ANNEXURE-1

METERING COMMUNICATION & DATA ACQUISITION REQUIREMENTS (MCDAR) FOR INTRA-STATE POWER SYSTEM OF UTTARAKHAND

MCDAR FOR INTRA-STATE POWER SYSTEM OF UTTARAKHAND
REVISIONS SUMMARY

REVISION NUMBER	DATE ISSUED	SECTIONS REVISED

Contents

MCDAR FOR INTRA-STATE POWER SYSTEM OF UTTARAKHAND

1. Introduction

1.1 These requirements may be called Metering Communication & Data Acquisition Requirements (**MCDAR) for Intra-State Power System of Uttarakhand** and shall come into force immediately on approval of the Commission.

1.2 MCDAR prescribes a uniform policy in respect of electricity metering in the Intra- State Power System and provide the minimum requirements and standards for installation and operation of meters for commercial and operational purposes for the State Transmission Utility, Transmission Licensees, Distribution Licensees, Generators and Users connected to Intra-State Power System.

1.3 This MCDAR has been prepared by the State Transmission Utility in pursuance of Chapter 8, Metering Code, Regulation 8.1 of the UERC (State Grid Code) Regulations, 2016 and forms the integral part of the UERC (State Grid Code) Regulations, 2016.

2. Objective

2.1 The MCDAR provides type, standards ownership, location, accuracy class, installation, operation, testing and maintenance, access, sealing, safety, meter reading and recording, meter failure or discrepancies, anti-tampering features, quality assurance, error compensation, and periodical testing of meters, additional meters, and adoption of new technologies in respect of following meters for correct accounting, billing and audit of electricity:

(i) Interface meters for Intra-State Power system.

(ii) Meters for Consumers connected to Intra-State Power System.

(iii) Meters for energy accounting and audit in Intra-State Power System.

(iv) Meter for generators directly connected to intra-State Power System.

2.2 The objective of the MCDAR is to define **minimum** acceptable metering standards for the purpose of accounting, commercial billing, and settlement of electrical energy in Intra- State Power system and also to provide system information for operation of State power system in economical and efficient manner.

3. Scope and Applicability

3.1 This MCDAR for Intra-State Power System shall apply to following in the State of Uttarakhand:

1. Transmission Licensees.
2. Generating Stations connected to Intra-State Transmission System or Distribution Network.
3. Distribution Licensees connected with Intra-State Transmission System including Deemed Distribution Licensees connected to the network.
4. Consumers of Distribution Licensee connected to Intra-State Transmission System or Distribution Network.
5. Transmission System Users connected to Intra-State Transmission System.
6. Open access customers availing open access on Intra-State Transmission System or Distribution network.
7. Captive Generators connected to Intra-State Transmission System.
8. Electricity Traders.
9. Any other consumer not covered in above points 1 to 8 and connected directly or indirectly with Intra State Power System of Uttarakhand.

The provisions for installation and operation of meters in accordance with this MCDAR shall be applicable from the date of approval of Commission.

4. Reference Standards

4.1 All interface meter, consumer meters and energy accounting and audit meters shall comply with the relevant standards of Bureau of Indian Standards (BIS). If BIS Standards are not available for a particular equipment or material, the relevant International Electro-Technical Commission (IEC) Standards, or any other equivalent Standard shall be followed.

4.2 Whenever an IEC Standard or any equivalent Standard is followed, necessary corrections or modifications shall be made for nominal system frequency and nominal system voltage, prevailing in India before actual adoption of the said Standard. Necessary corrections or modifications for ambient temperature and humidity shall be made as per the range specified in these Requirements at clause No. 12.

4.3 The following Indian Standards (amended up to date) shall be applicable as relevant to meters and *associated* equipment:

Sr. No.	Standard Number	Standard Title
i.	IS 16444 (Part-1): 2015	A.C. Static Direct Connected Watthour Smart Meter- Class1 and Class 2
ii.	IS 16444 (Part 2): 2017	A.C. Static Transformer Operated Watthour and VAR-Hour Smart Meters, Class 0.2S, Class 0.5S and 1S.
iii.	IS 2705	Indian Standard for Current Transformers
iv.	IS 3156	Indian Standard for Voltage Transformers
v.	IS 9348	Indian Standard for Coupling Capacitors and Capacitor Divider
vi.	IS 5547	Indian Standard for Capacitor Voltage Transformer
vii.	CBIP Technical Report – 88	Specification for AC Static Electrical Energy Meters
viii.	CBIP–88 Guidelines	Latest Amendments for immunity against external factors
ix.	CBIP Technical Report - 111	Specification for Common Meter Reading Instrument
x.	IS 9000	Basic Environmental Testing Procedures for Electronic & Electrical Items
xi.	IS 12063	Indian Standard for classification of degrees of protection. (IP)
xii.	IS15707:2006	Testing, Evaluation, Installation and Maintenance of AC Electricity Meters
xiii	IS-15959:2011	Data Exchange for Electricity Meter Reading Tariff & Load Control-Companion Specification
xiv-	IEEE 830-1998	IEEE Recommended Practice for Software Requirements Specifications

4.4 The following International Standards (amended up to date) can be applicable as relevant to meters and associated equipment not complying to Indian Standards or not manufactured in India:

Sr. No.	Standard Number	Standard Title
i.	IEC 687	Specification for AC Static Watt-hour Meters for Active Energy (Classes 0.2S and 0.5S)
ii.	IEC 62053-22	AC Static Watt-hour meters for Active Energy, Class 0.2S
iii.	IEC 62053-23	AC Static VARh meters for Reactive Energy, Class 0.5
iv.	IEC 62052-11	Electricity metering equipment (AC)-General requirements, tests and test conditions –Part 11: Metering equipment
v.	IEC 62053-21	Electricity metering equipment (AC)-r Particular requirements -art21: Static meters for active energy (classes 1 and 2)
vi.	IEC 62056	Standards for Electricity metering data exchange
vii	IEC 1036	Alternating Current Static Watt-hour Meters for Active Energy (Classes 1 & 2)
viii	IEC 1268	Alternating Current Static Watt-hour Meters for Reactive Energy (Classes 2 & 3)

4.5 Standards for installation and operation of meters

The meters and metering equipment shall conform to the requirements of the CEA (Installation & Operations of Meters) Regulations 2006 dated 17th March 2007, (including amendments) and standards prescribed there under.

5. Definitions

5.1 In the MCDAR for Intra-State Power System of Uttarakhand, the following words and expressions shall, unless the subject matter or context otherwise requires or is inconsistent therewith, bear the meaning given hereunder:

1) **'Act'** means the Electricity Act, 2003;

2) **'Accredited Test Laboratory'** means a test laboratory accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL);

3) **'Active Energy'** means the electricity supplied or consumed during a time interval, being the integral of Active Power with respect to time, measured in the units of 'Watt–hours' or standard multiples thereof. One 'kilowatt – hour' (kWh) is one unit;

4) **'Active Power'** means the electrical power, being the product of root mean square (rms) voltage, root mean square (rms) current and cosine of the phase angle between the voltage and current vectors and measured in units of 'Watt' (W) or in standard multiples thereof;

5) **'Advanced Metering Infrastructure'** is an integrated system of smart meters, communication network and data management system that enables two way communication between the utilities and energy meters, and the functional block of Advanced Metering Infrastructure typically include Head end system, Wide area network, Neighborhood area network, Data concentrator unit and Home area network;

6) **'Advanced Metering Infrastructure Service Provider'** is a person appointed by the distribution licensee, for owning, operating, and maintaining Advanced Metering Infrastructure or a part of the Advanced Metering Infrastructure, till its transfer to licensee;

7) **'Appropriate Load Despatch Centre'** means 'National Load Despatch Centre' (NLDC) or 'Regional Load Despatch Centre' (RLDC) or the 'State Load Despatch Centre' (SLDC) which includes any 'Area Load Despatch Centre' (ALDC) attached to

SLDC as the case may be;

8) **'Appropriate Transmission Utility'** means the 'Central Transmission Utility' (CTU) or the 'State Transmission Utility' (STU), as the case may be;

9) 'Availability **Based Tariff (ABT)'** means a tariff structure based on availability of generating units and having components viz, Capacity Charges (CC), Energy Charges (EC) or Variable Charges (VC) and charges for Unscheduled Interchange (UI);

10) **'Buyer'** means any generating company or licensee or consumer whose system receives electricity from the system of generating company or licensee;

11) **'Check** Meter' means a meter, which shall be connected to the same core of the Instrument Transformer to which main meter is connected and shall be used for accounting and billing of electricity in case of failure of main meter;

12) 'Commission' means Uttarakhand Electricity Regulatory Commission (UERC)

13) **'Consumer Meter'** means a meter used for accounting and billing of electricity supplied to or from the consumers but excluding those consumers covered under Interface Meters;

14) **'Correct Meter'** means a meter, complying the standards as specified in these requirements at clause No. 12 & 15;

15) **'Energy Accounting and Audit Meters'** means meters used for accounting of the electricity to various segments of electrical system so as to carry out further analysis to determine the consumption and loss of energy therein over a specified time period;

16) **'Instrument Transformer'** means the 'Current Transformer' (CT) or Current Transformer (CT) and Capacitor Voltage Transformer (CVT) or Current Transformer (CT) and Inductive Voltage Transformer (IVT);

17) **'Interface Meter'** means a meter used for accounting and billing of electricity, connected at the point of interconnection between electrical system of generating company, licensee and consumers, directly connected to the Inter-State Transmission System or Intra-State Transmission System or Distribution System and who have been permitted open access by the Appropriate Commission;

18) **'Main Meter'** means a meter, which would primarily be used for accounting and

billing of electricity;

19) **'Meter'** means a device suitable for measuring, indicating and recording the conveyance of electricity or any other quantity related with electrical system and shall include, whenever applicable, other equipment such as Instrument Transformer necessary for the purpose of measurement and also means Correct Meter if it complies with the standards as specified in the Schedule to these regulations;

20) **'Power Factor'** means the cosine of the electrical angle between the voltage and current vectors in an AC electrical circuit;

21) **'Reactive Energy'** means, the integral of Reactive Power with respect to time and measured in the units of 'Volt-Ampere hours reactive (VARh) or in standard multiples thereof;

22) **'Reactive Power'** means the product of root mean square (rms) voltage, root mean square (rms) current and the sine of the electrical phase angle between the voltage complex or and current complex or, measured in 'Volt – ampere reactive' (VAr) and in standard multiples thereof;

23) **'Smart Meter'** means a meter as specified in IS 16444 and as amended from time to time;

24) **'Special Energy Meters'** means such meters, of not less than 0.2S class accuracy, as are capable of:

    i. Recording time-differentiated measurements of active energy and voltage differentiated measurement of reactive energy, at intervals of fifteen (15) minutes;

    ii. Storing such measurements for not less than forty-five (45) days and;

    iii. Communication of such measurements at such intervals as maybe required by the State Load Despatch Centre for balancing and settlement of energy transactions;

25) **'Standards'** means Standards on Installation and Operation of Meters given in these requirements unless otherwise any other standard specifically referred;

26) **'Standby Meter'** means a meter connected to Instrument Transformer, other than those used for main meter and check meter and shall be used for accounting and billing of electricity in case of failure of both main meter and check meter;

27) **'Supplier'** means any generating company or licensee from whose system electricity flows into the system of another generating company or licensee or consumer.

5.2 All other words and expressions used and not defined herein have the meanings respectively assigned to them in the Act, the UERC (State Grid Code) Regulations, 2016 or Indian Electricity Grid Code (IEGC) and amendments thereof.

6. Type of meters

6.1 All new Interface meters and Energy Accounting and Audit Meters shall be of static type and shall have automatic remote meter reading facility.

6.2 The meters not complying with these requirements shall be replaced by the State Transmission Utility (STU) or concerned licensee/generating company as the case may be within a period of six months from the date of coming of these requirements in effect.

6.3 The Static meters, related hardware, the communication system and the related software shall be such that progressive up-gradation to the newer technologies for improved facilities of data transfer, data security, user friendliness etc. shall be possible without undergoing major replacements.

6.4 All consumers in areas with communication network, shall be supplied electricity with Smart Meters working in prepayment mode, conforming to relevant IS, within the timelines as specified by the Central Government/State Government/State Commission.

Provided that all consumer connections having current carrying capacity beyond that specified in relevant IS, shall be provided with meters having automatic remote meter reading facility or Smart Meters as per relevant IS.

Provided further that in areas which do not have communication network, installation of prepayment meters, conforming to relevant IS, shall be allowed by respective State Electricity Regulatory Commission;

7. Ownership

7.1 Interface meters

7.1.1 All interface meters installed at the points of interconnection with Intra-State Transmission System excluding meters installed at the points of interconnection with Inter-State Transmission System (ISTS) for the purpose of electricity accounting and billing shall be owned by STU.

7.1.2 Interface Meters installed at the points of interconnection with Inter-State Transmission

System (ISTS) for the purpose of electricity accounting and billing shall be owned by CTU.

7.1.3 All interface meters installed at the points of inter connection between the two licensees excluding those covered under sub-clauses (6.1.1) and (6.1.2) above for the purpose of electricity accounting and billing shall be owned by respective licensee of each end.

7.1.4 All interface meters installed at the points of inter connection for the purpose of electricity accounting and billing not covered under above sub-clauses shall be owned by supplier of electricity and in case of Open Access Customers ownership shall be as per Uttarakhand Electricity Regulatory Commission (Terms and Conditions of Intra-State Open Access) Regulations, 2015 and amendments thereof.

7.1.5 Pictorial representation of ownership of meters for Intra-State Power System has been depicted at **Annexure-A.**

7.2 Consumer Meters

a) Consumer meters shall generally be owned by the licensee:

Provided that in case the licensee has engaged the services of Advanced Metering Infrastructure Service Provider to provide Advanced Metering Infrastructure services for an advanced Metering Infrastructure project area, the ownership of meters shall remain with Advanced Metering Infrastructure Service Provider during the contract period.

b) If any consumer opts to purchase a meter, the same may be purchased by him as per the technical specifications laid down by the Distribution licensee in compliance with these regulations and meter purchased by the consumer shall be tested, installed and sealed by the distribution licensee:

Provided that the consumer shall claim the meter purchased by him as his asset only after it is permanently removed from the system of the licensee.

7.3 Energy accounting and audit meters shall be owned by the Generating Company or licensee, as the case may be.

7.4 Meters of EHV consumer shall be owned by the Distribution licensee or owned by the party as provided in the Agreement.

8. Access to meter

The owner of the premises where, the meter is installed shall provide access to the authorized

representative(s) of the distribution or transmission licensee for installation, testing, commissioning, reading, and recording and maintenance of meters.

9. Safety of meters

9.1 The supplier or buyer in whose premises the interface meters are installed shall be responsible for their safety.

9.2 The consumer shall take precautions for the safety of the consumer meter installed in his premises belonging to the licensee.

9.3 The generating company or the licensee who owns the energy accounting and audit meters shall be responsible for its safety.

9.4 Distribution licensee shall be responsible for the safety of the Consumer Meter located-outside the premises of the consumer and the consumer shall be responsible for the safety of the in-home display unit installed by the distribution licensee in consumer premises.

10. Location of meters

10.1 The location of interface meters, consumer meters, energy accounting and audit meter, and meters of EHV consumer shall be as given in Table-1.

Table-1

Metering Points	Main Meter	Check Meter	Standby Meter	Energy accounting and audit meter
	MMIT	CMIT	SMIT	MEAA
At all Generating Stations				
Generation-Transmission/Distribution (G-T/D) interface points	On all outgoing feeders including bus sectionalizer or tie line between two stages of generating stations having different tariffs or different ownership or both.	On all outgoing feeders including bus sectionalizer or tie line between two stages of generating stations having different tariffs or different ownership or both.	1. High Voltage (HV) Side of Generator Transformer (GT). 2. High Voltage (HV) Side of all Station Auxiliary Transformers (SAT).	1. At a point after the Generator Stator Terminal and before the tap-off to the Unit Auxiliary Transformer(s). 2. LVside of all UAT and SAT. 3. On all High Tension Motor Feeders.
Interface points between Transmission – Distribution.				
	At both ends of the lines between substations of two different licensees: Provided that meters at both ends shall be considered as main meters for respective licensees.	-	1. There shall be no separate standby meter. 2. Meter installed at other end of the line in case of two different licensees shall work as standby meter. 3. LV side of EHV Transformer at EHV substation of Transmission licensees	**Transmission System**: All incoming and outgoing feeders (if the interface meters do not exist) **Distribution System:** a) All incoming feeders (3.3kV and above) b) All outgoing feeders (3.3kV and above) c) Sub-station transformer including distribution transformer-Licensee may provide the meter

Metering Points	Main Meter	Check Meter	Standby Meter	Energy accounting and audit meter
	MMIT	CMIT	SMIT	MEAA
				on primary or secondary side or both side depending upon the requirement for energy accounting and audit.
Interface points between two Transmission Licensees				
	At both ends of the line between the substations of the same or different licensee;	-	1. There shall be no separate standby meter. Meter installed at other end of the line shall work as standby meter.	All incoming and outgoing feeders (if the interface meters do not exist)-
Interconnecting Transformer				
At generating station or at sub- station/receiving station of Transmission licensee, connected to the IaSTS.	High Voltage side of ICT	-	Low Voltage side of the ICT (connected to the IaSTS).	-
HV/EHV Consumers				
HV/EHV Consumers	On outgoing feeder at the sub-station of the Licensee. **OR** At the consumer premises at the connection point of the feeders as per Distribution code and amendments thereof.	To be located at the same location as where Main Meter is located on the same Instrument transformer cores.	-	-
Open Access Customers				
Open Access Customers	At the Open Access Customer end.	To be located at the same location as where Main Meter is located on the same Instrument transformer cores.	-	-
LT Consumers	Inside or outside of the premises of the consumer at such a location that the readings are accessible.	To be installed on the complaint of the consumer in the series with the Main Meter		

Provided that in case open access consumers are connected at L.T. voltage level, direct connected Smart meters shall be used as per IS.

Provided further that all feeders and distribution transformers shall be provided with meters having automatic remote meter reading facility or Smart Meters as per relevant IS, as per the timelines specified by the central Government/State Government/State Commission:

Provided further that distribution transformer level energy accounting data shall be uploaded by the distribution licensees on quarterly basis on National Power Portal as per the format prescribed in Bureau of Energy Efficiency (Manner and Intervals for conduct of Energy Audit in electricity distribution companies) Regulations, 2021.

10.2 The consumer meter shall be installed by the licensee either at the consumer premises or

outside the consumer premises:

Provided that where the licensee installs the consumer meter outside the premise of the consumer then the licensee on a request from consumer shall provide in home display unit at the premises of the consumer for his information to indicate the electricity consumed by the consumer

10.3 The location of meter and height of meter display from the floor shall be as per IS 15707 and as amended time to time.

10.4 **Outdoor installations: - T**he meter shall be protected by appropriate enclosure of level of protection as specified in the IS 15707 and as amended from time to time.

10.5 In case of renewable energy generating station, the meter shall be installed at the inverter Alternating Current (AC) output terminals

11. Installation of meters

11.1 State Transmission Utility (STU), Generating Company or Transmission / Distribution licensee, as the case may be, shall examine, test, and regulate all meters before installation and only correct meters shall be installed.

11.2 The meter shall be installed at locations, which are easily accessible for installation, testing, commissioning, reading, recording and maintenance. The place of installation of meter shall be such that minimum inconvenience and disruptions are caused to the site owners and the concerned organizations.

11.3 In case of single-phase meters, the consumer shall ensure that there is no common neutral or phase or looping of neutral or phase of two or more consumers on consumer's side wiring. If such common neutral or phase or looping of neutral or phase comes to the notice of the licensee, it shall suitably inform the consumer through installation report or regular electricity bills or meter test report or SMS as applicable, as soon as it comes to it's notice and the same shall be rectified by the consumer within 15 days from such notice by the licensee.

11.4 Consumer shall install the Earth Leakage Protective Device (ELPD) in accordance with the provisions of the rules or regulations in this regard.

11.5 If the earth leakage indication is displayed in the meter, the licensees shall suitably inform the consumer through installation report or regular electricity bills or meter test report or SMS as applicable, as soon as it comes to it's notice and the same shall be rectified by the

consumer within 15 days from the notice by the licensee.

11.6 In case instrument Transformer form part of the meter, the meter shall be installed as near as possible to the Instrument Transformer to reduce the potential drop in the secondary leads.

12. Specification and Accuracy limits.

12.1 Functional requirements

12.1.1 Interface Meters:

a) The Interface Meters shall be three phase four wire static type, composite meters, self-contained devices for measurement of active and reactive energy, and certain other parameters as described in the following paragraphs:

Provided that, the meters shall be suitable for being connected directly to voltage transformer (VTs) having a rated secondary line-to-line voltage of 110V and 220V/110V AC/DC automatically transferable auxiliary power supply, and to current transformers (CTs) having a rated secondary current of 1A or 5A:

Provided further that, the reference frequency shall be 50Hz.

b) The meters shall have a non-volatile memory capable of storing data for a period of at least last 45 days and shall be able to measure following parameters in the manner specified, in addition to those specified in the relevant Indian Standards:

(i) Average frequency for each successive time block up to 2 decimal truncation;

(ii) Net Wh transmittal during each successive time block up to two decimal, with plus sign for active power sent out from station busbars and minus sign for active power received into the busbars.

(iii) Cumulative Wh transmittal at each midnight, in eight digits including one decimal;

(iv) Separate registers for Active energy Import and Active energy Export.

(v) Cumulative VArh transmittal for Voltage high condition, at each midnight, in eight digits including one decimal;

(vi) Cumulative VArh transmittal for Voltage low condition, at each midnight, in eight digits including one decimal;

(vii) Date and time blocks of failure of VT supply on any phase, as a star (*) mark and (Z) mark in case of complete voltage failure;

(viii) Net VArh transmittal during each successive time block up to two decimal with plus sign for reactive power sent out from station busbars and minus sign for reactive power received into the busbars.

(ix) Average voltage up to 2 decimal truncations.

Provided that the time block for recording of meter data by the meter shall be 15 minutes or as specified by the Commission.

c) The meter shall store all the above listed data in their memories for a period of at least forty-five days. The data older than forty-five days shall get erased automatically on First-in-First-out (FIFO) basis. Each meter shall have an optical port on its front for tapping all data stored in its memory using hand held data collection device (i.e. CMRI). The meters shall have at least one RS-485 and Ethernet LAN port suitable for transmitting the data to remote location using appropriate communication medium. The communication protocol shall be open protocol and shall not be proprietary nature.

d) The active energy (Wh) measurement shall be carried out on 3-phase, 4-wire principle with accuracy as per class 0.2s as per IS 16444.

e) There shall be two reactive energy registers, one for the period when average RMS voltage is above 103% and the other for the period when the voltage is below 97%.

f) The Wh recording shall have a +ve sign when there is a net Wh export from substation busbars, and a –ve sign when there is a net Wh import.

Provided that the integrating (cumulative) registers for Wh and VArh shall move forward when there is Wh or VArh export from substation busbars, and backward when there is an import.

g) The meters shall also display (on demand), by turn, the following parameters:

i. Unique identification number of the meter

ii. Date

iii. Time

iv. Cumulative Wh register reading,

v. Average frequency of the previous time block,

vi. Net Wh transmittal in the previous time block, with +/-sign,

vii. Average percentage voltage.

viii. Reactive power with +/- sign

ix. Voltage-high VArh register reading

x. Voltage-low VArh register reading

xi. Net VArh transmittal in the previous time block, with +/-sign.

h) (i) The three line-to-neutral voltages shall be continuously monitored, and in case any of these falls below 80%, the same shall be suitably indicated and recorded in the meter memory.

(ii) The meters shall normally operate with the power drawn from the VT secondary circuits.

Provided that there shall be provision to operate the meters from AC and DC auxiliary power supply.

(iii) Each meter shall have a built-in calendar and clock, and shall have facility of automatic time synchronization.

(iv) The meter shall be properly sealed and tamper evident with no possibility of any adjustment at site.

i) Billing will be based on total energy/energy at fundamental frequency. The meter should measure total energy and energy at fundamental frequency in separate registers.

j) The main meter and check meter shall be connected to same core of Instrument Transformer.

k) The energy meters shall be capable to receive periodic time synchronization signals via proper on-line system. The meter time shall be in synch with GPS system.

l) All new meters shall have capability of recording frequency in steps of 0.01Hz.

m) All new meters shall be re-configurable at site for change of time block only as specified by the Commission.

12.1.2 Consumer Meters: (Measuring Parameters)

a) The consumer meter shall be suitable for measurement of cumulative active energy utilized by the consumer.

b) 1. The Consumer Meter shall have the facilities to measure, record and display parameters depending upon the tariff requirement for various categories of consumers in line with the relevant Indian Standards i.e IS16444.

Provided that the consumer meter shall also have facility to log and display tamper related events as per the requirement of licensee.

2. All meters shall have data storage capacity for at least last 45 days in a non-volatile memory.

c) Anti Tampering Feature

i. The meter shall not get damaged or rendered non-functional even if any phase and neutral are interchanged.

ii. The meter shall register energy even when the return path of the load current is not terminated back at the meter end and in such a case the circuit shall be completed through the earth. In case of metallic bodies, the earth terminal shall be brought out and provided on the outside of the case.

iii. The meter shall work correctly irrespective of the phase sequence of supply (only for poly phase)

iv. In the case of 3-phase, 4-wire meter system, the meter shall keep working even in the presence of any two wires i.e., in the absence of neutral and any one phase or any two phases.

v. In case of whole current meters and LV CT operated meters, the meter shall be capable of recording energy correctly even if input and output terminals are interchanged.

vi. The registration must occur whether input phase or neutral wires are connected properly or they are interchanged at the input terminals.

vii. The meter shall be factory calibrated and shall be sealed suitably before dispatch.

viii. The meter shall be capable of recording occurrences of missing potential (only for VT operated meters) and its restoration with date and time of first such occurrence and last restoration along with total number and duration of such occurrences

ix. Additional anti-tampering feature including logging of tampers such as current circuit reversal, current circuit short or open and presence of abnormal magnetic field may be provided as per the regulations or directions of the State Commission

Note: Smart Meter is bi-directional and therefore anti tamper feature stipulated at c(v) above shall not be applicable.

d) All meter shall have data storage capacity for at least 45 days in a non-volatile memory. The meters shall store all the above listed data in their memories for a period of at least forty-five days. The data older than 45 days shall get erased automatically on First-in First-out (FIFO) basis. Each meter shall have an optical port on its front for tapping all data stored in its memory using a hand-held data collection device (i.e. CMRI). The meters shall have at-least one RS-485 and Ethernet LAN port or any other suitable ports for transmitting the data to remote location using appropriate communication medium. The communication protocol shall be open protocol and shall not be proprietary nature.

12.1.3 Energy Accounting and Audit Meters: (Measuring parameters)

a) The energy accounting and audit meters shall be suitable for measurement, recording, and display of cumulative active energy with date and time.

b) The Energy Accounting and Audit Meters shall have the facility to measure, record and display parameters depending upon the energy accounting and audit requirement of the respective Generating Company or licensee in line with relevant Indian Standards. The meters installed at Distribution (at each feeder, 'T' points, DTs and consumers in the distribution network) and Generation Company level shall have a non-volatile memory in which the following shall be automatically stored:

i) Apparent power.
ii) Phase-wise kilowatt at peak kVA.
iii) Phase-wise kVA (reactive) at peak kVA.
iv) Phase-wise voltage at peak kVA.
v) Power down time.
vi) Average power factor.
vii) Line currents.
viii) Phase voltages.
ix) Date and time.
x) Tamper events.
xi) Cumulative apparent energy (kVAh)
xii) Any other parameter required for tariff application or analysis.

c) The meters shall store all the above listed data in their memories for a period of at least forty-five days. The data older than 45 days shall get erased automatically on First-in First-out (FIFO) basis. Each meter shall have an optical port on its front for tapping all data stored in its memory using a hand-held data collection device (i.e. CMRI). The meters shall have at-least one RS-485 and Ethernet LAN port or any other suitable ports for transmitting the data to remote location using appropriate communication medium. The communication protocol shall be open protocol and shall not be proprietary nature.

12.2 Accuracy Class:

These standards provide for specifications of meters, immunity to external factors, sealing points and functional requirements that are required from regulatory perspective:

Provided that, detailed technical specifications shall be prepared by the Generating Company or Licensee, as the case may be:

The specification of the main meters and check meters for interface points, consumer meters, meters for energy accounting and audit, and standby meters is given in Table-2.

Table-2

<table>
<tr><td>Standard Reference Voltage</td><td>As per IS</td></tr>
<tr><td>Voltage Range</td><td>The meter shall work satisfactorily on 110 Volts AC (Line-Line) with voltage variation range as per IS</td></tr>
<tr><td>Standard Frequency</td><td>The meter shall work satisfactorily on 50 Hertz with variation range as per IS</td></tr>
<tr><td>Standard Basic Current</td><td>As per IS (Current range of consumer meters shall be so chosen as to record the load current corresponding to the sanctioned load)</td></tr>
<tr><td>Accuracy Class</td><td>Meters shall meet the following requirements of Accuracy Class
<table>
<tr><td>Interface meters</td><td>0.2S</td></tr>
<tr><td colspan="2">consumer meters</td></tr>
<tr><td>Up to 650 volts Direct Connected</td><td>1.0 or better</td></tr>
<tr><td>Up to 650 volts CT Connected</td><td>Class 0.5S as per relevant IS where separate CTs are used
Or
Class 1.0 as per relevant IS for terminal less direct connected long current range meters.</td></tr>
<tr><td>Above 650 volts and up to 33 kV</td><td>0.5S or better</td></tr>
<tr><td>Above 33 kV</td><td>0.2S</td></tr>
<tr><td>Energy accounting and audit meters</td><td>(i) In generating stations, the accuracy class of the meter(s) at a point after the generator stator terminals, before the tap off to the unit auxiliary transformer(s) and at the inverter AC output terminals in case of Renewable Energy generating station, shall not be inferior to that of 0.2S accuracy class:</td></tr>
</table></td></tr>
</table>

		Provided that, the accuracy class of other meters shall not be inferior to that of 1.0 accuracy class. (ii)The accuracy class of meters in transmission system shall not be inferior to that of 0.2S accuracy class. (iii)The accuracy class of meters in distribution system shall not be inferior to that of 0.5S accuracy class where separate CTs are used with meter: Provided that in case of terminal less direct connected long current range meters accuracy class shall not be inferior to class 1.0. (iv) The accuracy class of Energy accounting and Audit Meters for renewable energy generating station located at consumer premises shall be same as that of consumer meter.
Ambient Temperature and Humidity (in case an International Standard or an IEC standard is followed)	Temperature range: limit range of operation: -10 °C to +70°C limit range for storage and transport: -10°C to +70°C relative humidity: up to 100% Note: (1) For special applications other temperature values can be used according to agreement between manufacturer and purchaser. (2) Operation, storage and transport of the meter at the extremes of the temperature range should be for a maximum period of six hours.	
Only fundamental frequency quantities shall be measured and computed while measuring Wh and VArh.		
Starting Current and Maximum Current	As per IS	
Power Factor Range	The meter shall work satisfactorily over a power factor range of zero lag to unity to zero lead	
Power Frequency Withstand Voltage	As per IS	
Impulse Voltage Withstand Test for 1.2/50 micro sec	As per IS	
Power Consumption	As per IS	

12.3 Data download capability of Meters

Meters shall have at least one port for downloading facilities of metered data through Common Meter Reading Instrument (CMRI) and other port(s)/system(s) for remote communication. CMRI shall be capable of downloading data/information from various makes of AC static energy meters when loaded with the corresponding meter specific downloading software(s) called meter reading instrument programs. The CMRI shall be able to extract information about energy data, load survey data, billing parameters, meter status, meter anomaly and tamper data from the memory of the meter and store for retrieval at a later stage.

Anti-tampering features shall be reviewed from time to time as mutually agreed by the concerned licensees and the meter shall be able to store at least 100 tamper events on FIFO basis; which includes PT miss, CT reversal, Voltage unbalance, Current

unbalance and power on/off.

12.4 Immunity to External Factors

The meter shall be immune to external influences like magnetic induction, vibration, electrostatic discharge, switching transients, surge voltages, oblique suspension, and harmonics and necessary tests shall be carried out in accordance with relevant standard.

12.5 Accuracy class of Instrument Transformers

(a) The accuracy class of Instrument Transformers shall not be inferior to that of associated meters.

(b) The Instrument Transformers shall comply with relevant Indian Standards.

(c) The existing Instrument Transformers not complying with these regulations shall be replaced by new Instrument Transformers, if found defective or non-functional.

(d) In case the Instrument Transformers of the same accuracy class as that of meters cannot be accommodated in the metering cubical or panel due to space constraints, the Instrument Transformers of the next lower accuracy class can be installed.

12.6 Lead Cables

Lead Cables of Instrument Transformers shall be of sufficient cross-section for reducing voltage drop to minimum between end connections (connection between cable lead end and Instrument Transformers terminals as well as between cable leads and meter terminals). No joints shall be allowed in cable leads. The burden on metering cores of Instrument Transformers including burden of lead cables and meters connected there to shall not exceeds rated burden.

13. Meter reading and recording

13.1 Interface Meters

(a) It shall be the responsibility of the Generating Company or the licensee, in whose premises the meter has been installed, to download the meter data, record the metered data and furnish such data to various agencies as per the procedure laid down by the State Commission.

Provided that the responsibility of maintaining database of all the information associated with the Interface Meter and verifying the correctness of the metered data

shall be in accordance with the procedure laid down by the State Commission.

(b) The metered data shall be communicated to the State Load Dispatch Centre by using a secured and dedicated communication system.

13.2 Energy accounting and audit meters

(a) It shall be the responsibility of the generating company or licensee to download the meter data locally or remotely, record the metered data, maintain database of all the information associated with the energy accounting and audit meters and verify the correctness of the metered data.

(b) Each generating company or licensee shall prepare quarterly, half-yearly and yearly energy account for its system for taking appropriate action for efficient operation and system development.

13.3 Consumer Meters

(a) It shall be the responsibility of the Distribution licensee to download the Meter data either locally or remotely, record the metered data, maintain database of all the information associated with the Consumer Meters and verify the correctness of the metered data.

(b) The Distribution licensee shall maintain accounts for the electricity consumption and other electrical quantities of its consumers.

Provided that the Distribution licensee shall provide information to the consumer related to his energy consumption through Mobile App or Web application or in-home display or any other suitable means.

(c) Brief history, date of installation and details of testing, calibration and replacement of meters shall be maintained by the Distribution licensee.

14. Rights of access to metering data

14.1 Authorized representatives of the following entities shall be entitled to have access to the metering data from the metering installations:

a) Generating Company, Transmission Licensee, Distribution Licensee, CPP and STU as the case may be who is responsible for the metering installation;

b) The State Load Dispatch Centre;

c) The State Transmission Utility;

d) The consumer of electricity or the generator of electricity at the metering installation as the case may be;

e) Any other person who has an authorization from persons at S. No. a, b & c or from the Commission;

f) The Commission.

15. Sealing of meters

15.1 Sealing Arrangements

All meters shall be sealed by the manufacturer at its works. In addition to the seal provided by the manufacturer at its works, the sealing of all meters shall be done as follows at various meter sealing points:

i. Sealing of interface meters, shall also be done by both, the supplier and the buyer.

ii. Sealing of consumer meters shall be done by the Distribution licensee.

iii. Sealing of energy accounting and audit meters shall be done by the licensee or generating company as the case may be.

15.2 Sealing Points

a) Sealing shall be done at the following points (as applicable):

(i) Meter body with cover (Not applicable if integrated body is used),

(ii) Meter terminal cover,

(iii) Meter test terminal block,

(iv) Meter cabinet/panel,

(v) Instrument Transformer (s) terminal box for metering purpose, and junction box, if any.

(vi) Monitoring Seals & Sealing Records

b) A tracking and recording mechanism for all seals shall be maintained by the licensee so as to track total movement of seals starting from procurement (with manufacturer's details), storage, record keeping, installation, series of inspections and removal.

c) Seal shall be unique for each utility and name or logo of the utility shall be clearly visible on the seals.

d) Only the patented seals (seal from the manufacturer who has official right to manufacture the seal) shall be used.

e) Polycarbonate or acrylic seals or plastic seals or holographic seals or any other superior seals shall be used.

f) Lead seals shall not be used in the new meters installed at consumer premises. Old lead seals shall be replaced by new seals in a phased manner and the time frame of the same shall be submitted by the licensee to the Commission for approval.

15.3 Removal of seals from meters

15.3.1 Interface meters

Whenever seals of the interface meters have to be removed for any reason, advance notice shall be given to other party for witnessing the removal of seals and resealing of the interface meter. The breaking and re-sealing of the meters shall be recorded by the party, who carried out the work, in the meter register, mentioning the date of removal and resealing, serial numbers of the broken and new seals and the reason for removal of seals.

15.3.2 Consumer meters

Seal of the consumer meter shall be removed only by the licensee. No consumer shall tamper with, break or remove the seal under any circumstances. Any tampering, breaking, or removing the seal from the meter shall be dealt with as per relevant provisions of the Act and Supply Code applicable.

15.3.3 Energy accounting and audit meters

Seal of the energy accounting and audit meter shall be removed only by the authorized person of generating company or the licensee as the case may be who owns the meter.

16. Meter failure or discrepancies

16.1 Interface meters

a) Whenever difference between the readings of the Main meter and the Checkmeter for any month is more than 0.5%, the following steps shall be taken:

(i) Checking of Instrument Transformer connections.;

(ii) Testing of accuracy of interface meter at site with reference standard meter of accuracy class higher than the meter under test.

(iii) Based on the test result as specified in items (i) and (ii), corrective action shall be taken to replace the defective meter

b) In case of conspicuous failures like burning of meter and erratic display of metered parameters and when the error found in testing of meter is beyond the permissible limit of error provided in the relevant standard, the meter shall be replaced immediately with a Correct Meter:

Provided that whenever an Interface Meter is replaced, it shall be ensured that Interface Meter at the other end, if any, of the transmission or distribution system, shall have same accuracy class.

c) In case where both the Main meter and Check meter fail, at least one of the meters shall be immediately replaced by a Correct Meter by the STU/licensee official in presence of authorized representatives from concerned licensee/Customer.

16.1.1 Billing for the Failure Period

a) The billing for the failure period of the meter shall be done as per the UERC (The Electricity Supply Code, Release of New Connections and Related Matters) Regulations, 2020 and amendments thereof.

b) Readings recorded by Main, Check and Standby meters for every time slot shall be analyzed, cross checked and validated by STU and SLDC. The discrepancies, if any, noticed in the readings shall be informed by the SLDC in writing to the energy accounting agency for proper accounting of energy. SLDC shall also intimate the discrepancies to the Transmission Utility or the concerned licensee or generating company as the case may be who shall take further necessary action regarding testing, calibration or replacement of the faulty meters in accordance with the provisions laid down.

c) The defective meter shall be immediately tested and calibrated.

16.2 Consumer Meters

In case the consumer reports to the Distribution Licensee about consumer meter readings not commensurate with his consumption of electricity, stoppage of meter, damage to the seal, burning or damage of the meter, the Distribution licensee shall take necessary steps as per the procedures given in the Electricity Supply Code Regulations and amendments issued from time to time by the Commission read with the notified

conditions of supply of electricity.

16.3 Energy accounting and audit meters

Energy accounting and audit meters shall be rectified or replaced by the concerned generating company or licensee immediately after notice of any of the following abnormalities:

a) The errors in the meter readings are outside the limits prescribed for the specified Accuracy Class;

b) Meter readings are not in accordance with the normal pattern of the load demand;

c) Meter tampering, or erratic display or damage.

d) Readings not in conformity with the readings of Interface Meters.

17. Calibration and periodical testing of meters

17.1 Interface meter

a) At the time of commissioning, each interface meter shall be tested by the owner at site for accuracy using standard reference meter of better accuracy class than the meter under test.

b) All interface Meters shall be tested on-site using accredited test laboratory for routine accuracy testing at least once in five years and recalibrated if required.

Provided that these meters shall also be tested whenever the energy and other quantities recorded by the meter are abnormal or inconsistent with electrically adjacent meters. Whenever there is unreasonable difference between the quantity recorded by interface meter and the corresponding value monitored at the billing center via communication network, the communication system and terminal equipment shall be tested and rectified. The meters may be tested using accredited mobile laboratory or at any accredited laboratory and recalibrated if required at manufacturer's works.

c) Testing and calibration of interface meters shall be carried out in the presence of the representative of the supplier and buyer by giving advance notice to the other party regarding the date of testing.

17.2 Consumer meters

The testing of all consumer meters shall be done at site by the Distribution Licensee

through accredited test laboratory and recalibrated if required at such intervals as given in the UERC (The Electricity Supply Code, Release of New Connections and Related Matters) Regulations, 2020 and amendments thereof.

Provided that the Distribution Licensee instead of testing the meter at site can remove the meter and replace the same by a Correct Meter duly tested in an accredited test laboratory.

Provided further that meters shall be tested if consumption pattern changes drastically from the similar months or seasons of the previous years or if there is consumer's complaint pertaining to a meter.

Provided also that the meter used for testing shall be of better accuracy class than the meter under test. The testing for consumer's meters above 650 volts should cover the entire metering system including Instrument Transformers. Testing may be carried out through accredited mobile laboratory using secondary injection kit, measuring unit and phantom loading or at any accredited test laboratory and recalibrated if required at manufacturer's works.

17.3 Energy accounting and audit meters

Energy Accounting and Audit Meters shall be tested at site through accredited test laboratory at least once in five years or whenever the accuracy is suspected or whenever the readings are inconsistent with the readings of other meters, e.g., Check Meters, Standby Meters and defective meters shall be recalibrated, if required:

Provided that the testing shall be carried out without removing the Instrument Transformers connections. Testing may be carried out through accredited mobile laboratory using secondary injection kit, measuring unit and phantom loading or at any accredited test laboratory and recalibrated if required at manufacturer's works

18. MCDAR Committee

18.1 State Transmission Utility shall be responsible for managing and serving the MCDAR for Intra-State Power System of Uttarakhand with each constituents/Users of Intra-State Power System discharging respective obligations under the MCDAR.

18.2 The Grid Coordination Committee (GCC) shall also work as MCDAR Committee and in case any specialist member is required, GCC may nominate from the State Constituents.

18.3 The rules to be followed by the Committee in conducting their business shall be formulated

by the Committee itself and shall be approved by GCC. The Committee shall meet at least once in six (6) months and conduct the following functions:

(a) To keep MCDAR for Intra-State Power system and it's working under scrutiny and review.

(b) To consider all requests for amendment to the MCDAR for Intra-State Power system which any user makes.

(c) To publish recommendations for changes to the MCDAR for Intra-State Power system together with the reason for the change and any objection if applicable.

(d) To issue guidance on the interpretation and implementation of the MCDAR. Any amendments and changes recommended by the MCDAR committee and subsequently approved by the Grid-Coordination Committee (GCC) shall be put up to the Commission for approval before they become effective.

19. Mechanism for Dispute Resolution

Any disputes relating to metering amongst STU, other transmission licensees, Transmission system user of IaSTS, any Generating Company, Distribution licensees in Uttarakhand, any traders registered in Uttarakhand, any consumer connected directly to the IaSTS and any disputes relating to inter-utility metering between STU and any Generating Company/Distribution Licensees/Users shall be settled in accordance with procedures given in UERC (State Grid Code) Regulations, 2016. The dispute relating to billing and settlement among the entities shall be resolved under relevant agreements like Power Purchase Agreements (PPA), and Connection Agreement etc.

20. Development of Metering Infrastructure and telemetry requirement

20.1 For proper energy audit and accounting and deviation settlement in the state different constituents of the state power system will develop and maintain an infrastructure as follows-

a) SLDC will develop a data centre for collecting energy meter data of all interface meters (of both ends including distribution licensee ends and generator ends also), energy accounting meters of STU and other Transmission Licensee and perform proper energy audit and accounting and deviation settlement work. SLDC and STU can also ask for providing the data automatically or otherwise, of any energy meter from any of the constituents of Uttarakhand State Power System which they thinks is required for the energy audit and accounting work.

b) STU and Transmission Licensee will develop an infrastructure for metering to communicate interface and energy accounting meters data to SLDC.

c) All the generators of the state will develop an infrastructure for metering to communicate interface energy meters data to SLDC.

d) All the distribution licensees in the state will develop an infrastructure for metering to communicate the data of their end interface energy meters, consumer energy meters of consumers 33 kV and above voltage level & Open Access customer energy meters to SLDC.

20.2 STU, Transmission Licensee and Generators will install and maintain telemetry equipments at their end to communicate their real time data to SLDC which is necessary for real time grid operation.

21. Dynamic Code

The MCDAR requires review and updation from time to time in view of continuously and fast changing metering and communication technology and for new commercial agreements and tariff, industry structure. All changes and revision in the MCDAR shall be discussed in MCDAR Committee and approved by the Commission.

22. Quality Assurance of Meters

22.1 The licensees, Generating Company, CPP/Co-generating plant, who are responsible for procurement and/or installation and commissioning of the meters covered under these requirements shall ensure that all type, routine and acceptance tests are performed by the suppliers satisfactorily on these meters before they are commissioned. Subsequent to commissioning of the meters at site, the owners of the meters and the entities responsible for satisfactory functioning of the meters shall draw up a plan for routine maintenance / testing of the meters in line with Regulation 17 above and shall submit the same to the State Commission for approval.

22.2 The licensee shall set up accredited testing laboratories or utilize the services of other accredited testing laboratories.

22.3 The licensee shall take immediate action to get the accreditations of the existing meter testing laboratories from NABL, if not already done.

22.4 The generating company or licensee shall ensure that all type, routine and acceptance tests are carried out by the manufacturer complying with the requirement of the relevant Indian

Standards.

23. Additional meters

23.1 In addition to any meter placed by the licensee for recording the electricity consumed by the customer or by distribution licensee, the licensee may connect additional meters, maximum demand indicators or other apparatus as he may think fit for the purpose of ascertaining or regulating either the quantity of electricity supplied or the number of hours of supply or combination of both for summation purposes.

23.2 The customers may, in consultation with the supplier, install appropriate meters with reasonable level of accuracy to support the load management plans stipulated by the supplier. Any charges of electricity supplied to the customers, based on the readings of the above meters shall be as per the agreement between the parties or as per the Supply Code as the case may be.

24. Adoption of new Technologies

The Licensees shall make out plans for introduction and adoption of new technologies which will be useful in integrating with the suppliers and other entities in the State, the Demand Side Management (DSM) efforts and energy conservation programs.

25. Cyber Security

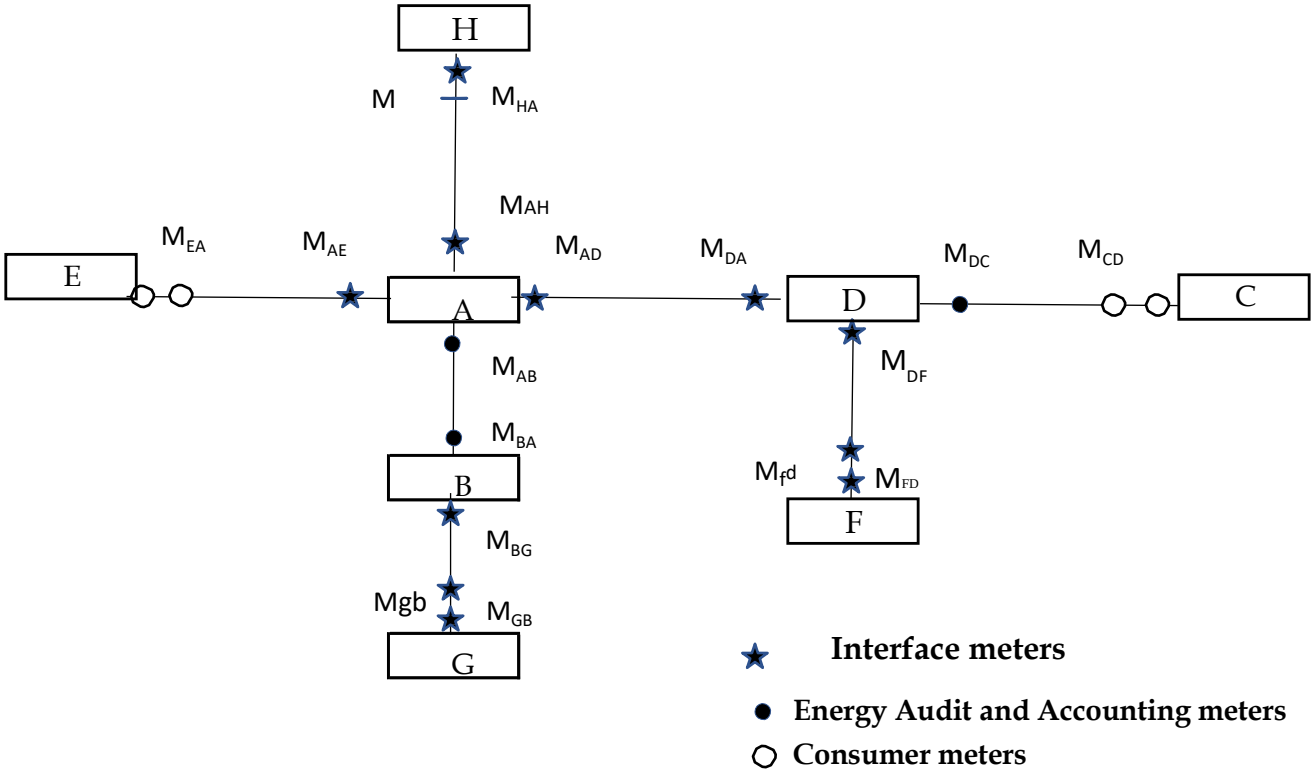
Generating Company and licensee shall comply with cyber security guidelines issued by the Central/State Government, from time to time, and the technical standards for communication system in power Sector laid down by the appropriate Authority.

26. Relaxation of Requirements

The Commission, by order in writing and the reasons to be recorded, may relax any provision of these Requirements in respect of any matters referred to the Commission on case to case basis.

Annexure-A

Type & Ownership of Meters



Type & Ownership of Meters:

(i) M_{AB} & M_{BA} are Energy Accounting & Audit Meters owned by STU/TL installed at the feeder.

(ii) $M_{BG,}$ M_{gb} & M_{GB} are interface meters. M_{BG} is owned by STU/TL. Mgb & M_{GB} are Main & Check meters owned by Generator.

(iii) M_{AD} & M_{DA} are interface meters owned by STU/TL & Distribution Licensee respectively.

(iv) M_{DF} is interface meter owned by distribution licensee installed at outgoing feeder at sub-station.

(v) M_{fd} & M_{FD} are Check & Main interface meters owned by distribution licensee installed at Open access customer (including generators) premises.

(vi) M_{DC} is Energy Accounting & Audit Meters owned by Distribution Licensee installed at outgoing feeder of sub-station.

(vii) M_{cd} & M_{CD} are Check & Main Consumer meters owned by Distribution Licensee.

(viii) M_{AE} is interface meter owned by STU. M_{ea} & M_{EA} are Check & main consumer meter installed at EHV consumer owned by Distribution Licensee.

(ix) M_{ha} & M_{HA} are Check & Main interface meters owned by distribution licensee installed at Open access customer (including generators) premises.

(x) M_{AH} is interface meter owned by STU/TL installed at outgoing feeder at sub-station.

Where:

A, B → S.T.U/Transmission Licensee (TL)
C → Consumer
D → Distribution Licensee
E → EHV Consumer
F/H → Open Access Customer including
G → Generator