the event of any conflict or inconsistency between the Governing Documents, any other Laws of Zambia, Licence conditions and this Agreement such conflict shall be resolved in the following order of priority:

- a. Legal Requirements (including the Electricity Act and the Energy Regulation Act and Open Access Regulations);
- b. Licence conditions issued by ERB;
- c. Market Guidelines;
- d. These System Operator Guidelines
- e. Other procedures and guidelines issued by the ERB or the System Operator pursuant to the Governing Documents.

If a provision of a document higher in the order of precedence is inconsistent with a provision of a document lower in the order of precedence, then the higher provision prevails, but only to the extent of the inconsistency.

3. Roles and Responsibilities of the System Operator

The **System Operator** ensures the safe, secure, and efficient operation of the IPS in accordance with the Electricity Act] and other applicable statutory obligations.

In addition to the statutory duties set out in the Electricity Act, the System Operator's key responsibilities under these SO Guidelines, as further described herein and detailed in the annexed Procedures, include:

3.1 Statutory Duties

- a) Operate the transmission network and interconnectors to guarantee security of supply of electricity in accordance with Section 10(a) of the Electricity Act.
- b) Manage energy flows on the transmission network and maintain balance of energy flow in accordance with Section 10(b) of the Electricity Act.
- c) Ensure the availability of necessary ancillary services for the generation of electricity in accordance with Section 10(c) of the Electricity Act.
- d) Provide sufficient information to other transmission regional operators on interconnected systems to ensure secure and efficient operation in accordance with Section 10(d) of the Electricity Act.
- e) Ensure non-discrimination between system users or classes of system users in accordance with Section 10(f) of the Electricity Act.
- f) Provide system users with information needed for efficient access to the transmission system and distribution system, dispatching of electricity and determining the use of interconnectors in accordance with Section 10(g) of the Electricity Act.

3.2 Operational Responsibilities

- a) Confirm the viability of applications for **Open Access**;
- b) **Scheduling and Dispatch**:
 - Scheduling Open Access transactions in consultation with **Participants**.
 - Develop day-ahead schedules and ensure real-time balancing of supply and demand.
 - Prioritise **Dispatch** in the order of Long-term Open Access, Medium-term Open Access, and Short-term Open Access transactions.
- c) Metering and Data Management:
 - Ensure **that Metering Installations** comply with the **Governing Documents** and have real-time communication capabilities.
 - Monitor and access metering data from Metering Installations for billing and compliance purposes.
- d) Curtailment and Grid Security:
 - Curtail power during **Emergencies** in the following order of **priority: Short-term Open Access, Medium-term Open Access, and Long-term Open Access** transactions.

- Implement load shedding and other operational measures as necessary to maintain grid stability and system security.
- Coordinate system restoration during **Emergencies**, including the **implementation of Black Start** procedures where required.
- e) Transmission and Distribution Capacity Management:
 - Allocate transmission and distribution capacity based on the priority order of **Long-term Open Access**, **Medium-term Open Access**, and **Short-term Open Access** transactions in accordance with the Open Access Regulations.
 - Coordinate with **TNSPs** and **DNSPs** to determine transmission and distribution capacity availability and constraints.
 - Publish annual and monthly **Available Spare Capacity** reports.
- f) Compliance Monitoring:
 - Coordinate with the Market Operator Unit (MOU), a ringfenced unit under the System Operator, which maintains and publishes the public Register of Q Participants in accordance with Regulation 17 of the Open Access Regulations and the Market Guidelines.
 - Develop Open Access procedures, in consultation with stakeholders, **subject to ERB** approval, and monitor user compliance.
 - Facilitate bilateral trade nominations and conduct annual compliance audits of Participants.
- g) Financial and Contractual Management:
 - Acquire financial security from **Participants** to cover energy imbalances and other financial obligations.
 - Issue monthly invoices and ensure timely payment settlement of financial obligations.
 - Facilitate the registration of **Power Purchase Agreements (PPAs)** and **Power Supply Agreements (PSAs)** by Participants.
- h) Regional Coordination and Interconnection:
 - Collaborate with neighbouring system operators for cross-border electricity transactions.
 - Ensure grid stability and harmonisation of grid requirements with neighbouring countries.
- i) Incident Reporting and Investigation:
 - Report grid incidents to the **ERB** within twenty-four (24) hours and submit detailed incident reports within fourteen (14) days.
 - Investigate incidents and implement corrective actions to prevent recurrence.
- j) Emergency Preparedness and Restoration:
 - Develop and maintain **Emergency** procedures, including load shedding and **Black Start** procedures.
 - Ensure rapid system restoration following Emergency situations.

- k) Operational Liaison:
- Coordinate and liaise with **TNSPs, DNSPs**, and other **Participants** to ensure reliable grid operations.
 - Approve and coordinate maintenance schedules for transmission and distribution systems and generation facilities.

4. Application Process for Open Access

The application process for Open Access ensures a transparent, efficient, and non-discriminatory framework for granting access to the IPS.

The process comprises the following steps:

4.1 Eligibility Criteria

Qualifying Participants eligible to apply for Open Access include:

- a. entities holding a valid trading or generation licence issued by the **ERB**;
- b. entities with an installed generating capacity of at least 1 MW;
- c. entities with a contracted demand of at least 1 MW; and
- d. entities connected to the **IPS**.

In addition to meeting the eligibility criteria set out above, all applicants must:

- a. hold the relevant licence issued by the ERB, where applicable; and
- b. not be subject to insolvency or bankruptcy proceedings.

4.2 Application Requirements

Applicants must submit the appropriate application form available on the **System Operator's OAMS**, together with the following supporting documents [**OAREGS §6(2)**]:

- a. **Infrastructure Details**: Details of the applicant's infrastructure, including specifications of installed energy meters and communication systems.
- b. **Procurement or Supply Details**: Details of the entity from which electricity is proposed to be procured or to which electricity is proposed to be supplied.
- c. **Quantum of Electricity**: The quantum of electricity to be transmitted or wheeled.
- d. **Financial Viability**: A declaration of financial viability, accompanied by proof of funds or the most recent audited financial statements.
- e. **Points of Injection and Points of Withdrawal**: The points at which the applicant intends to inject or withdraw electricity.
- f. **Duration and Timing**: The duration for which Open Access is required, including the number of hours per day and time of access.
- g. **Category of Open Access**: Indicate whether the application is for **Long-term Open Access**, **Medium-term Open Access**, or **Short-term Open Access**.

Applications may be submitted either in physical form or electronically through the OAMS.

4.3 Processing Timelines

Applications shall be processed in accordance with the following steps:

- a. **Acknowledgement of Receipt**: The **TNSP** or **DNBP** must acknowledge receipt of the application within five (5) days, indicating whether the application is complete and properly lodged.
- b. **Application Review**: The **TNSP** or **DNBP** reviews the application to ensure compliance with the requirements of Regulation 6 of the Open Access Regulations.

- c. Request for Additional Information: If the application is incomplete or requires clarification, the **TNSP** or **DNSP** may request additional information via Form II. The thirty (30) day period referred to in Clause 4.3(d) shall commence from the date complete information is received.
- d. Approval or Rejection: The **TNSP** or **DNSP** must approve or reject the application within thirty (30) days of receipt of a complete application in accordance with Section 14 of the Electricity Act. If approved, the System Operator is notified within five (5) days to check for network congestion.

4.4 Approval and Rejection

4.4.1 Approval

Where the **SO** confirms that the transmission or distribution system is free of congestion, the **SO** shall grant approval for **Open Access** and inform the **relevant TNSP** or **DNSP** in writing within five (5) days. **Upon receipt of such confirmation, the TNSP or DNSP** shall issue a notice of approval to the applicant and grant access to its network on the standard terms and conditions of its Use of System Agreement as approved by the **ERB**.

4.4.2 Rejection

An application for Open Access may be rejected on any of the following grounds:

- a) the applicant does not meet the eligibility criteria set out in Clause 4.1;
- b) **the relevant TNSP or DNSP** lacks sufficient transmission or distribution capacity to accommodate the requested Open Access; or
- c) the System Operator identifies congestion or operational constraints that would compromise grid security or reliability.

Rejected applicants shall be notified in writing within five (5) working days, with detailed reasons for rejection clearly stated.

4.5 Amendments and Resubmission

Where an application is returned for amendments, the revised application shall be treated as a fresh submission and must comply with the requirements set out in Clause 4.2.

4.6 Appeals

- a) An applicant aggrieved by a rejection or the terms of access may appeal to the **ERB** within sixty (60) days of the decision, in accordance with Section 14 of the Electricity Act.
- b) The **ERB** shall determine the appeal and notify the parties of its determination within thirty (30) days.
- c) In determining an appeal, the **ERB** may:
 - (i) confirm the rejection;
 - (ii) direct the **TNSP** or **DNSP** to grant access on specified terms;
 - (iii) modify the terms of Open Access; or
 - (iv) make any other order it considers appropriate in relation to the Open Access application.

4.7 Priority Allocation

Open Access shall be allocated in accordance with the priority provisions set out in Regulation 11 of the Open Access Regulations, with Long-term Open Access having priority over Medium-term Open Access, which in turn has priority over Short-term Open Access.

5. Scheduling and Dispatch Procedures

The **Scheduling** and **Dispatch** process ensures the efficient and reliable operation of the **IPS** by balancing supply and demand in real time. This section sets out the procedures and responsibilities for scheduling Open Access transactions and managing IPS operations, with detailed procedures contained in Annexure A.3.

5.1 Scheduling Procedures

5.1.1 Day-Ahead Scheduling:

Open Access users must submit their day-ahead nominations to the MOU by 14:00 hours daily.

Nominations shall include the following information:

- a) Points of Injection and Points of Withdrawal.
- b) The quantum of electricity to be transmitted or wheeled.
- c) The duration and timing of access.

The MOU consolidates nominations and the SO schedules them, ensuring compliance with the **Grid Code**.

5.1.2 Real-Time Scheduling:

The System Operator monitors real-time conditions of the IPS and adjusts scheduled quantities as necessary to maintain system balance.

Changes to nominated quantities are permitted up to twenty (20) minutes before the commencement of the next **Trading Period**, subject to the approval of the System Operator and compliance with operational constraints.

5.1.3 Prioritisation of Nominations:

Nominations shall be prioritised in accordance with the following order of priority:

- a) Long-term Open Access transactions.
- b) Medium-term Open Access transactions.
- c) Short-term Open Access transactions.

5.2 Real-Time Balancing

5.2.1 Balancing Mechanism

The System Operator shall ensure real-time balancing of supply and demand **through the utilisation of Ancillary Services** and market purchases.

Key balancing tools include:

- a) **Automatic Generation Control (AGC)**: Automatically adjusting generation output to maintain grid frequency.
- b) **Load Frequency Control (LFC)**: Managing frequency deviations within acceptable limits; and

- c) **Economic Dispatch:** Optimising the allocation of generation resources to minimise production costs while ensuring grid reliability and meeting demand;

5.2.2 *Energy Imbalance Management*

The System Operator calculates energy imbalances as the difference between scheduled and actual energy delivered at each Point of Connection.

Energy imbalances are physically resolved through:

- a) adjustments to generation output or demand; and
- b) utilisation of Ancillary Services.

The **Balance Responsible Party** for each **Point of Connection** shall be financially liable for deviations between scheduled and metered quantities at that **Point of Connection**.

5.3 **Ancillary Services**

5.3.1 *Frequency Regulation:*

The System Operator maintains grid frequency within the limits stipulated in the Grid Code.

Regulation services are procured from generators capable of rapid response to frequency deviations.

5.3.2 *Voltage Control:*

The System Operator shall ensure that voltage levels remain within the limits stipulated in the Grid Code.

Voltage control shall be achieved through reactive power support from generators and other grid assets as specified in the Grid Code.

5.3.3 *Reserve Capacity:*

The System Operator shall ensure that adequate reserve capacity is available to respond quickly to sudden changes in demand or supply.

5.3.4 *Spinning Reserves:*

The System Operator shall procure additional generating capacity that can be quickly dispatched to meet changes in demand or respond to outages, equivalent to five percent (5%) of peak demand.

5.3.5 *Black Start Capability:*

The System Operator shall ensure the availability of Black Start capability to restart the IPS following a blackout.

The System Operator shall contract with at least two **(2) generators with Black Start** capability.

5.4 **Transmission Constraints and Congestion Management**

5.4.1 *Transmission Capacity*

The System Operator shall ensure that scheduled transactions do not exceed

the available transmission capacity.

The System Operator **shall publish Available Spare Capability (ASC)** reports to inform users of capacity limits.

5.4.2 *Congestion Management*

Where congestion occurs, the System Operator may:

- a) redispatch generation to relieve transmission constraints; and/or
- b) curtail offtake, starting with Short-term Open Access users.

5.5 **Operational Coordination**

5.5.1 *Maintenance Coordination*

The System Operator coordinates planned outages and maintenance schedules with **TNSPs, DNSPs**, and generators to minimise disruptions to the IPS.

A yearly maintenance schedule shall be published annually and updated monthly by the System Operator.

Coordination of maintenance activities shall be conducted in accordance with the Plant and Equipment Outage Planning Procedure.

5.5.2 *Protection Systems*

The System Operator shall:

- ensure proper grading and coordination of protection systems to maintain grid reliability; and
- review protection settings following system alterations and maintain an updated database of protection system configurations.

5.6 **Emergency Procedures**

5.6.1 *Load Shedding*

During **Emergencies**, the System Operator may implement load shedding procedures to maintain grid stability.

Priority shall be given to maintaining supply to essential services and critical infrastructure during Emergencies in accordance with established load shedding procedures.

5.6.2 *System Restoration*

The System Operator coordinates the restoration of the **IPS** after outages, using **Black Start** capabilities and other resources.

5.7 **Reporting and Monitoring**

5.7.1 *Real-Time Monitoring*

The System Operator shall continuously monitor the operational status of the IPS, including generation output, load demand, transmission flows, and system parameters to ensure grid stability and reliability.

The System Operator shall utilise SCADA systems and other monitoring technologies to maintain real-time visibility of system conditions and ensure

compliance with operational parameters specified in the Grid Code.

5.7.2 Incident Reporting

The System Operator shall report to the ERB within twenty-four (24) hours any incidents that materially affect the integrity, security, or reliability of the IPS.

Detailed incident reports shall be submitted to the ERB within **seven (7)** days of the incident, including analysis of the root cause, response actions taken, system restoration time, and preventive measures to be implemented.

6. Metering and Data Management

The objective of metering and metering data management is to ensure accurate measurement, recording, and communication of electricity flows for Open Access transactions. This section sets out the requirements and procedures for metering and data management, with detailed procedures contained in the Metering and Data Management Procedure (Annexure A.4).

6.1 Metering Requirements

6.1.1 Installation of Meters

The System Operator shall confirm that energy and quality of supply **Metering Installations** are installed at all Points of Injection and Points of Withdrawal.

Metering Installations shall comply with the **Governing Documents**.

6.1.2 Meter Specifications

Metering Installations shall have an accuracy class in accordance with the **standards specified in the Grid Code and applicable Zambian** metering standards.

Metering Installations shall be capable of measuring active power (kW), active energy (kWh), apparent power (kVA), reactive power (kVar), reactive energy (kVARh), power factor (Pf) and power quality parameters including voltage, frequency, and harmonics as specified in the Grid Code.

6.1.3 Real-Time Communication:

Meters must have real-time communication capabilities to transmit data to the System Operator for monitoring and billing purposes.

Data transmission must comply with applicable industry standards for reliability and security.

6.2 Commissioning and Maintenance

6.2.1 Commissioning

Metering Installations must be commissioned before being used for Open Access transactions.

Commissioning tests shall verify the accuracy and functionality of the Metering Installations in accordance with the applicable technical standards.

6.2.2 Maintenance

Metering Installations shall be maintained in accordance with the **Grid Code** and applicable technical standards.

The responsible party shall establish regular maintenance schedules to ensure continuous accuracy and reliability of Metering Installations.

6.2.3 Auditing and Testing

Metering Installations shall be audited and tested at least annually to verify compliance with accuracy standards.

Non-compliant Metering Installations shall be repaired or replaced promptly.

6.3 Data Management

6.3.1 Data Collection

The **TNSP** or **DNSP** shall collect metering data from all injection and extraction points and share it with the System Operator.

The TNSP or DNSP shall collect the following metering data from all Metering Installations at injection and extraction points:

- a) Active energy injected or extracted (kWh).
- b) Reactive energy (kVARh).
- c) Power quality parameters (voltage, frequency, harmonics, and other parameters as specified in the Grid Code).

6.3.2 Data Storage

Metering data from Metering Installations shall be stored securely for a minimum of five (5) years in accordance with the Electricity (Grid Code) Regulations, 2013.

Metering data shall be accessible to authorised parties for auditing, billing, settlement, and regulatory compliance purposes.

6.3.3 Data Reporting:

The System Operator shall provide metering data to Participants and other authorised parties for billing and settlement purposes.

Monthly reports shall be generated and shall include the following information:

- a) Total energy injected or extracted (kWh).
- b) Deviations from scheduled energy quantities.
- c) Power quality parameters (including voltage, frequency, and harmonics) or as specified in the Grid Code.

6.4 Power Factor Management

6.4.1 Power Factor Requirements

Participants shall maintain a power factor within the range specified by the **Grid Code**.

Where the power factor at Points of Connection deviates from 0.92 lagging or better as specified in the **Grid Code**, appropriate penalty and incentive schemes shall apply as approved by the ERB.

6.4.2 Reactive Power Compensation

Participants may be required to install reactive power compensation devices (e.g., capacitors, reactors) to maintain the required power factor.

6.5 Compliance Monitoring

6.5.1 Metering Compliance

The System Operator shall monitor compliance with metering requirements through regular audits and inspections.

Non-compliant users may face penalties, Liabilities, or disconnection from the IPS in accordance with the applicable procedures.

6.5.2 Data Accuracy

The System Operator shall verify the accuracy of metering data through periodic cross-checks and reconciliation with other data sources, including SCADA systems and operational data.

6.6 Metering Disputes

- a) If Main Meter and Check Meter readings diverge by more than one percent (1%), the Parties shall seek an amicable resolution of the discrepancy. If such resolution is not achieved within seven (7) Business Days, the metering data dispute must be resolved through the dispute resolution procedures outlined in the Grid Code and the Market Guidelines.
- b) All dispute resolution logs, witness signatures for manual readings, and related documentation shall be retained for at least five (5) years in accordance with audit requirements.
- c) Metering disputes among Participants shall follow the dispute resolution procedures set out in the Market Guidelines, unless expressly governed by the Grid Code dispute mechanism.

7. Curtailment and Grid Security

The Curtailment and Grid Security Procedure (Annexure A.5) provides detailed procedures for how curtailment is implemented on the **IPS** by the System Operator. The purpose of the Curtailment and Grid Security Procedure is to ensure the stability and reliability of the **IPS** during Emergencies or operational constraints. This section sets out the procedures and responsibilities for curtailment and maintaining grid security.

7.1 Curtailment Priority

The System Operator has the authority to curtail power for Open Access Users in the following order of priority [*OAREGS §15*]:

- a) Short-term Open Access Users.
- b) Medium-term Open Access Users.
- c) Long-term Open Access Users.

The System Operator may implement curtailment to address operational constraints or maintain the security and stability of the **IPS**.

Curtailment shall be implemented in an equitable and non-discriminatory manner in accordance with the established procedures.

7.2 Notification

The System Operator must notify affected **Participants** two (2) hours before curtailment, where practicable.

Such notifications shall include the following information:

- a) the reason for curtailment;
- b) the expected duration of the curtailment; and
- c) the anticipated impact on the **affected Participant's** operations.

7.3 Reasons for Curtailment

7.3.1 Transmission Constraints

The System Operator may implement curtailment to relieve transmission constraints on the **IPS** caused by:

- a) overloads on transmission lines or transmission system equipment;
- b) voltage instability; and/or
- c) equipment failures or maintenance activities.

7.3.2 System Stability

The SO may implement curtailment to:

- a) prevent cascading outages or system collapse;
- b) limit the extent of system disturbances; and/or
- c) expedite restoration of the **IPS** after an outage.

7.3.3 *Emergency Conditions*

The SO may implement curtailment during **Emergencies**, including:

- a) sudden loss of generation capacity;
- b) **Forced Outages** of critical transmission system equipment; and/or
- c) natural disasters or other external threats to the IPS.

7.4 **Load Shedding**

7.4.1 *Load Shedding Procedures*

The System Operator may implement load shedding procedures to maintain grid stability during Emergencies.

Load shedding shall be prioritised in accordance with the established procedures detailed in the Curtailment and Grid Security Procedure.

7.4.2 *Automatic Under-Frequency Load Shedding (UFLS)*

UFLS systems shall be automatically activated when grid frequency falls below predefined thresholds in accordance with the UFLS settings implemented on the IPS.

UFLS schemes are designed to prevent grid collapse by automatically shedding load in a controlled and coordinated manner.

7.5 **Grid Stability Measures**

7.5.1 *System Restoration*

The System Operator shall coordinate the restoration of the IPS after outages, using:

- a) **Black Start** capability contracted with at least two **(2) Black Start** capable generators; and/or
- b) **Islanding** procedures to isolate parts of the IPS for incremental power restoration.

7.5.2 *Protection Systems*

The System Operator shall ensure proper grading and coordination of protection systems to:

- a) prevent damage to Equipment; and
- b) minimise the impact of faults on the stability of the IPS.

7.5.3 *Operational Limits*

The System Operator shall determine and enforce operational limits for:

- a) Voltage levels.
- b) Frequency.
- c) Transmission line loading.

7.6 Emergency Preparedness

7.6.1 Emergency Plans

The System Operator, in conjunction with all **Participants**, shall develop and maintain emergency preparedness plans, including:

- a) Load shedding procedures;
- b) System restoration protocols; and
- c) Communication plans for notifying affected **Participants**.

7.6.2 Testing and Drills

Emergency plans shall be tested periodically through drills and simulations.

Tests shall be coordinated with TNSPs, DNSPs, and other relevant Participants.

7.7 Reporting and Analysis

7.7.1 Incident Reporting

The **SO** shall report incidents that materially affect grid integrity to the **ERB** within 24 hours.

A detailed outage report shall be submitted within seven (7) days, including:

- a) Cause of the incident.
- b) Response time.
- c) Corrective and preventive measures implemented.

7.7.2 Incident Investigation

The System Operator shall investigate incidents to identify root causes and implement appropriate corrective actions to prevent recurrence.

The System Operator shall conduct investigations in accordance with the Grid Code [*GC Ch. 4 §14.2*].

7.8 Compliance and Liabilities

The System Operator shall monitor compliance with curtailment and grid security procedures [*GC Ch. 4 §10*].

Non-compliance with curtailment and grid security procedures may result in Liabilities, including:

- a) Financial Liabilities as determined by the ERB.
- b) Disconnection from the IPS.
- c) Legal action in severe cases of non-compliance.

8. Transmission Capacity Management

The objective of transmission capacity management is to ensure the efficient and reliable allocation of transmission capacity for **Open Access** Users. This section outlines the procedures and responsibilities for managing transmission capacity.

The Procedure for Assessing the Transmission Capacity Available for Open Access Transactions (Annexure A.2) provides detailed procedures for transmission capacity management on the **IPS** by the System Operator.

8.1 Capacity Allocation

The System Operator shall determine the **Available Spare Capacity (ASC)**.

8.1.1 Priority Allocation

Open Access is allocated based on the provisions of Regulation 11 of the Open Access Regulations [OAREGS §11].

8.1.2 Available Spare Capacity (ASC)

The System Operator shall determine and publish **ASC** reports to inform Participants of transmission capacity available for new **Open Access** Transactions.

ASC is determined based on:

- a) total unconstrained transmission capacity;
- b) operational constraints; and
- c) existing contractual commitments.

8.2 Application and Approval Procedure

8.2.1 Application Submission

Qualifying Participants shall submit applications for transmission capacity to the relevant TNSP or DNSP to which they are connected.

Applications shall include the following information [OAREGS §6(2)]:

- a) injection and extraction points;
- b) quantum of electricity to be transmitted; and
- c) duration and timing of Access.

8.2.2 System Impact Studies

The System Operator, in conjunction with TNSPs and DNSPs, conducts **System Impact Studies** to assess the impact of new connections or modifications on the IPS and determine whether the proposal would result in congestion [OAREGS §10(4)]. **System Impact Studies** shall evaluate:

- a) transmission line loading;
- b) voltage stability; and
- c) system reliability.

System Impact Studies shall be conducted in accordance with the Electricity

(Open Access) Regulations [OAREGS §10(4)], assessing the impact of proposed connections or capacity increases on IPS security, reliability, and other Users.

8.2.3 *Approval or Rejection*

Applications are approved if:

- a) Sufficient transmission capacity is available.
- b) The application complies with the **Grid Code** and applicable regulatory requirements.

Applications may be rejected if:

- a) sufficient transmission capacity is not available; or
- b) the application does not comply with the Grid Code or applicable regulatory requirements.

8.3 **Transmission Upgrades and Modifications**

8.3.1 *System Strengthening*

Where transmission capacity is insufficient, the **SO** may recommend system upgrades or modifications.

System upgrades may include:

- a) construction of new transmission infrastructure;
- b) installation of new substations or transformers; and/or
- c) reinforcement of existing transmission infrastructure.

8.3.2 *Cost Allocation*

The cost of system upgrades shall be borne by the beneficiaries, including the applicant, unless otherwise agreed. Where system upgrades benefit all current and future users of the system, the costs shall be socialised.

The **SO** shall monitor the upgrades to confirm that they are completed in a timely manner to facilitate **Open Access** Transactions.

8.4 **Congestion Management**

8.4.1 *Congestion Identification*

The System Operator monitors transmission lines for congestion, which occurs when demand exceeds available transmission capacity.

The System Operator identifies congestion through:

- a) real-time monitoring of transmission line flows; and
- b) analysis of **Available Transfer Capacity (ATC)** reports.

8.4.2 *Congestion Relief*

The **SO** shall implement appropriate measures to relieve congestion, including:

- a) re-dispatch of generation to utilise less congested transmission lines;
- b) curtailment of transactions, with priority given to short-term **Open Access** transactions; and/or
- c) implementation of Load Shedding procedures, if necessary.

8.5 **Cross-Border Coordination**

8.5.1 *Regional Transmission Capacity*

The **SO** shall collaborate with neighbouring system operators to manage cross-border transmission capacity.

Capacity shall be allocated for regional power pool transactions in accordance with the **Southern African Power Pool (SAPP)** operational guidelines.

8.5.2 *Harmonization of Grid Standards*

The **SO** shall ensure harmonisation of grid standards with neighbouring countries to facilitate seamless integration and interoperability of interconnected power systems.

8.6 **Reporting and Transparency**

8.6.1 *Capacity Reporting*

The **SO** shall publish annual and monthly reports on transmission capacity, which shall include:

- a) total transmission capacity;
- b) allocated capacity; and
- c) **Available Spare Capacity**.

8.6.2 *Transparency*

Transmission capacity information shall be made available to all Participants through the OAMS.

Participants may access real-time data on transmission flows and capacity availability.

8.7 **Compliance with Transmission Capacity Allocation Procedure**

8.7.1 *Compliance Monitoring*

The **SO** monitors compliance with transmission capacity allocation procedures and Open Access requirements.

Non-compliance may result in Liabilities, including:

- a) Financial Liabilities as determined by the ERB;
- b) disconnection from the grid; and/or
- c) legal action against non-compliant Participants in severe cases.

8.7.2 *Audits and Inspections*

The **SO** shall conduct regular audits and inspections to ensure compliance with transmission capacity management procedures and requirements.

The System Operator shall conduct audits which may include:

- a) Review of transmission capacity allocation records; and
- b) Inspection of transmission infrastructure; and
- c) Verification of adherence to technical and operational standards.

9. Compliance and Monitoring

The compliance and monitoring framework ensures that all Open Access Participants adhere to the Governing Documents, procedures, and standards governing the operation of the Integrated Power System (IPS). This section outlines the procedures and responsibilities for monitoring compliance and resolving disputes.

9.1 Register of Qualifying Participants

9.1.1 Maintenance of Register

The **MOU** shall maintain a public register of all Qualifying Participants granted Open Access [*OAREGS §17*].

The register shall include the following information for each Qualifying Participant:

- (a) the Balancing Point;
- (b) the Point of Connection to which the Balancing Point is connected;
- (c) the Balance Responsible Party for the Balancing Point;
- (d) the following details of the contract(s) under which power physically injected or withdrawn at the Balancing Point is sold or purchased:
 - I. The counterparties;
 - II. The tenor;
 - III. The quantities, including profiles;
 - IV. Points of Injection and/or Points of Withdrawal;
 - V. The BRP for the associated Balancing Points where power is either injected for supply under the contract or withdrawn for sale under the contract; and
 - VI. the order of priority established by the BRP for reconciling contracts at the Balancing Point.

9.1.2 Updates and Reporting

The register shall be updated continuously and made available:

- a) to the ERB, by such date as may be reasonably determined by the ERB; and
- b) to the other Parties, as and when reasonably required for the performance of their respective obligations under this Code.

Participants shall notify the **MOU** of any changes to their registered information within fourteen (14) days of the occurrence of such changes.

9.2 Compliance Monitoring

9.2.1 Monitoring Framework

The System Operator shall monitor compliance with:

- a) the Governing Documents;

- b) **Open Access** Guidelines and procedures; and
- c) technical and operational standards applicable to the **IPS**.

9.2.2 *Key Areas of Compliance*

Technical compliance includes:

- a) adherence to Grid Code connection standards, including voltage levels, frequency, and power factor requirements; and
- b) Proper operation of Protection Systems.

Operational compliance comprises:

- a) Adherence to scheduled energy injection or extraction.
- b) Timely reporting of deviations and incidents.

Commercial compliance comprises:

- a) Payment of transmission charges and other fees.
- b) Maintenance of financial obligations as Balance Responsible Party (BRP), or assignment of the BRP role to a financially viable party under the Balancing Agreement.

9.2.3 *Monitoring Tools and Systems*

The **SO** employs advanced monitoring tools, including:

- a) Supervisory Control and Data Acquisition (SCADA) systems for real-time data acquisition; and
- b) Energy Management Systems for real-time monitoring and control; and
- c) **Deviation Settlement** Mechanisms for tracking and settling energy imbalances.

9.3 **Audits and Inspections**

9.3.1 *Periodic Audits*

The **SO** shall conduct annual audits of Participants to verify compliance with applicable requirements.

Audits shall include the following assessments:

- a) Review of metering data, energy accounting records and settlement records;
- b) Inspection of grid connection infrastructure, protection systems, and metering equipment; and
- c) interviews with operational and technical staff of Participants to verify adherence to operational procedures and Grid Code requirements.

9.3.2 *Non-Compliance Identification*

The **SO** identifies non-compliance through:

- a) Automated system alerts;
- b) **Participant** self-reporting [*ELACT 21(1)*];

- c) complaints from other Participants or the public; and/or
- d) findings from audits or inspections.

9.3.3 *Corrective Actions*

Participants found to be non-compliant shall implement corrective actions within a timeline specified by the SO.

Such corrective actions may include:

- a) repair or replacement of non-compliant equipment;
- b) payment of Liabilities for deviations or non-payment of charges; and
- c) submission of revised schedules or operational plans to ensure future compliance with applicable requirements.

9.4 **Dispute Resolution Procedures**

9.4.1 *General Dispute Resolution Procedures*

Subject to 6.6, Disputes between Participants and the **SO**, or between Participants, shall be resolved through the dispute resolution procedures set out in the **Grid Code** and these Guidelines.

The dispute resolution process shall comprise the following sequential stages:

- a) **Internal Mediation**: The **SO** and the affected Participant shall attempt to resolve the dispute through internal mediation within thirty (30) days of the dispute arising;
- b) **ERB Intervention**: Disputes that remain unresolved after the internal mediation period shall be escalated to the **ERB** for determination in accordance with the applicable dispute resolution procedures set out in the Electricity Act and related regulations.

9.5 **Liabilities for Non-Compliance**

Non-compliance with the requirements of this Code may result in the following consequences:

- a) Financial Liabilities as determined by the **ERB** in accordance with the Electricity Act;
- b) disconnection from the Grid; and/or
- c) legal action against non-compliant Participants in severe cases.

9.6 **Reporting and Transparency**

9.6.1 *Compliance Reports*

The **SO** shall submit periodic compliance reports to the **ERB**, including:

- a) a summary of Participants' compliance status with applicable requirements;
- b) details of non-compliance incidents; and
- c) Corrective Actions taken or planned to address non-compliance.

9.6.2 Transparency

Compliance information shall be made available to all Participants through public reports and the **OAMS**.

9.7 Record Keeping

The System Operator shall retain records of all compliance monitoring activities for a minimum period of seven (7) years.

Such records shall include:

- a) audit reports;
- b) non-compliance incident reports and associated corrective actions;
- c) dispute resolution procedures records, including documentation of disputes between Participants, mediation attempts, ERB interventions, and final determinations.

10. Financial and Contractual Management

This Financial and Contractual Management framework ensures the financial viability and contractual integrity of Open Access arrangements. This section establishes the procedures and responsibilities for managing financial security, billing, payment processes, and contractual agreements governing Open Access transactions.

10.1 Financial Security

- 1.1.1. The System Operator may require Participants to provide financial security to cover obligations under these Guidelines and the Balancing Agreement.
- 1.1.2. Financial security shall be reasonable and *proportionate* to the *Participant's* obligations, in accordance with the Electricity Act.
- 1.1.3. The amount and form of financial security shall be as approved by the ERB or as specified in the Balancing Agreement.

10.1.1 Financial Security Requirements

Participants shall provide financial security to cover potential energy imbalances in accordance with the Balancing Mechanism.

10.2 Billing and Payment

10.2.1 Billing Procedures

- i. Amounts payable for balancing services shall be invoiced and settled in accordance with the Balancing Agreement
- ii. Other amounts payable to the SO shall be invoiced by the SO by the 5th Business Day of each month. Such System Operator invoices may include Charges to recover System Operator operational costs
- iii. Participants may dispute invoices within fourteen (14) days of receipt

10.2.2 Payment Timelines:

Open Access Users shall make payments within thirty (30) days of invoice issuance.

10.2.3 Billing Dispute Resolution

Billing disputes shall be resolved through the Dispute Resolution Procedures outlined in the **Zambian Grid Code**.

10.3 Contractual Agreements

10.3.1 ERB Approval Requirements

- a) Participants intending to enter into a power purchase agreement (PPA) or power supply agreement (PSA) for the local or export market shall submit the proposed agreement to the ERB for approval within thirty (30) days, in accordance with Section 19 of the Electricity Act.
- b) The ERB shall approve or reject the agreement within a reasonable time, stating reasons for any rejection.

10.3.2 MOU Registration

- a) Following ERB approval, parties to a PPA or PSA shall register the agreement with the Market Operator Unit (MOU) via the Open Access Management System (OAMS).
- b) Registration with the MOU does not substitute for ERB approval required under Section 19 of the Electricity Act.

10.3.3 System Operator Coordination

- c) The SO shall receive consolidated schedules from the MOU reflecting registered PPAs and PSAs for system operation and balancing purposes.

10.3.4 Power Purchase Agreements (PPAs)

Participants engaging in bilateral transactions shall register their PPAs with the MOU.

Information required for PPA registration shall include:

- a) the parties to the agreement (**Eligible Seller** and **Contestable Consumer**);
- b) the quantity of electricity to be supplied; and
- c) the term and duration of the agreement.

10.3.5 Power Supply Agreements (PSAs)

Participants engaging in bilateral transactions must register **their PSAs** with the **MOU**.

Information required for PSA registration must include:

- a) the parties to the agreement (**Eligible Seller** and **Contestable Consumer**);
- b) the quantity of electricity to be supplied; and
- c) the term and duration of the agreement.

10.3.6 Balancing Agreements

Balance Responsible Parties (BRPs) shall enter into a **Balancing Agreement** with the **SO** to cover energy imbalances.

The **Balancing Agreement** shall set out:

- a) responsibilities for deviations between scheduled and metered quantities;
- b) responsibilities for maintaining system balance between supply and demand within the SO's Control Area; and
- c) Financial Liabilities for energy imbalances and deviations from scheduled energy injection or extraction quantities.

10.4 Tariff Approval and Adjustment

10.4.1 Tariff Approval

The **SO's** charges for balancing services and ancillary services are subject to

approval by the **ERB**.

Tariff determination shall be based on:

- a) cost of service, including the **SO's** procurement costs;
- b) prevailing market conditions; and
- c) applicable regulatory requirements.

10.4.2 Tariff Adjustments

The **SO** may apply to the **ERB** for tariff adjustments to reflect changes in:

- a) operating costs;
- b) inflation; and
- c) regulatory requirements.

All tariff adjustments are subject to **ERB** approval.

10.5 Record Keeping and Reporting

10.5.1 Financial Records

The System Operator shall maintain comprehensive financial records for a minimum of seven (7) years.

Such records shall include:

- a) invoices, credit notes, and payment receipts;
- b) financial security arrangements; and
- c) tariff determination and adjustment documentation.

10.5.2 Reporting

The **SO** shall submit periodic financial reports to the **ERB**, which shall include:

- a) revenue derived from balancing and ancillary service charges, and the associated costs of service procurement; and
- b) outstanding payments and liabilities from Participants.

11. Regional Coordination and Interconnection

This Regional Coordination and Interconnection framework ensures the integration and efficient operation of cross-border electricity trade within the Open Access regime. This section establishes the procedures and responsibilities for managing regional interconnections and harmonizing grid operations with neighbouring systems.

11.1 Cross-Border Electricity Trade (Southern African Power Pool)

The SO collaborates with neighbouring system operators under the **SAPP Operating Guidelines** to facilitate cross-border electricity trade.

The SO's key activities in facilitating cross-border electricity trade include:

- a) Scheduling and dispatching cross-border transactions;
- b) Managing transmission capacity for regional trades;
- c) Ensuring compliance with the **SAPP Operating Guidelines**.

11.1.1 Transaction Scheduling

Cross-border transactions shall be scheduled in consultation with the relevant system operators

Cross-border transaction schedules shall comply with:

- a) **SAPP Operating Guidelines**; and
- b) Bilateral agreements between SAPP members.

11.1.2 Energy Imbalance Management:

The System Operator manages energy imbalances arising from cross-border transactions in accordance with the Balancing Mechanism and SAPP Operating Guidelines for the settlement of inadvertent energy flows.

11.2 Transmission Capacity Management

11.2.1 Regional Transmission Capacity

The System Operator shall allocate available transmission capacity for cross-border transactions in accordance with SAPP Operating Guidelines and applicable bilateral agreements between SAPP members.

11.3 Grid Code Standards Harmonization

11.3.1 Alignment with SAPP Grid Code Standards

The System Operator shall ensure that **all Grid Code requirements** are harmonized with SAPP grid standards to facilitate seamless integration of interconnected systems.

Key areas of harmonization shall include:

- a) Technical standards for grid connection.
- b) Operational procedures for scheduling and dispatch.
- c) Protection and control systems.

11.3.2 Interoperability

The System Operator shall collaborate with neighbouring System Operators to ensure interoperability of grid infrastructure and control systems, including:

- a) Substation automation systems.
- b) Communication and telemetry systems.

11.4 Operational Coordination

11.4.1 Control Area Operations

The System Operator operates as the **Control Area Operator** for regional interconnections and is responsible for:

- a) Matching generation and load within the **SO's Control Area**.
- b) Maintaining scheduled interchange with other **Control Areas**.
- c) Ensuring grid frequency and voltage stability are maintained within prescribed limits.

11.4.2 Ancillary Services:

The **SO** shall procure ancillary services for cross-border transactions, including:

- a) Frequency regulation.
- b) Voltage control.
- c) Spinning reserves.

11.5 Emergency Preparedness and System Restoration

11.5.1 Regional Emergency Coordination

The System Operator shall develop and maintain comprehensive emergency plans for cross-border interconnections, which shall include:

- a) System restoration protocols.
- b) Load curtailment procedures.
- c) Communication protocols for notifying Participants and other affected parties of emergency situations.

11.5.2 Black Start Capabilities

The **SO** shall ensure that adequate black start capabilities are maintained and available for cross-border interconnections to facilitate system restoration following a major system disturbance or blackout.

11.6 Reporting and Transparency

11.6.1 Regional Reports

The **SO** shall submit periodic reports to the **SAPP Coordination Centre** and the **ERB**, including:

- a) Cross-border transaction schedules.
- b) Transmission capacity utilization.

c) Energy imbalance settlements.

11.6.2 Transparency Requirements:

The SO shall make information on cross-border transactions and available transmission capacity accessible to Participants through the **OAMS** in accordance with applicable confidentiality requirements.

Annexure A PROCEDURES

A.1 Plant and Equipment Outage Planning Procedure

The process for coordinating outages across participants.

A.2 Procedure for Assessing the Transmission Capacity Available for Open Access Transactions:

Detailed steps for determining and allocating transmission capacity.

A.3 Scheduling and Dispatch Procedure:

Step-by-step process for day-ahead and real-time scheduling.

A.4 Metering and Data Management Procedure:

Guidelines for installing, commissioning, and maintaining meters.

A.5 Curtailment and Grid Security Procedure:

Protocols for implementing curtailment and maintaining grid stability.

A.6 Compliance Monitoring and Audit Procedure:

Steps for conducting compliance audits and resolving disputes.

A.7 Emergency Preparedness and Restoration Procedure:

Detailed plans for responding to grid emergencies and restoring power.

A.8 Cross-Border Transaction Procedure:

Guidelines for scheduling and managing cross-border electricity trade.

Annexure B SAMPLE AGREEMENTS

B.1 Participation Agreement Template

B.2 Balancing Agreement Template:

Annexure C MAPS AND DIAGRAMS

C.1 Transmission Network Map:

A map showing the national transmission network and key interconnection points.

C.2 Regional Interconnection Map:

A map showing cross-border transmission lines and regional interconnections.