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MALDIVES ENERGY AUTHORITY

METERING SCHEME REGULATION

METERING SCHEME

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CHAPTER I. GENERAL REGULATION

Section 1. General Provisions

Article 1. Purpose

The purpose of this Metering Scheme is to define the characteristics and requirements for the metering system and metering activities in a Distribution Network of the Republic of Maldives.

Article 2. Scope

This procedure will develop the following aspects that will apply to any metering installation of assets connected to the Distribution Network:

1. Standards for Electric Metering Equipment;
2. Accepted Schemes for meters installations;
3. Management of the collected information;
4. Responsibilities for meter operation, management and reading; and
5. Certification and testing.

Article 3. Application

1. The contents of this Metering Scheme will apply to all new applications for connection, modification of existing connections to the distribution networks, or in those cases where inspections and verifications prove that existing conditions in metering equipment are not in compliance with provisions of this Metering Scheme.

2. All processes, methods, actions and responsibilities detailed or derived from this Metering Scheme have been defined for Metering Systems for Customers connected to the Distribution Network of a Service Provider.

Section 2. Glossary

Article 4. Definitions

The following definitions are to be referenced when interpreting this Metering Scheme:

1. Active Power: the time average of the instantaneous power over one period of the electrical wave, measured in Watts (W) or multiples thereof. In a three-phase system it is the sum of the Active Power of the individual phases.
2. AMR: Automatic Meter Reading
3. Backup Meter: Meter utilized to check the measurement provided by the Main Meter or to replace it in case of failure of the Main Metering System.
4. Backup Metering System: group of Meter and the associated equipment and services that will be used by the Service Provider, in market settlement process, for the purpose of checking and validating the measurements provided by the Main Metering Systems, or to replace measured data in case of failure or malfunction of the Main Metering System.
5. Balancing: The activities performed to ensure balance between electricity demand and supply.
6. Calibration Tests: series of tests and checks performed by Certifying Agency to determine that the accuracy of an existing Metering Installation is within the specifications of the Service Provided Code and this Metering Scheme
7. Certifying Agency: agency which has the technical and infrastructure capability to perform accuracy tests for Meters and Metering Equipment licensed by the MEA
8. Connection Point: point of connection of a Generating Station or a Consumer to the Distribution Network of a Service Provider.
9. Consumer: agent connected to the Distribution Network of a Service Provider and to which the Service Provider supplies electricity.

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10. Contracted Capacity: maximum of MIC and MEC of a connection to the Distribution Network.
 11. CT: acronym for Current Transformer
 12. Customer: agent connected to the Distribution Network of a Service Provider and that extracts electricity from it or which uses the Distribution Network of a Service Provider to inject the electricity it generates.
 13. Data Collection System: data collection system operated by the Service Provider and accessible to any third party that is authorized to do so in the regulation.
 14. Distribution Network: group of assets and equipment required for the distribution of electricity in the Republic of Maldives, comprising voltage levels not higher than 35 kV.
 15. Distribution System: power system that includes the Distribution Network and the Generating Stations there connected.
 16. Generating Station: power generator or group of power generators located in a same site and their associated equipment and facilities that are connected to the Distribution Network.
 17. Generator: agent connected to the Distribution Network of a Service Provider that owns a Generating Station.
 18. Hourly reading: cumulative reading metered and registered by the metering device for each full hour, not taking into account, e.g. two separate readings of two-rate products.
 19. Hourly metering: Hourly metering of the amount of electricity and the registration of this data in the memory of the metering equipment.
 20. Hourly metering equipment: Metering equipment for metering and registering of electricity consumption or feed to the network in the memory of the equipment. The data register by this equipment may be read from the memory of the equipment via the data transmission network.
 21. Large Consumer: Consumer with Contracted Capacity higher than 500 kW or connected to the MV Distribution Network.
 22. Low Voltage or LV: any voltage lower than 1 kV that is normalized and approved by the MEA for its use in power distribution in the Republic of Maldives.
 23. Main Meter: Meter, other than a Backup Meter, forming part of the Main Metering System, acting as main reference to measure electric magnitudes at a Connection Point.
 24. Main Metering System: metering system whose data will be used by the Service Provider as a prime reference for the measurement of the active or reactive energy interchanged at a Connection Point in Market Settlement process.
 25. MEA: Maldives Energy Authority. Regulator of the energy sector in the Republic of Maldives.
 26. MEC: Maximum Export Capacity. Total electric power measured in kVA for which a connection is designed to supply power from the Customer's premises to the Distribution Network.
 27. Medium Voltage or MV: any voltage from 1 kV up to 35 kV that is normalized and approved by the MEA for its use in power distribution in the Republic of Maldives.
 28. MIC: Maximum Import Capacity. Total electric loading measured in kVA for which a connection is designed to supply power from the Distribution Network to the Customer's premises.
 29. Meter: device that measures and registers the integral Active Energy or Reactive Energy over a metering interval and may include a data recorder, but shall be deemed to exclude instrument transformers.
 30. Meter Type: specific and unique model of Meter of a specific manufacturer, identified by a definite trademark and type. Manufacturer's variants of a specific Meter model or trademark, or different options of a model as voltage or current ratings, storage capacity, etc., shall be considered, for purposes of this Metering Scheme as different Meter Types.

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31. Metering Equipment: term to refer to the group of equipments for power measurement (Meter, Current Transformer, Voltage Transformer and auxiliary or ancillary equipment) or any of them individually.
 32. Metering Installation: Meter or Meters and their associated Metering Equipment those are located at a specific Customer's location.
 33. Metering System: system that includes equipments and circuits devoted to metering electric variables in the Distribution System. It includes a Meter and the associated current transformers, voltage transformers, metering protection equipment including alarms, LV electrical circuitry, associated data collectors, data transmitters related to the measurement and recording and transmitting to the Data Collection System the active energy and/or reactive energy, as the case may be.
 34. Operator of the Distribution Network: Service Provider in charge of the operation of the Distribution Network.
 35. Reactive Energy: component of the apparent energy that is not able to produce work but is required to generate magnetic fields. It is measured in kVARh or its multiples and submultiples. It is obtained by integrating the Reactive Power over a certain period.
 36. Reactive Power: capacity of an electric wave to generate magnetic fields by consuming Reactive Energy. It is measured in kVAR or its multiples and submultiples. It equals the instantaneous value of the Reactive Energy.
 37. Reading System: a system for gathering Metering Reading and maintaining the settings of the metering device.
 38. Routine Tests: series of tests and checks performed by Certifying Agency to determine that a new Meter or Metering Equipment complies with the provisions of this Metering Scheme. Routine Tests shall be performed to each individual Meter or Metering Equipment or by sampling of a group of Meters or Metering Equipments.
 39. Service Provider: agent licensed by the MEA to develop activities of generation, distribution and sale of electricity in the Republic of Maldives and that has to abide by Service Provider Code.
 40. Service Provider License: license issued by the MEA that is required for carrying out activities of Service Provider in the Republic of Maldives.
 41. System Provider: it is the entity that coordinate, plans and controls in real time generation, transmission and distribution in the national power system.
 42. Type Tests: series of tests and checks performed by Service Provider to determine that a new Meter Type complies with the provisions of this Metering Scheme. MEA will issue directives and procedures regarding the Type Tests to be performed to each Meter Type.
 43. VT: acronym for Voltage Transformer.

Section 3. International Standards reference list

Article 5. International Standards Reference List

The following International Standards are to be referenced when reading this Metering Scheme:

1. IEC 61869-1. Instrument transformers - Part 1: General requirements.
2. IEC 61869-2. Instrument transformers - Part 2: Additional requirements for current transformers.
3. IEC 61869-3. Instrument transformers - Part 3: Additional requirements for inductive voltage transformers.
4. IEC 61869-5. Instrument transformers - Part 5: Additional requirements for capacitor voltage transformers.
5. IEC 60529: 2001: Degrees of protection provided by enclosures (IP Code)
6. IEC 62052-11: 2003: Electricity metering equipment (a.c.) – General requirements, tests and tests conditions – Part 11: Metering equipment

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7. IEC 62053-11: Electricity metering equipment (a.c.) – Particular requirements – Part 11: Electromechanical meters for active energy (class 0,5, 1 and 2).
 8. IEC 62053-21: 2003, Electricity metering equipment (a.c.) – Particular requirements – Part 21: Statistic meters for active energy (classes 1 and 2)
 9. IEC 62053-22: 2003, Electricity metering equipment (a.c.) – Particular requirements – Part 22: Static meters for active energy (classes 0,2 S and 0,5 S).
 10. IEC 62053-23: 2003, Electricity metering equipment (a.c.) – Particular requirements – Part 23: Statistic meters for reactive energy (classes 2 and 3)
 11. IEC 62056-21: 2002, Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange

CHAPTER II. PROCEDURE FOR MV METERING EQUIPMENT

Section 1. Guidelines for Location of Meters

Article 6. Types of Connection Points at MV Networks

Depending on the location and function of the Connection Point, two types shall be distinguished:

1. Type 1: Connection Point between Distribution Network of a Service Provider and Consumer;
2. Type 2: Connection Point between Distribution Network of a Service Provider and a Generating Station.
 - 2.1. Type 2.a) The Generating Station is connected to the Distribution Network and is used to supply power to other parties;
 - 2.2. Type 2.b) The Generating Station is not connected to the Distribution Network and is thus used for self-consumption.

Article 7. Main Metering Systems and Backup Metering Systems

The following rules apply to the composition of the Metering Systems by Type of Connection Point:

1. Type 1 Connection Points: The Connection Point is at MV and the Metering System shall be composed of a Main Metering System. A Backup Metering System may also be installed for Large Consumers.
2. Type 2 Connection Points: The Connection Point is at MV and Metering System shall be composed of a Main Metering System and a Backup Metering System.

Article 8. General Rule for Location of Meters at MV Networks

As a general rule, both the Main Metering System and the Backup Metering System shall be located as close as feasible to the Connection Point. Where there is a material difference in location, an adjustment for losses between the location of the Metering System and the Connection Point may be calculated by the Operator of the Distribution Network and agreed to by the Customer. Such loss adjustments may include transformer and line loss compensation resulting from the distance of the Metering System to the physical location of the Connection Point.

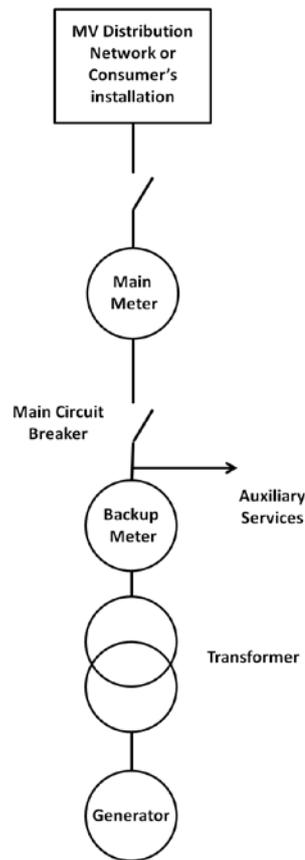
Article 9. Specific Rules for Location of Meters

The following rules apply to the location of Main and Backup Metering Systems by Type of Connection Point:

1. Type 1 Connection Points
 - 1.1. If the Connection Point is at:
 - 1.1.1. The Operator of the Distribution Network's substation, then the Main Metering System shall be located downstream the main breaker of the feeder at the Operator of the Distribution Network's substation, unless otherwise agreed.
 - 1.1.2. The Consumer's substation, then the Main Metering System shall be located at the head of the feeder, near the circuit breaker or disconnecter at the MV side of the substation's transformers, unless otherwise agreed.
 - 1.2. The Backup Metering, if any, will be located:
 - 1.2.1. at the other side of the breaker;
 - 1.2.2. at the first pole of the line outside the substation; or
 - 1.2.3. in case none of the above options is possible, as agreed between the parties.
2. Type 2 Connection Points
 - 2.1. If the Connection Point is at:
 - 2.1.1. The Generating Station's substation,

- a) the Main Metering System shall be located downstream the main circuit breaker or disconnecter at the higher MV level side of the step-up transformer directly connected to the Distribution System, unless otherwise agreed. The following scheme shows the recommended location of the Main Meter.
- b) The Backup Metering System's shall be located in the outgoing line at the Generating Station's substation, unless otherwise agreed. The following scheme shows the recommended location of the Backup Meter.
- c) Auxiliary services for the generator, if any, shall be located downstream the Backup Meter but upstream the Main Circuit Breaker.

Figure 1 - Scheme of meter location in the connection of a Generating Station to the Distribution Network or a Consumer's Installation at MV



Section 2. Determination of Technical Requirements for Metering Equipment

Article 10. Interpretation of Technical Requirements

The technical requirements on Meter and Metering Equipment presented in this section are the minimum technical requirements to be fulfilled in any installation. If a contract between relevant Customers or an agreement between Operator of the Distribution Network and Customer has additional requirements for Metering Systems or requirements in relation to Meters, those requirements shall, so long as they do not prevent compliance with this Metering Scheme, apply in addition to the requirements of this Metering Scheme.

Article 11. Configuration of the Metering System

1. Connection Points of Type 1 and Type 2 shall be equipped with remote metering functionalities in compliance with the provisions of Chapter V.
2. The general configuration of a Metering System (be it either used as Main Metering system or Backup Metering System) must include:
 - 2.1. Current Transformer (CT);
 - 2.2. Voltage Transformer (VT);
 - 2.3. Meter;
 - 2.4. Electric circuit and secondary cable;
 - 2.5. Facilities to keep the Metering System from being manipulated in any way;
 - 2.6. Auxiliary equipments, terminals, test blocks, voltage selector, current and voltage checking equipment.

Article 12. Meters Technical Requirements

1. The Meter must be three phases and four wire type;
2. The Meter must be digital, with multi-function integrated and programmable;
3. The Meter shall be capable of supporting multiple tariff features;
4. Registers of active energy shall be done in all the ways the energy could flow. This may be achieved by using one or more metering equipments as it is convenient.
5. Registers of reactive energy shall be done in all the four quadrants reactive energy could flow. This may be achieved by using one or more metering equipments as it is convenient.
6. The Meter shall be able to measure peak power (maximum Active Power and/or maximum Reactive Power as applicable) and the load curve;
7. The Metering System for Type 2.a connections shall be capable of separately registering the magnitudes related to the energy injected into the Distribution Network and the energy extracted from the Distribution Network. This shall preferably be achieved by means of a single Meter with capability to register power flows both ways. Metering Systems for Type 2.b connection shall be capable of registering the magnitudes related to the energy generated by the Generating Station.
8. The Meter must be able to connect to a computer for local and remote data collection;
9. Auxiliary voltage to the Meter must be supplied from VT voltage and be able to operate when any one or two VT voltage wire is disconnected;
10. To prevent unauthorized access to the data in the Meters or Data Registers a security scheme shall be incorporated for both local and remote access. Separate security levels shall be provided for the following activities:
 - 10.1. Level 1 - Password for read only of the following metering data, which shall be transferable on request during the interrogation process:
 - 10.1.1. Meter or Data Register ID;
 - 10.1.2. Energy Metered Values;
 - 10.1.3. Cumulative measured quantities;
 - 10.1.4. Alarm indications; and
 - 10.1.5. Meter or Data Register time and date.
 - 10.2. Level 2 - Password for corrections to the time and/or date and resetting of maximum values.
 - 10.3. Level 3 - Password for programming of
 - 10.3.1. Displays, tariff schemes and other functions; and
 - 10.3.2. The passwords for levels 1, 2 and 3.
 - 10.4. Level 4 - Password for removal of Metering Equipment cover(s) necessitating the breaking of the seals for:
 - 10.4.1. Calibration of the Metering Equipment;
 - 10.4.2. Programming the level 3 password and the level 4 password.

In addition to the functions specified for each level it shall be feasible to undertake the functions at the preceding or lower level. The Meter must be prepared to install a secured seal that keeps it safe from interference in the metering circuit and setting parameters;

11. The Meter shall be enclosed in a cabinet or otherwise installed in a manner which shall conform to the manufacturer's stated environmental conditions. The installation shall provide protection from moisture and dust ingress and from physical damage, including vibration complying with at least the degree of protection IP54 of IEC 60529-2004 or the standard that replaces it. In addition, the cabinet or meter must be sealed to prevent unauthorized access.
12. The Meter must be able to store metering information for at least 60 days with capability to record data in steps of between 5 minutes up to 1 hour, in non volatile memories;
13. The Meter must record measures automatically on internal or separate Data Registers. In any case, all Meters shall have a display showing the accumulated values of the measured quantities.
14. In cases separate Data Registers are used, each Data Register may store information from one or more Metering Equipment, provided that Backup Meters shall have separate Data Registers from the Main Meters.
15. The Meter or the Data Register, as the case may be, shall have an adequate communication channel, either through serial port RS-232, opto-couplers according IEC Standard 62056-21, or any other system the MEA may authorize for Customers. This communication channel will permit automatic downloading, including remote interrogation and batch downloading, by the Data Collection System.
16. The Main Meter must:
 - 16.1. Be of accuracy class 0.5 for active energy metering and comply with the requirements of IEC 62053-22 standard or the standard that replaces it; and
 - 16.2. Be of accuracy class 2.0 for reactive energy metering and comply with the requirements of IEC 62053-23 standard or the standard that replaces it;
17. The Backup Meter (if any) must comply with the same accuracy class requirements as the Main Meter, unless otherwise agreed between the Operator of the Distribution Network and the Customer.

Article 13. CT technical requirements

1. The CT must have secondary coils exclusively devoted to metering.
2. The CT's secondary nominal current shall be 5A.
3. The CT's cables and connections between the CT and the Main or Backup Meter (if any) must be securely sealed to prevent interference with their function.
4. The CT installed in the Main Metering System must be of accuracy class 0.5, complying with the requirements of IEC 61869-1 and 61869-2 standards or the standards that replace them.
5. The CT installed in the Backup Metering System (if any) must be of the accuracy class determined by agreement between the PC and the Customer provided it is class 0.5 or higher.
6. The maximum burden imposed by the cables that connect the current transformers with the metering equipment shall be lower than 4 VA. In any case the section of these cables shall not be lower than 6 mm².

Article 14. VT Technical Requirements

1. The VT must have secondary coils exclusively devoted to metering;
2. The VT's secondary nominal current shall be either 100 V or 110 V;
3. The VT's cables and connections between the VT and the Main or Backup Meter must be securely sealed to prevent interference with their function.
4. Connections cables between VT and the metering equipment shall have a section enough to guarantee that the voltage drop will be always lower than 1 per 1000. In any case the section of these cables shall not be lower than 6 mm².
5. The burden of the VT must be 50% of higher than the nominal burden at any time.
6. The VT installed in the Main Metering System must be of accuracy class 0.5, complying with the requirements of the IEC 61869-1 and IEC 61869-3 standards, or the standards that replace them; and complying with the requirements of the IEC 61869-1 and IEC 61869-5 standards for capacitive voltage transformers, or the standards that replace them;

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7. The VT installed in the Backup Metering System must be of the accuracy class equivalent or higher to that of the Main Metering System.

Section 3. Determination of Documents to be provided

Article 15. Documents to be Provided for New Meter Installations

Every new Meter Equipment shall be accompanied by:

1. Type Test certification;
2. Routine Test certification.

Only meters with approved Type Test and Routine Test certifications may be installed in the Maldivian system.

Article 16. Documents to be Provided for Existing Meter Installations

For each existing Meter Installation, the Operator of the Distribution Network shall provide MEA with the documentation required by the applicable procedure defined in Chapter [4](#)) of this Metering Scheme.

CHAPTER III. PROCEDURE FOR LV METERING EQUIPMENT

Section 1. Guidelines for location of Meters

Article 17. Type of Connection Points at LV Networks

Depending on the location and function of the Connection Point, three types shall be distinguished:

1. Type 3: Connection Point between the Distribution Network of a Service Provider and Consumer through a three phase link at low voltage level; where,
 - a) Direct Connection
 - b) Indirect Connection (through CT).
2. Type 4: Connection Point between the Distribution Network of a Service Provider and a Consumer through a single phase link at low voltage level;
3. Type 5: Generating Stations
 - Type 5.a) Generating Station with the Connection Point between the Distribution Network of a Service Provider and a Generating Station using a three phase direct link at low voltage level;
 - Type 5.b) Generating Station with the Connection Point between the Distribution Network of a Service Provider and a Generating Station using a three phase indirect link at low voltage level;
 - Type 5.c) Generating Station with the Connection Point between the Distribution Network of a Service Provider and a Generating Station using a single-phase link at low voltage level;
 - Type 5.d) Generating Station exclusively used for self-consumption, where only the outgoing flow generated by the Generating Station shall be measured.

Article 18. Main Metering System and Backup metering System

The following rules apply to the composition of the Metering Systems by Type of Connection Point:

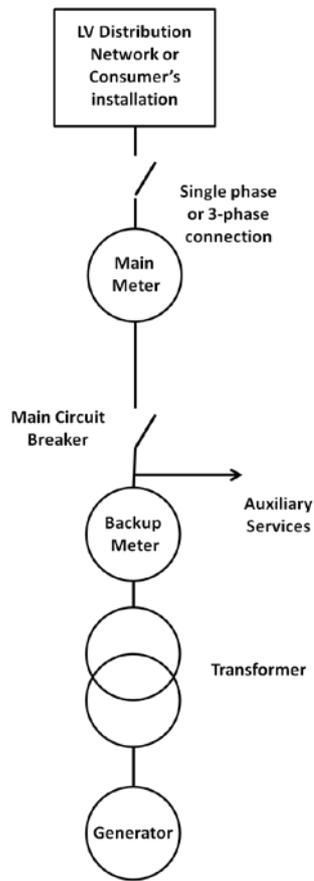
1. Type 3 Connection Points: The Connection Point is at LV and the Metering System shall be composed of a Main Metering System. A Backup Metering System may also be installed in case of Large Consumers.
2. Type 4 Connection Points: The Connection Point is at LV and the Metering System shall be composed of a Main Metering System.
3. Type 5 Connection Points: The Connection Point is at LV and the Metering System shall be composed of a Main Metering System and a Backup Metering System.

Article 19. General Rule for Location of Meters at LV Networks

The following rules apply to the composition of the Metering Systems by Type of Connection Point in compliance with Service Provider Code:

1. Type 3 and Type 4: The location of the Main Metering System shall be downstream the Customer's Connection Point in compliance with Service Provider Code, unless otherwise agreed. The Meter should be located at the border of the Customer's property, either inside or outside the property, and possess permanent permission which will guarantee access for the Operator of the Distribution Network or the MEA's officials.
2. Type 5: The location of the Main Metering System shall be at the Generating Station's Connection Point in compliance with Service Provider Code, unless otherwise agreed and authorized by the MEA. The Main Metering System shall be located downstream the main circuit breaker or disconnecter at the lower voltage side of the connection to the Distribution System, unless otherwise agreed and authorized by MEA. The Backup Metering System shall be located in the outgoing line of the generator, at the HV side of the transformer (if any), unless otherwise agreed and authorized by the MEA. Auxiliary services for the generator, if any, shall be located downstream the Backup Meter but upstream the Main Circuit Breaker. The following schemes for the location of the Meter show the options recommended, depending on the location of the Connection Point:

Figure 2 – Scheme of meter location in the connection of a Generating Station to the Distribution Network or a Consumer's Installation at LV



Section 2. Determination of Meters Technical Requirements

Article 20. Interpretation of Technical Requirements

The technical requirements on Meters and Metering Equipment presented in this section are the minimum technical requirements to be respected in any installation. If a contract between relevant Customers or an agreement between Service Provider and Customer has additional requirements for Metering Systems or requirements in relation to Meters, those requirements shall, so long as they do not prevent compliance with this Metering Scheme, apply in addition to the requirements of this Metering Scheme.

Article 21. Configuration of the Metering System

1. Type 3:

- 1.1. The Metering System shall contain a Meter or more than one Meter that must comply with the requirements of this Metering Scheme.
- 1.2. The Metering System shall contain when necessary metering Current Transformer(s) which are tested and comply with the requirements of this Metering Scheme.
- 1.3. The Meter shall be enclosed in a cabinet or otherwise installed in a manner which shall conform to the manufacturer's stated environmental conditions. The installation shall provide protection from moisture and dust ingress and from physical damage, including vibration complying with at least the degree of protection IP54 of IEC 60529-2004 or the standard that replaces it. In addition, the cabinet or meter must be sealed to prevent unauthorized access. The Metering System shall contain a suitable circuit breaker in the main cable on the supply side of the meter.
- 1.4. Meters and Metering Equipment shall have a minimum service life of 15 years without maintenance from date of manufacture. The maximum service life of Meters and Metering Equipment shall be as specified by the manufacturer of such equipments, but in any case longer than 20 years unless a larger value will be authorized by the MEA.
- 1.5. The whole Metering System, including terminal boxes, CT, Meter, terminals, jumpers, secondary circuit, meter cabinet and communications network must be sealed to prevent illegal access.
- 1.6. Electronic Meters shall be equipped with software capable of read only access.
- 1.7. Connection Points of Type 3 may be or not be a remote metering system. Remotely metered Connection Points shall be equipped with remote metering capability in compliance with the provision of Chapter V.

2. Type 4:

- 2.1. The Metering System shall contain a Meter or more than one Meter that must comply with the requirements of this Metering Scheme.
- 2.2. The Meter shall be enclosed in a cabinet or otherwise installed in a manner which shall conform to the manufacturer's stated environmental conditions. The installation shall provide protection from moisture and dust ingress and from physical damage, including vibration complying with at least the degree of protection IP54 of IEC 60529-2004 or the standard that replaces it. In addition, the cabinet or meter must be sealed to prevent unauthorized access. The Metering System shall contain a suitable breaker or fuse in the main cable on the supply side of the meter.
- 2.3. Meters and Metering Equipment shall have a minimum service life of 15 years without maintenance from date of manufacture. The maximum service life of Meters and Metering Equipment shall be as specified by the manufacturer of such equipments, but in any case longer than 20 years unless a larger value will be authorized by MEA.
- 2.4. The whole Metering System, including terminal boxes, Meter, terminals, jumpers, secondary circuit, meter cabinet and communications network must be sealed to prevent illegal access.
- 2.5. Electronic Meters shall be equipped with software capable of read only access.
- 2.6. Connection Points of Type 4 may be or not be a remote metering system. Remotely metered Connection Points should be equipped with remote metering capability in compliance with the provision of Chapter V.

3. Type 5:

- 3.1. The Metering System shall contain a Meter or more than one Meter that must comply with the requirements of this Metering Scheme.
- 3.2. The Metering System shall contain when necessary metering Current Transformer(s) which are tested and comply with the requirements of this Metering Scheme.

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- 3.3. The Meter shall be enclosed in a cabinet or otherwise installed in a manner which shall conform to the manufacturer's stated environmental conditions. The installation shall provide protection from moisture and dust ingress and from physical damage, including vibration complying with at least the degree of protection IP54 of IEC 60529-2001 or the standard that replaces it. In addition, the cabinet or meter must be sealed to prevent unauthorized access. The Metering System shall contain a suitable breaker or fuse in the main cable on the supply side of the meter.
 - 3.4. Meters and Metering Equipment shall have a minimum service life of 15 years without maintenance from date of manufacture. The maximum service life of Meters and Metering Equipment shall be as specified by the manufacturer of such equipments, but in any case longer than 20 years unless a larger value will be authorized by MEA.
 - 3.5. The whole Metering System, including terminal boxes, CT, Meter, terminals, jumpers, secondary circuit, meter cabinet and communications network must be sealed to prevent illegal access.
 - 3.6. Electronic Meters shall be equipped with software capable of setting different password levels for different users or the administrator.
 - 3.7. Connection Points of Type 5 shall be a remote metering system. Connection Points shall be equipped with remote metering capability in compliance with the provision of Chapter V.

Article 22. Meters Technical Requirements

1. The Meter must be of:
 - a) Type 3a) or 5a): Three phases and four wire type;
 - b) Type 3b) or 5b): three phases and three wire type for three phases metering;
 - c) Type 4 or 5c): One phase and two wire type for one phase metering; or
 - d) Type 5d) three phase and four wire, three phase and three wire or one phase.
2. The Meter must be prepared to install a secured seal that keeps it safe from interference in the metering circuit and setting parameters; connections and cabling in the terminal box must be sealed to prevent interference with their function.
3. The Meter must be of:
 - a) Type 3 and 5: Accuracy class 0.5 for three phases metering, complying with the requirements of IEC 62053-21 standard for electronic meters and the requirements of IEC 62053-11 standard for inductive meters, or the standards that replace them;
 - b) Type 4: Accuracy class 2.0 for one phase inductive metering and 1.0 for one phase electronic metering, complying with the requirements of IEC 62053-21 standard for electronic meters and the requirements of IEC 62053-11 standard for inductive meters, or the standards that replace them. The MEA will determine the cases where inductive metering is allowed to be installed.
4. The Meter must be able to record active energy (kWh).
5. Type 3b) or 5) The Meter must be able to record reactive energy (kVARh).
6. Type 3 and Type 5 meters shall record Maximum Load (kW) in the cases where the applicable tariff includes that component.
7. The Metering System for Type 5 connections shall be capable of separately registering the magnitudes related to the energy injected into the Distribution Network and the energy extracted from the Distribution Network, except for Type 5d) which shall only require the energy generated (outgoing) to be registered. This shall preferably be achieved by means of two separate meters, measuring the energy flowing each way separately. In case the Generating Station is not connected to the Distribution Network only one meter will be required to measure the outgoing flows of the Generating Station.

Article 23. CT technical requirements

1. The CT must have secondary coils exclusively devoted to energy measurement.
2. The CT's secondary nominal current shall be either 1A or 5A.
3. The CT's cables and connections between the CT and the Main or Backup Meter (if any) must be securely sealed to prevent interference with their function.
4. The CT installed in the Metering System must be of accuracy class 0.5, complying with the requirements of IEC 61869-1 and 61869-2 standards or the standards that replace them.

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5. The maximum burden imposed by the cables that connect the current transformers with the metering equipment shall be lower than 4 VA. In any case the section of these cables shall not be lower than 6 mm²

Section 3. Determination of Documents to be provided

Article 24. Documents to be Provided for New Meter Installations

Every new Meter Equipment shall be accompanied by:

- Type Test certification;
- Routine Test certification.

Only meters with approved type and routine tests shall be installed in the Maldivian system.

Article 25. Documents to be Provided for Existing Meter Installations

For each existing Meter Installation, the Operator of the Distribution Network shall provide MEA the documentation required by the applicable procedure defined in Chapter [IV](#) of this Metering Scheme.

CHAPTER IV. INSTALLATION STEPS AND RESPONSIBILITIES

Section 1. Responsibilities of Investment and Installation

Article 26. Responsibilities of Investment and Installation

The responsibilities in the investment (covering the costs) and installation (including replacement) of Metering Systems by type of Connection Point are:

1. Type 1, 2, 3 and 5 Connection Points
 - 1.1. The Operator of the Distribution Network shall be responsible for coordinating with the Customer/Generator the test, programming and connection of the Metering System, ensure the Metering System meets the technical requirements and to procure and install the Data Collection System (when required) in accordance with the provisions of the Service Provider Code and this Metering Scheme.
 - 1.2. The Consumer or Generator shall be responsible for procuring and installing the Metering System as stipulated in the Service Provider Code and in this Metering Scheme.
2. Type 4 Connection Points
 - 2.1. The Service Provider shall be responsible for the procurement and the installation of the Meter and the connection of the Metering System as stipulated in the Service Provider Code and in this Metering Scheme
 - 2.2. The Customer shall be responsible for procuring and installing all remaining elements (box, fuse or breaker, cabling, etc) as stipulated in the Service Provider Code and in this Metering Scheme before the connection to the network.

Article 27. Responsibilities of Management and Operation

1. The Agent Responsible is the party that provides and owns the Metering System and shall be responsible for managing, operating and testing as well as carrying out the routine maintenance of the Metering System.
2. The management, operation, testing and routine maintenance of the Metering System can be transferred to the Service Provider if so agreed between the Service Provider and the party that owns the Metering System. In this case the Service Provider shall be granted the required access to perform such activities.
3. In case it is necessary to remove the Metering System or any of its components to perform repair or maintenance actions, the Agent Responsible shall provide a replacement Metering System and coordinate with the Operator of the Distribution Network if necessary to take off the installed Metering System, install the replacement one and after repair and maintenance was conducted, to install back wherever required the original Metering System.
4. Regardless of the agent that performs the management and operation activities, the installation and operation will be subject to inspection by the MEA.
5. The Operator of the Distribution Network shall communicate with Customers connected to its network to coordinate the management, operation, maintenance and eventual replacement of the Metering System to ensure it works accurately, in a stable, reliable and secure way.
6. The Operator of the Distribution Network, or Agent Responsible, shall coordinate and carry out regular verification, testing status of operation of the Metering System and notifying the relevant parties in case any abnormality or problem related to the Metering System is detected.

Article 28. Requirements for Meter Reading

1. The Operator of the Distribution Network shall be responsible for carrying out reading of the metered values of energy injected into or extracted from the Distribution System by each Customer as registered by the Metering System associated to such Customer as per Article 35 of this Metering Scheme.
2. Meter reading shall be manually (on the field) for such Metering Systems not equipped with remote metering capability and preferably remotely if the required equipment is installed and in operation.
3. Meter reading shall be performed in compliance with provisions of the Service Provider Code and the Metering Scheme.

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4. In case the reading obtained from the Metering System is questioned, either by the Service Provider itself, the Customer that presents a claim or the MEA, the Service Provider will be responsible for estimating the use of the connection performed by the Customer.

Article 29. Responsibilities of Organizing and Implementation

1. The MEA shall be responsible for organizing, building and enforcing the procedures of delivering, receiving and operating a Metering System.
2. The implementation of the Metering System defined in the Service Provider Code and in this Metering Scheme will be subject to the durations, and implementation considerations stipulated in the Service Provider Code.
3. Exemptions to the implementation of the Metering System in accordance with the stipulations of the Service Provider Code and this Metering Scheme may be requested by the Customer.

Section 2. Certification and Tests

Article 30. Certification of New Installations

1. Type Test Certification. Every Meter Type (model) of meter intended to be used in a Distribution System shall be certified (type-tested) by a certified metering and calibration laboratory or any other body as may be approved by the MEA to perform this Type Tests, to confirm its specific characteristics and to prove that it complies with the requirements of relevant standards and accuracy class as outlined in the Service Provider Code and the Metering Scheme. The MEA shall permanently maintain registers with the list of certified Meter Types.
2. Routine Test. Prior to the installation, any Meter or Metering Installation shall be:
 - 2.1. Submitted by the owner of the Meter to the Certifying Agency, which has been accredited by the MEA to perform Routine Tests and certification; or
 - 2.2. Received by the owner of the Meter directly from a manufacturer with a test certificate endorsed by the Certifying Agency accredited by MEA to endorse manufacturer's certifications.
3. Certifications of Meters or Metering Equipment issued by a Certifying Agency, shall be issued for a pre-definite period of time, which in no case will exceed twenty (20) years, and shall clearly indicate the minimum required calibration tests and their frequency to maintain its validity.
4. Certification shall be confirmed by the attachment of a seal or certification sticker put by the Certifying Agency for the individual Meters and Metering Equipment. Certification of a Metering Installation will be valid as long as the certifications of all components of the Metering Installation remain valid.
5. Test certificates shall be retained by the Operator of the Distribution Network whilst the Metering Equipment is in use, and for Metering Equipment that is no longer in use, for a minimum period of five (5) years after the Metering Equipment has been de-commissioned and rendered un-useable or scrapped. The Operator of the Distribution Network shall submit copies of these certificates upon notice from the MEA.
6. The MEA shall permanently maintain a register of authorized Certifying Agency, to perform either:
 - 6.1. Type Tests certification
 - 6.2. Routine Tests certification
 - 6.3. Endorsement of manufacturer's certifications
 - 6.4. Calibration Test certifications
7. On request from any Customer or Service Provider, the MEA shall provide a copy of such register to such Customer or Service Provider.

Article 31. Re-certification

1. Before the certification of a Metering Installation, or of any of its components, has expired, the Metering Installation should require re-certification, by Certifying Agency accredited by the MEA to perform Calibration Tests certifications.
2. Certification of the overall Metering Installation expires when the individual certification of any one of its components expires.

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3. Any such component would be recertified by means of removal and testing offline, testing online, or replacement, as appropriate. If any part of the wiring of the Metering Installation is modified, or if additional components are connected to the Metering Installation (other than testing or monitoring equipment temporarily connected via the test block), the certification of the Metering Installation should be deemed to be cancelled until the tests and checks prescribed by the Metering Schemes have been satisfactorily carried out by the Certifying Agency.

Article 32. Faulty Metering Equipment

1. A Metering System shall be considered faulty and not in compliance with this Metering Scheme if it is determined that any part of that Metering System does not comply with the provisions of this Metering Scheme.
2. If a Metering System fault occurs, the Operator of the Distribution Network shall provide Metering Services to repair or replace the Metering System as soon as is reasonably practicable and in any event within three (3) working days of the Operator of the Distribution Network discovering that the fault exists.
3. The Customer shall use Metering Equipment in a safe and prudent manner and shall take due care to avoid damage. The Customer shall notify the Operator of the Distribution Network of any damage to the Metering Equipment, however caused.
4. The Operator of the Distribution Network shall ensure that suitable data is obtained or estimated for the period of time commencing when a Meter or Metering Equipment becomes faulty until the completion of the repair or replacement.
5. The Operator of the Distribution Network shall record all relevant Meter parameters for a replacement Meter in that Metering System.

Article 33. Periodical verification

Each Metering System shall be verified by the Agent Responsible at least:

1. Once every two years for Metering Systems at MV
2. Once every three years for three phased Metering Systems at LV; and
3. Once every five years for single phase Metering Systems at LV.

Article 34. Test failure

1. Where, following a test, the accuracy of the Metering System is shown not to comply with the requirements of this Metering Scheme, the certification issued for the Meter or Metering Equipment which has failed the test will automatically expire, and a new one will be required.
2. The owner will at its own cost:
 - 2.1. Consult with the Operator of the Distribution Network in regard to the errors found and the possible duration of the existence of the errors; and
 - 2.2. make repairs or replacements to the Metering System to restore the accuracy to the required standards.
3. Where a Metering System is found to be faulty, or non-compliant or outside the accuracy of metering, then the Operator of Distribution Network and all Customers that have an interest in this Metering System shall also be informed of the failure. Such notification shall include the plans by the owner to restore the Metering System to compliance with this Metering Scheme and the procedures to be followed to determine any estimated readings during the period, including any revised readings that were provided during the period that the Metering System was faulty or non-compliant.
4. In the event that a Customer cannot or does not comply with its obligations to repair, adjust or replace or renew any defective component, the Operator of the Distribution Network shall have the right to carry out such repair, adjustment, replacement or renewal and to recover its own costs, expenses and profit thereon from such Customer forthwith on demand (such profit to be based on a reasonable rate of return which shall be approved by the MEA).

Section 3. Data management

Article 35. Meter Reading

1. The Operator of the Distribution Network shall schedule a monthly reading for all manually read meters and daily reading for remote meters;
2. For kilowatt-hour meters, the Operator of the Distribution Network shall verify at each meter reading that the Meter identification number on the Meter matches the Meter identification number on the Meter reading schedule.
3. The Operator of the Distribution Network shall record the following data:
 - 3.1. The Meter identification number;
 - 3.2. The Meter reading and read date at the beginning of the Meter reading period;
 - 3.3. The Meter reading and read date at the end of the Meter reading period;
 - 3.4. The cumulative Active Energy (kWh) recorded during the Meter reading period;
 - 3.5. For Connection Points of Type 1, Type 2, Type 3 and Type 5 the cumulative Reactive Energy (kVARh), the maximum Active Power and the maximum Reactive Power recorded during the Meter reading period; and
 - 3.6. Details of any Meter alarms that were recorded during the period (e.g., system outages, VT failure).
 - 3.7. For Connection Points of Type 1, Type 2 and Type 5 in case it is an electronic meter, the load profile shall be recorded between 5 minutes to 1 hour of the Meter reading period.
4. The Operator of the Distribution Network shall be responsible for performing the reading of Meters in the interface between the Distribution Network and the Consumer and the reading of Meters in the interface between the Distribution Network and the Generating Station.

Article 36. Data Management

The Operator of the Distribution Network shall:

1. Maintain a metering data registry that contains usage data for each Customer and data required for settlement purposes in respect of each Metering System;
2. Validate metering data for each Metering System;
3. Estimate usage when Meter readings are not available, inaccurate, or otherwise not suitable for settlement purposes; the procedure for estimation shall be proposed by the Service Provider and approved by MEA prior to its implementation;
4. Apply adjustments to metering data to account for system losses and unaccounted energy as per Article 37;
5. Aggregate metering data for settlement and loss calculation purposes; and
6. Use reasonable endeavours to maintain the security and confidentiality of the metering data.
7. Establish and maintain a register that contains at least the following information for each Metering System:
 - 7.1. A unique identifier assigned by the Operator of the Distribution Network to the Metering System cross-referenced to the location of the Metering System and cross referenced to the Customer's account;
 - 7.2. The date of installation of the Metering System;
 - 7.3. The functionality of the Meter and the unit of measurement used to measure Energy flowing through the Metering System (e.g., kWh meter, kVARh meter);
 - 7.4. The Meter Type installed;
 - 7.5. Identification of the ancillary equipment;
 - 7.6. Any site-specific adjustment factors to be applied, including a cross reference to the unique identifier of the Metering System;
 - 7.7. The existence of redundancy and sources of backup metering data, where required by the Service Provider Code or this Metering Scheme, and identification of the meters designated as the Main Meter and as the Backup Meter;
 - 7.8. Data for each Meter following completion of the validation and estimation procedures;
 - 7.9. Billing data for each Meter following completion of adjustments for losses and unaccounted for energy; and
 - 7.10. The historical data covering a period of not less than twelve months which shall be immediately accessible in electronic form.

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8. Report any or all of the collected data to the MEA in electronic form upon request.

Article 37. Data Validation and Loss Adjustment

For correct reading and validation of the data from Meter reading, the Operator of the Distribution Network shall:

1. Have in place data validation procedures and loss adjustment calculation methodologies approved by MEA;
2. Where necessary, determine site-specific loss adjustment factors for each Metering System;
3. Multiply each valid reading by the appropriate loss adjustment factor to produce loss adjusted production or consumption; and
4. Shall maintain both unadjusted and loss-adjusted values in the metering data registry in respect of each Metering System.

CHAPTER V. AUTOMATIC METER READING

Article 38. Automatic Meter Reading Registering

1. The MEA shall define a frequency of data reading (daily, weekly, or monthly)
2. With respect to the energy data, the metering device should meter and register cumulative readings into the memory of the metering device for:
 - 2.1. Connection Point of Type 1, Type 2 and Type 5 the meter must be capable of registering data in intervals going from 5 min up to 1 hour.
 - 2.2. Connection Point of Type 3 and Type 4 shall be equipped with metering devices able to perform data registering daily.
3. Customers are entitled to acquire their own hourly metering equipment.

Article 39. Remote Metering Equipment and System

1. The Operator of the Distribution Network shall specify the type of equipment to be used for communication with remote meters.
2. The Operator of the Distribution Network shall conduct such tests as it deems necessary to verify production or consumption recorded at each Metering Point.
3. The recorded data and the data transmitted to the Data Collection System of the Operator of the Distribution Network shall be encoded to avoid illegal access and/or manipulation.
4. The Meter or the Data Register, as the case may be, shall have an adequate communication channel, either through serial port RS-232, opto-couplers according IEC Standard 62.056-21, or any other system the MEA may authorize. This communication channel will permit automatic downloading, including remote interrogation and batch downloading, by the Data Collection System.
5. The Operator of the Distribution Network shall define the communication protocol to be used in remotely interrogating Meters, which shall be unique and of standard type in order to reduce the costs that shall be borne by the Customers. The selected communication protocol shall be approved by the MEA and communicated to the involved Customers at least six (6) month before remote interrogation will start.
6. Time synchronization of Meters and Data Registers, as the case may be, shall be done preferably through GPRS/GSM systems. Other synchronization systems may be used provided that they comply with the requirements regarding accuracy and security and do not distort the calculations of the energy balances. Such other methods shall be authorized by the MEA.
7. The metering equipment must be able to receive load control commands sent via the data network, and it must have at least one control device available for load control, and this control device may not be reserved for any other use.
8. The reading system must read from the meter new and missing data registered by the meter.
9. The clock of the metering device is tested against the time of the reading system in connection with every reading and, when necessary, the clock of the metering device must be set to the correct time after reading. GPS time will be the valid time for all systems and devices.

Article 40. Responsibilities related to metering

1. The Operator of the Distribution Network is responsible for arranging for metering, reading the metering data, verifying the validity of the data, transmission and reporting of metering data. The Operator of the Distribution Network is also responsible for the metering equipment, including its data transmission connections.
2. The Operator of the Distribution Network also responsible for the data protection related to meter reading and the recording and transmission of metering data. Hourly data must be handled in the same way as personal information all the way from the metering device. The Customer and the body authorized by the Customer are entitled to have access to the metering data. The electricity market participants are given the information they need, e.g. for meeting the balance responsibility and for billing.

Article 41. The reading system and data transmission connection

1. The data transmission connection must be a two-way system.
2. It is recommended that the data transmission connection of a metering device is selected so that data transmission is successful at all times of the day and night.

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3. The Operator of the Distribution Network must be able to read the data registered by the metering device at any moment. Moreover, it should be taken into account in the selection of data transmission connections and systems that the meter is capable of transmitting, e.g. alarms to the Operator of Distribution Network's system and controls from the Operator of Distribution Network's system to the metering device with the desired response time.
 4. The Operator of Distribution Network should set a minimum level for successful reading.
 5. The requirements may be set separately for data transmission and the reading system. In terms of data transmission, any technical restrictions related to the selected data transmission technology and the life cycle of the data transmission channel should be taken into account.
 6. The data transmission protocol must be based on a public standard (e.g. DLMS/COSEM).
 7. Openness should be a requirement for the systems so that metering devices of different suppliers can be matched to the same systems.

Article 42. Information security

1. The remote reading system must have comprehensive information security. Information security consists of e.g. personnel security, document security (backup and safe copying), physical security, hardware security, software security, telecommunications security and operating security (malware protection).
2. It must be ensured that access to the data by unauthorized persons is prevented. The data transmission protocol must ensure that no data will be altered in data transmission without it being detected in the reading system. This error detection method must be public.
3. With respect to the transmission and recording of metering data, it must be ensured that access to the data by unauthorised persons is blocked. Remote reading and programming of the metering device should only be possible by a body authorised by the MEA.