ZESCO LIMITED

RENEWABLE ENERGY SYSTEM TECHNICAL SPECIFICATIONS FOR NET METERING

Contents

1.0. TECHNICAL SPECIFICATIONS

1.1. Voltage Levels and Deviation

The Renewable Energy System must operate at the standard voltage levels of ZESCO's distribution network:

a) Single-phase: 230V ±10%
b) Three-phase: 400V ±10%
c) Three-phase: 11,000V ±10%
d) Three-phase: 33,000V ±10%

Prosumers must ensure that voltage levels at the point of connection do not deviate beyond the limits specified by ZESCO, maintaining system stability and equipment integrity. Under mitigating circumstances, voltage regulation or compensation equipment must be installed to adhere to the acceptable voltage deviation range. The cost of this equipment, including purchase, installation, and maintenance, is the responsibility of the prosumer.

1.2. Phase Sequence

The system must maintain the correct phase sequence: L1, L2, L3.

1.3. Frequency and Deviation

The system must operate at a frequency of 50 Hz ±0.15 Hz to maintain the stability of the grid. Prosumers must ensure that the frequency of electricity generated closely matches the grid frequency. Utilization of frequency regulation technologies and ensuring generation units can adjust their output to maintain the required frequency range are essential. The operational frequency for each Renewable Energy System must be set at the nominal 50 Hz. The Renewable Energy System must remain in synchronism with the grid even when system frequency momentarily exceeds the limits, providing a buffer period for system correction measures.

The prosumer shall ensure that the Renewable Energy System is controlled, for the purpose of enabling the management of system frequency stability, by ZESCO.

1.4. Power Factor

Prosumers connected to the ZESCO grid must manage their power factor to align with ZESCO's operational limits. The power factor should not deviate significantly from unity (1.0) to minimize reactive power flow and ensure grid stability. Prosumers are required to operate with a power factor within the range specified by ZESCO, not falling below 0.95 leading or lagging. If a prosumer's operation results in a power factor outside the acceptable range, they must install power factor correction equipment to adjust and maintain the required levels. The investment in power factor correction equipment, including purchase, installation, and maintenance, is the responsibility of the prosumer.

1.5. Harmonic Distortion

The system must maintain voltage THD ≤ 5% and individual harmonic currents should not exceed 3% under normal operating conditions. Prosumers are required to implement harmonic filtering solutions and adhere to equipment selection criteria that minimize harmonic generation.

1.6. Inverter Specifications

The Inverter must conform to the following minimum requirements:

a) The inverter must be a grid-tied inverter capable of synchronizing with ZESCO's grid and confirm to Zambian Standards.
b) It should support anti-islanding protection to prevent back-feeding into the grid during outages.
c) Net metering generation exceeding thirty kilo-watts (30kW should have the capability to facilitate remote monitoring of energy flows by a distribution enterprise.
d) For Prosumers with capacity of greater or equal to 2MW, the RES shall comply with the fault ride through requirements as stipulated in the Grid Code relating to distribution system.

1.7. Safety and Protection Devices

Subject to the provisions of the Grid Code relating to the distribution system, the prosumer's RES must allow and include following, but not limited to:

a) Overcurrent Protection: The system must include overcurrent protection devices appropriately rated for the system's capacity.
b) Surge Protection: Surge protection devices must be installed to protect the system from voltage spikes and lightning strikes.
c) Isolation Switches: An automatic or manual disconnector switch must be installed to allow safe isolation of the system from the grid for maintenance and outage purposes.
d) Earthing: All components of the Renewable Energy System must be properly earthed according to ZESCO's standards to ensure safety and prevent electrical shocks.

1.8. System Installation

The Renewable Energy System must be connected to the main electrical panel through a dedicated circuit breaker. The prosumer shall ensure the Renewable Energy System is capable of being controlled by ZESCO in accordance with the operating requirements and arrangements of the Distribution Grid Code.

1.9. Technical Documentation

The customer must provide detailed technical documentation of the Renewable Energy System, including:

a) System design and layout
b) Electrical schematics
c) Component specifications
d) Installation manuals

1.10. Synchronizing Facilities

Prosumers are required to have synchronizing facilities for each Renewable Energy System connected to the grid to ensure seamless integration and operation with the grid system. This includes a synchronizing relay and a sync-check relay, with settings that must be reviewed and approved by ZESCO to prevent adverse effects on grid operations.

2.0. SAFETY

2.1. Operation and Maintenance

The Prosumer shall be responsible for the safe operation, maintenance, and rectification of defects in the Renewable Energy System up to the interconnection point. Beyond this point, the responsibility for safe operation, maintenance, and rectification of any defects, including the net meter, rests with ZESCO.

2.2. Safety Compliance

The Renewable Energy System must comply with all applicable safety standards and regulations, including those set forth by the Zambian Bureau of Standards (ZABS), International Electrotechnical Commission (IEC), and Institute of Electrical and Electronics Engineers (IEEE) standards.

2.3. Back Feeding Prevention

The Prosumer must install necessary safety devices to prevent back feeding into the grid during outages, which could pose a risk to maintenance personnel and the public. The prosumer shall operate and maintain the Renewable Energy System with a visibly open, lockable manual or motorised, and clearly labelled switch, to prevent the net metering generation from back-feeding a de-energised distribution system line.

2.4. Liability for Accidents

The Prosumer shall be solely responsible for any accidents to human beings or animals (fatal or non-fatal), equipment and the environment that may occur due to back feeding from the Renewable Energy System when the grid supply is off. ZESCO reserves the right to disconnect the consumer’s installation at any time to prevent accidents or damage.

2.5. Inspection and Access

ZESCO personnel may enter the Prosumer's premises to inspect protective devices and read or test the meter at any time. The Prosumer must provide access to ZESCO personnel for these purposes.

2.6. Compliance with Standards

The Prosumer shall strictly adhere to the standards specified by the relevant regulatory bodies and ensure that the installation of electrical equipment complies with the Grid code relating to distribution system and other relevant standards.

2.7. Design and Approval

Approval of the detailed designs by ZESCO shall not relive the Prosumer of the responsibility to design according to minimum specifications.