MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.

SRM e-TENDER FOR --

'Supply, Installation, Testing & Commissioning for Implementation of 5 Minutes metering with new Interface Energy Meters (IEM), Automated Meter Reading (AMR) system following "SAMAST" recommendations in MSEDCL.'

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Volume – II

Section - I

Technical Specification

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ABBREVIATIONS

Sr. No	Acronym	Definition
1	AMR	Automated Meter Reading
2	ATP	Acceptance Test Plan
3	CDCS	Central Data Collection System
4	CMRI	Common Meter Reading Instrument
5	C&R	Control & Relay
6	STU	State Transmission Utility
7	DCD	Data Collection Device
8	DCU	Data Concentrator Unit
9	DSM	Deviation Settlement Mechanism
10	EA	Energy Accounting
11	EHV	Extra High Voltage
12	FAT	Factory Acceptance Test
13	FTE	Full Time Equivalent
14	GPRS	General Packet Radio Service
15	GSM	Global System of Mobile
16	HHU	Hand Held Unit
17	IEC	International Electro-technical Commission
18	IEEE	Institute of Electrical and Electronics Engineers
19	IEM	Interface Energy Meter
20	IP	Ingress Protection
21	IS	Indian Standard
22	ISTS	Inter State Transmission System
23	LAN	Local Area Network
24	MDP	Meter Data Processing
25	NMS	Network Management System

26	OEM	Original Equipment Manufacturer
27	PCB	Printed Circuit Board
28	RDBMS	Relational Database Management System
29	RMS	Root Mean Square
30	SAT	Site Acceptance Test
31	SEM	Special Energy Meter
32	SRS	Software Requirements Specification
33	TOC	Taking Over Certificate
34	VPN	Virtual Private Network
35	WAN	Wide Area Network
36	RLDC	Regional Load Dispatch Centre
37	WRPC	Western Regional Power Committee
38	SLDC	State Load Dispatch Centre
39	MSEDCL	Maharashtra State Electricity Distribution Company

I. SCOPE OF THE PROJECT

The details of the Interface Energy Meters required and number of substations considered in the existing MSEDCL is enclosed as below. The tentative 36 Nos. of Main IEM meters spread over at 32 substations in jurisdiction of MSEDCL along with accessories and services will have to be provided. The number of IEM/ABT meters and other material may vary as per the existing infrastructure and the requirement of SLDC.

Zone wise Substations & Interface locations.

The details of Zone wise Substation & Interface location for Installation of the tentative 36 No.s of Main IEM Are mentioned in Annexure – AD for reference.

The final Bill of Quantities shall be developed after site survey.

The present project envisages:

1. Replacing the existing Special Energy Meters (15 min, ABT meters) at the existing interface points in jurisdiction of MSEDCL with Interface Energy Meters (5 min, Interface meters).

2. All IEM meters (5 min, interface meter) having TCP/IP port will be connected to the LAN switches to create a LAN network and terminate to the Gateway/DCU of respective substation. Gateway/DCU will have inbuilt or external 4G/3G/2G/Internet modem which will connect further to the central data center through 4G/3G/2G/Internet communication network and also to OFC network available at any of the substation, same can be used for data transfer as parallel path/communication. Provision of necessary communication links like OFC/ VSAT/ 2G/3G/ 4G/Internet will be in utility's scope. In case of communication failure ,data downloading by MRI and sending to SLDC is the responsibility of MSEDCL.

3. DCU/Gateway at each substation will also be installed and connected to the Ethernet switch for increasing the reliability & availability of meter data. DCU/gateway shall have capability of storing the acquired meter data and in case of non-availability of network link; DCU/gateway will store the data and transfer whenever link will be available.

4. The project also envisages putting in place a system of Automated Meter Data Reading (AMR) software along with the associated hardware for meter data collection (meter data will be transmitted by the DCU to the server at SLDC using GPRS/VSAT/GSM/Internet or Optical fiber network), validation and processing at State Load Dispatch Centre (SLDC) for energy accounting

5. The successful bidder shall be responsible for supply and installation of hardware and software at respective locations.

6. This project envisages delivering an end to end solution for energy metering at the intrastate level. It shall involve capital as well as O&M expenditure by the successful bidder.

7. During the warranty and O&M phase, the bidder shall provide web based system for complaint registration, support and maintenance and shall provide assistance for diagnose and address any software related issues in AMR/MDP/reporting system.

8. This project also envisages application server which should be web/browser based as such an Internet Information Server needs to be deployed on a same/separate server as application server. It shall be possible to access the application through a web link from remote (subject to availability of web link) and viewing the data. These clients should be in view mode only they cannot perform any task from there. Access needs to be via secured VPN.

Service Conditions:

All equipment's to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions

a) Maximum ambient temperature	55^0 C
b) Maximum ambient temperature in shade	45^0 C
c) Minimum temperature of air in shade	35^0 C
d) Maximum daily average temperature	40^0 C
e) Maximum yearly weighted average temperature	32^0 C
f) Relative Humidity	10 to 95%
g) Maximum Annual rainfall	5600 mm
h) Maximum wind pressure	150 Kg/m^2
i) Maximum altitude above mean sea level	1000 mtrs
j) Isoceraunic level (days/year)	50
k) Seismic level (Horizontal acceleration)	0.3 g

Climate: - Moderately hot and humid tropical climate conducive to rust and fungus growth.

The technical specifications are broadly in the following chapters

Chapter – I: The first chapter of the specifications covers the design, manufacturing, testing, supply and delivery of AC 3 ph., 4 wire Interface Energy Meter (IEM). The meter shall incorporate suitable communication features to communicate with DCU (Data Concentrator Unit) installed at the substation.

Chapter– II: The second chapter covers the design, manufacturing, testing, supply and delivery of DCU & facility/provision of Communication facility. The DCU shall communicate with Central Data Collection System for data transfer to SLDC, as per the user defined schedule.

Chapter – III: The third chapter covers the general software & hardware requirement for AMR.

Chapter – IV: The fourth chapter covers the Documentation requirement

Chapter – V: The fifth chapter covers the Acceptance test plan & procedure for SAT & FAT.

Chapter – VI: The sixth chapter covers the scope of warranty

The installation of the IEM at the interface points shall involve shutdown of distribution elements. This shall be coordinated through the existing outage coordination procedure approved by the MSEDCL. MSEDCL shall coordinate for administrative approvals from the utility in whose premises the IEM/DCU have to be installed. The bidder shall keep suitable margins for grid related uncertainties while formulating the meter installation plan.

CHAPTER – I: INTERFACE ENERGY METERS (IEM)

1. Basic Features of Interface Energy Meters

1.1 The energy metering system specified herein shall be used for tariff metering for bulk, inter-utility/intra-utility, G to T, T to D power flows. Static composite meter shall be installed at interface points as a self-contained device for measurement of Voltage (V), Frequency (f), Active (Wh) and Reactive (VArh) energy exchanged in each successive 5 min time block. The meter shall conform to the following standards along with latest amendments, if any.

IS15959	AC static transformer operated Watt-hour and VAR hour meters for class 0.2s category B (ABT compliant)metering
IS: 14697 (1999)	AC static transformer operated Watt-hour and VARh meters for class 0.2S and 0.5S
IEC62056	Detection of Tamper conditions for DLMS compliant meter
IEC-62056-51	For Data security
IEC-62053-22:2003/IEC 62053-23:2003	For meter accuracy

1.2 Each meter shall have a unique identification code, which shall be marked permanently on its front, as well as in its memory. All meters supplied to as per this specification shall have their identification code starting with "MSEDCL", which shall not be used for any other supplies. "MSEDCL" shall be followed by an eight digit running serial number. **CT ratio of 1A or 5A shall be user configurable or shall be of single rating.**

This shall be mutually agreed between the buyer and the vendor.

1.3 The meters shall be suitable for communication with external device like modem, DCU, etc. which shall be able to communicate with CDCS for local/remote data transfer. The meter shall compulsorily have at least 1 optical port for taking reading through Hand Held Unit (HHU).The supply of required number of HHU is in scope of bidder.(see price

bid)

The meter shall also have following communication ports for local/remote reading:

i) IEC 1107 optical port

ii) RS485 port (should be configurable on DLMS)

iii) TCP/IP Ethernet (should be configurable on DLMS TCP)

iv) USB

Note: All the ports shall be fixed or modular. If provision of USB port is not possible then RS 232 port with converter for RS 232 to USB should be provided

1.4 **Auxiliary Supply to IEM:** The meters shall normally operate with the power drawn from DC auxiliary power supply (Range 110V to 220V DC) to reduce the Voltage Transformer (VT) burden. In addition, there shall be provision to operate the meter from the Voltage Transformer (VT) secondary circuit having a rated secondary line-to-line voltage of 110V, and current transformers (CTs) having a rated secondary current of 1 A or 5A. Any further transformers/ transactions/ transducers required for their functioning shall be in-built in the meters. Necessary isolation and/or suppression shall also be built-in, for protecting the meters from surges and voltage spikes that occur in the VT and CT circuits of extra high voltage switchyards. The reference frequency shall be 50Hz. Also, the meter shall have suitable of ±15% tolerance for DC supply.

1.5 The meters shall safely withstand the usual fluctuations arising during faults etc. In particular, VT secondary voltages 115% of Vref applied continuously and 190% of Vref for 3.0 seconds, and CT secondary current 150% of Iref applied continuously and 30 times of Iref applied for 0.5 seconds shall not cause any damage to or mal-operation of the meters.

1.6 The meters shall continue to function for the remaining healthy phase(s), in case one or two phases of VT supply fails. In case of a complete VT supply failure, the computation of average frequency shall be done only for the period during which the VT supply was available in the 5-minute block. Any time block contraction or elongation for clock correction shall also be duly accounted for.

1.7 The total burden imposed by a meter for measurement and operation shall be defined as per IS 14697. An automatic backup for continued operation of the meter's calendar- clock,

and for retaining all data stored in its memory, shall be provided through a long- life battery, which shall be capable of supplying the required power for at least 2 years. The meters shall be supplied duly fitted with the batteries, which shall not require to be changed for at least 10 years, as long as total VT supply interruption does not exceed two years.

1.8 The meters shall fully comply with all stipulations in IS 14697 except those specifically modified by this specification. The reference ambient temperature shall be 27°C.

1.9 Each meter shall have a test output device (visual), as per clause 6.11 of IS 14697.1999, for checking the accuracy of active energy (Wh) measurement. The preferred pulsing rate is twenty (20) per Wh for CT sec-1A and four (4) per Wh for CT sec –5A. However, bidder may decide on their own. It shall be possible to couple this device to suitable testing equipment also.

1.10 **Exception Management** - The three line-to-neutral voltage shall be continuously monitored and in case any of these falls below defined threshold (70% of Vref), meter shall have suitable indication on LED/ LCD. The meter shall also have provision for low voltage event logging in meter memory in case of any phase voltage going below a defined threshold. The time blocks in which such a voltage failure occurs/persists shall also be recorded in the meter's memory with a symbol"*" if 3 Phase RMS voltage applied to the IEM is in between 5% to 70% of Vref and if Voltage is less than 5% of Vref, meter should record Zero voltage symbol "Z".

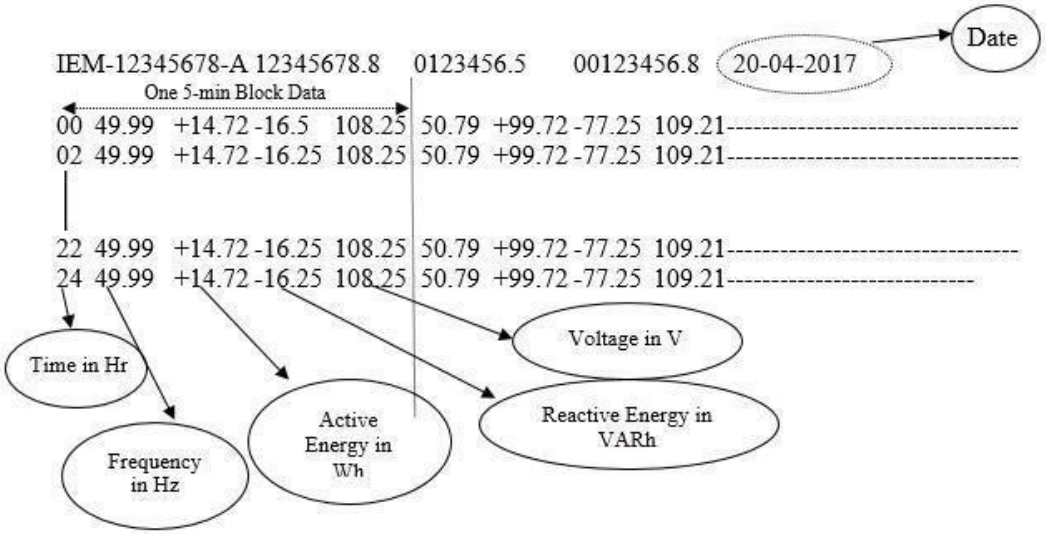
1.11 **Time Accuracy** - Each meter shall have a built-in calendar and clock, having an accuracy of 10 seconds per month or better. The calendar and clock shall be correctly set at the manufacturer's works. The date (year-month-day) and time (hour-min.-sec.) shall be displayed on the meter front on demand. Meter shall have the intelligence to synchronize the time with GPS (Local GPS/CDCS GPS) signal and from PC using software. Limited time synchronization through meter communication port shall be possible at site. The meter shall be capable of accepting time synchronizing signal from local BCU, DCU, GPS or remote MDAS. When an advance or retard command is given, twelve subsequent time blocks shall be contracted or elongated by five seconds each. Time advance and retard command should be limited to one command/week. All clock corrections shall be registered in the meter's memory and suitably shown on print out of collected data.

1.12 A touch key or push button, backlit LCD display shall be provided on the meter front

for switching on the display and for changing from one indication to the next. Preferably the display shall switch off automatically about one minute after the last operation of touch

Key / push button. When the display is switched on, the parameter last displayed shall be displayed again, duly updated.

1.13 The whole system shall be such as to provide a print out (both from the local PC,



and from remote central computer) of the following format:

Figure 1 – Standard raw data format for IEM

There are 4 values in one 5 min time block. The first row shall contain the meter data for 2 hours, i.e. 24 time blocks, 00 hrs. to 02:00 hrs. Similarly the 2nd row shall contain the data for the next 2 hours and henceforth.

The above data shall be available in text file format (file extension as per IEEE standard/.txt) exportable to Excel. Indication of time retard or advance to be provided without disturbing the proposed format. Each 5-min block data consists of Frequency (in HZ), Active energy (in Wh), Reactive energy (in VArh) and Voltage (in V). All 5 minute Wh and VArh figures in required (.CSV/.NPC/ any other) output report shall be rounded off up to third decimal. Active and Reactive energy High Low to be in the order of 7+1 digits.

1.14 The portable hand held unit (HHU)/ Common meter reading instrument (CMRI) / Data Collecting Device (DCD) shall be having IS-15959:2011 compatibility for

standardized parameters. The optical coupler for tapping data stored in the SEMs memory shall be compatible universally across different make of SEMs.

1.15 Constructional Features:

1.15.1 The meters shall be supplied housed in compact and sturdy, metallic or molded cases of non-rusting construction and/or finish. The cases shall be designed for simple mounting on a plane, vertical surface such as a control/relay panel front. All terminals for CT and VT connections shall be arranged in a row along the meter's lower side. Terminals shall have a suitable construction with barriers and cover, to provide a secure and safe connection of CTs and VTs leads through stranded copper conductors of 2.5 sq. mm. sizes.

1.15.2 All meters of the same model shall be totally identical in all respects except for their unique identification codes. They shall also be properly sealed and tamper evident, with no possibility of any adjustment at site, except for transactions allowed in IS 15959.

1.15.3 The meters shall safely withstand, without any damage or mal operation, reasonable mechanical shocks, earthquake forces, ambient temperature variations, relative humidity etc. in accordance with IS-14697. They shall have an IP51 category (But without suction in meter) dust tight construction, and shall be capable of satisfactory operation in an indoor, non-air conditioned installation & outdoor installation in a panel.

1.15.4 Either the meters shall have built-in facility (e.g. test links in their terminals) for in-situ testing, or a separate test block shall be provided for each meter. However, in case of new metering panel separate TTB will be the part of panel.

1.15.5 The sealing arrangement should be suitable for application of polycarbonate seals.

2. Measurement

2.1 The active energy (Wh) measurement shall be carried out on 3-phase, 4-wire principle, with an accuracy as per class 0.2S (IS 14697).

2.2 The meter shall compute the net active energy (Wh) sent out from the substation bus bars during each successive 5 min block, and store it in its memory up to fourth decimal with plus sign if there is net Wh export and with a minus sign if there is net Wh import. Further Wh data in (.CSV/.NPC/ any other) output report shall be rounded up to third decimal.

2.3 The meter shall count the number of cycles in VT output during each successive 5 min block, and divide the same by 300 (60 sec/min x 5min) to arrive at the average frequency. The least count of the frequency data shall be 0.01 Hz. The frequency data shall be stored in the meter's memory in Hertz up to two decimal. Further Hz data in (.CSV/.NPC/ any other) output report shall be rounded up to two decimal.

2.4 The meter shall continuously compute the average of the RMS values of the three line-to-neutral VT secondary voltages as a percentage of 63.51 V, and display the same on demand. The accuracy of the voltage measurement/computation shall be at least 0.5%, a better accuracy such as 0.2% in the 95-105% range being desirable. The voltage data shall be stored in the meter's memory in volts up to third decimal. Further Wh data in (.CSV/.NPC/ any other) output report shall be rounded up to second decimal.

2.5 The Reactive energy (VArh) measurement shall be carried out on 3-phase, 4-wire principle, with an accuracy of 0.2S as specified in IS 14697. The meter shall compute the net Reactive energy (Net VArh = (VArh Export - VArh Import)) sent out from the substation bus bars during each successive 5 min block, and store it in its memory up to fourth decimal with plus sign if there is net VArh export and with a minus sign if there is net VArh import. It shall also display on demand the net VArh sent out during the previous 5 min block. Further VArh data in (.CSV/.NPC/ any other) output report shall be rounded up to third decimal.

2.6 The meter shall also integrate the reactive energy (VArh) algebraically into two separate registers, one for the period for which the average RMS voltage is above 103.0%, and the other for the period for which the average RMS voltage is below 97.0 %. The current reactive power (VAR), with a minus sign if negative, and cumulative reactive energy (VArh) readings of the two registers (>103% and <97%) shall be displayed on demand. The readings of the two registers at each midnight shall also be stored in the meter's memory. When reactive power is being sent out from substation bus bars, VAR display shall have a plus sign or no sign and VArh registers shall move forward. When reactive power flow is in the reverse direction, VAR display shall have negative sign and VArh registers shall move backwards. The meters to be commissioned for secondary voltage i.e. -/110V and primary voltage shall be configurable at site during commissioning. Generally, the standard PT ratios are132/110V, 220 kV /110V, 400 kV /110 V and 765 kV / 110 V. However, at the time of commissioning the vendor may confirm the same from site and configure the meter accordingly to ensure correct recording of reactive energy. For

Reactive High & Low recordings, PT secondary voltage shall be configured in the meter.

2.7 Further, the meter shall continuously integrate and display on demand the net cumulative active energy sent out from the substation bus bars up to that time. The cumulative net Wh reading at each midnight shall be stored in the meter's memory. The register shall move backwards when active power flows back to substation bus bars.

2.8 Errors for different power factors shall be as defined in IS14697.

2.9 For reactive power (VAR) and reactive energy (VArh) measurements, IS14697 shall be complied with. The accuracy of measurement of reactive energy shall be as per class 0.2S.

2.10 The harmonics shall be filtered out while measuring Wh, V and VArh, and only fundamental frequency quantities shall be measured/computed.

2.11 The meter shall be capable of measuring total harmonic distortion for current and voltage.

2.12 The meter shall be capable of measuring four quadrant import/ export metering for active, reactive and apparent power.

2.13 Data security shall be ensured as per IS 15959 (three layers of security).

3. Memory/ Storage

3.1 Each meter shall have a non-volatile memory in which the following shall be automatically stored:

3.1.1 Average frequency for each successive 5 min block, in Hertz up to third decimals.

3.1.2 Net Wh transmittal during each successive 5 min block, up to fourth decimal, with plus sign if there is net Wh export and with a minus sign if there is net Wh import.

3.1.3 Net VArh transmittal during each successive 5 min block, up to fourth decimal, with plus sign if there is net VArh export and with a minus sign if there is net Varh import.

3.1.4 Cumulative Wh transmittal at each midnight, in eight digits including one decimal.

3.1.5 Cumulative VArh transmittal for voltage high condition, at each midnight in eight digits including one decimal.

3.1.6 Cumulative VArh transmittal for voltage low condition, at each midnight, in eight

digits including one decimal.

3.1.7 Average RMS voltage for each successive 5min block.

3.1.8 Date and time blocks of failure of VT supply on any phase, as a star (*)/ (Z) mark.

3.2 The meters shall store all the above listed data in their memories for a period of minimum fifteen (15) days.

4. Display

4.1 Each meter shall have digital display for indication of the following (one at a time), on demand:

4.1.1 Meter serial no. and model: IEM12345678A or IEM12345678B

4.1.2 Date (year month day /yyyy mm dd): 20160311 d

4.1.3 Time (hour min sec /hh mm ss): 195527 t

4.1.4 Cumulative Wh reading: 1234567.8 C

4.1.5 Average frequency of the previous block: 49.89 F

4.1.6 Net Wh transmittal during the previous block: - 28.75 E

4.1.7 Net VArh transmittal during the previous block: - 18.75 R

4.1.8 Average % Voltage: 99.2 U

4.1.9 Reactive power (VAR): 106.5 r

4.1.10 Voltage - high VArh registers reading: 1234567.5 H

4.1.11 Voltage - low VArh register reading: 1234567.4 L

4.1.12 Low battery indication

4.1.13 The three line-to-neutral voltages shall be continuously monitored and in case any of these falls below 70 %, then preferably, the corresponding flashing LED/LCD provided on meter's front shall become steady. They all shall go off if all three voltages fall below 1570 %. The LED/LCD shall automatically resume flashing when all VT secondary voltages are healthy again.

4.1.14 The two VArh registers (x and xi) shall remain stay-put while VT supply is unhealthy.

4.2 Any other better or more informative mechanism to display the above shall be

preferred. The above shall be mutually agreed between the meter buyer and vendor.

4.3 Navigation keys to be provided at the meter front plate to navigate the display menu.

4.4 The display can be identified through symbols/ legend on display itself or through display annunciator.

4.5 Power factor range of meter should be Zero lag, Unity, to Zero lead. The starting current should be 0.1% Ib at Unity Power Factor & rated maximum current should be 200% Ib.

4.6 Meter is provided with test output accessible from the front of the meter & details of test output device provided for Wh & VArh.

4.7 Meter should have open communication protocol as per IS 15959-2011

5. Communication

5.1 Each meter must have an optical port on its front for tapping all data stored in its memory through HHU. In addition to the above each meter shall also be provided with a RS-485, Ethernet and USB port/ optical to USB converter cable on one of its sides, from where all the data stored in the meter's memory can also be transferred to CDCS (through DCU), local computer and external storage. The overall intention is to tap the data stored in the meter's memories at a scheduled time from any of the above mentioned ports or any other means and transmit the same to a remote central computer using suitable means of communication. It shall be possible to securely download the IEM data through an USB port via external storage thereby removing the requirement of a MRI (Meter Reading Instrument). It shall be ensured that data transfer through USB shall be unidirectional only i.e. from Meter to external storage device in an authentication process. Meter data shall be tamper-proof .(As an alternative RS232 to USB converter can be provided)

5.2 All meters shall be compatible with Optical port, RS-485 port, Ethernet port and USB/ optical to USB converter cable all together at a time and communicate using DLMS independently. It shall also be possible to obtain a print out (hard copy) of all data collected from the meters, using the local PC. Data collection from any local laptop/PC shall be possible by installing data collection software.

The meter shall comply with latest prevalent interoperability open data exchange protocols in metering, including DLMS. It shall be capable of transmitting required data either to local DCU or to remote MDAS.

5.3 Entire project has to be based on Optic Fiber/VSAT/GSM/Internet/4G/3G/2G. Communication between DCU and MDAS shall be OF/GSM (Sim)/VSAT/Internet

provided by MSEDCL. In case of communication failure data downloading by MRI and sending SLDC is the responsibility of MSEDCL.

5.4 The bidder may design appropriate architecture for providing end to end metering solution. He is free to decide upon the best solution out of all the available options to ensure that data from all IEMs are available at the SLDC by the scheduled time. However, the entire responsibility of fully functional end to end metering system shall rest with the bidder in order to meet the performance levels as given in this document. MSEDCL may adopt Optical Fiber/VSAT/GSM/3G/4G/Internet communication technology or a combination of these technologies as per the site requirement adopting best available technology in the proposed area of implementation. The successful bidder shall be responsible for proper data exchange among IEM, DCU, CDCS, MDP and other operational/requisite software as part of fully functional metering system.

5.5 The bidder shall adhere to the appropriate security algorithm for encryption and decryption.

5.6 The bidder shall design a reliable, interference free & robust communication network keeping in view the site conditions. It shall be flexible in terms of providing communication in variable terrain & urban density. The bidder shall design the network architecture keeping in view the existing and planned infrastructure of the utility. During designing, suitable consideration shall be kept for future expansion as per requirement of Utility. The entire infrastructure & associated works required for installation & commissioning of equipment/devices like DCUs, repeaters, routers etc. shall be in the Scope of bidder. The operational testing of all the network elements has to be demonstrated by the bidder to the satisfaction of the utility.

5.7 The Bidder shall provide the necessary software which would enable a local PC/ DCU to:

5.7.1 Accept the data from the Optical/Ethernet/WAN and store it in its memory in user defined formats (text, csv, xls, etc.) in a user-defined file name (file name format must be dd mm yy substation name-utility name).

5.7.2 Polling feature along with a task scheduler to run the data downloading software at a pre-designated date and time repeatedly or by manually selecting a meter. File naming for such downloaded data should also be in user-defined format**.** A detailed activity log shall

also be available for each downloading operation.

5.7.3 Upload/Import meter data (binary files) in the software for further processing. While uploading, there shall be provision to upload all selected files with single key-stroke.

5.7.4 Convert the binary file(s) to text file(s).There should be provision to select multiple files based on filename, convert all selected files with single key-stroke and store the text files in the same location where binary files are stored.

5.7.5 Display the collected data on PC's screen in text format, with forward / backward rolling.

5.7.6 Print out in text format the data collected from one or more meters, starting from a certain date and time, as per operator's instructions.

5.7.7 Transmit the collected data, in binary format, through an appropriate communication link to the central computer, starting from a certain date and time, as per operator's instructions.

5.7.8 Store the collected data in binary format, on a CD/Pen Device. In addition to above, in general the software shall be able to convert IEMs data to existing format as well as in tabular (.csv) format as applicable.

5.8 The above software shall further ensure that absolutely no tampering (except erasing of complete data with password protection) of the collected metering data is possible during its handling by the PC. The software shall be suitable for the commonly available PCs, (Windows) and shall be supplied to Owner in a compatible form to enable its easy loading into the PCs available (or to be installed by the Owner/others) at the various substations.

5.9 The bidder shall ensure data integrity checks on all metered data received from data collection systems.

5.10 The quality of installation of the various equipment & power supply wiring to all field equipment shall be as per standards/ regulations/prevailing practices of the utility. The supply of electricity needed for operation and maintenance of entire Metering system shall be provided free of cost by the respective owners of the premises.

6. Quality Assurance

The quality control procedure to be adopted during manufacturing of the specified equipment shall be mutually discussed and finalized in due course, generally based on the established and proven practices of the manufacturer. The software shall be user friendly which can be easily installed in any PC / Laptop irrespective of operating system of the PC / Laptop, and shall be certified for ensuring data handling capabilities. The same shall be demonstrated by the party during technical evaluation.

7. Testing

7.1 All equipment, after final assembly and before dispatch from manufacturer's works, shall be duly tested to verify that is suitable for supply to the Owner. Routine and acceptance tests shall be carried out on the meters in line with IS 14697.

7.2 An**y** meter which fails to fully comply with the specification requirements shall be liable to be rejected by the Owner.

7.3 Acceptance Tests for PC Software and data down loading using meter communication ports-

All IEMs after final assembly and before dispatch from Bidder's/Manufacturer's works shall be duly tested to verify that they are suitable for downloading data using meter communication ports shall be subjected to the following acceptance test.

7.3.1 Downloading Meter Data from the Meter(s) to PC via optical port.

7.3.2 Downloading meter data through USB port.

7.3.3 Downloading meter data to DCU through Ethernet port.

7.3.4 Compatibility with PC Software.

7.3.5 Functioning of Time synchronization, advance and retard time commands.

7.3.6 Per meter downloading time verification.

7.4 Copy of Test certificate shall be submitted to MSEDCL/OWNER.

8. Type Tests

8.1 One (1 Nos.) meters per lot shall be subjected to the complete range of type tests as per IS14697 and IS15959, after final assembly. In case of any failure to pass all specified tests,

the bidder shall arrange to carry out the requisite modifications/ replacements in the entire lot of meters at his own cost. After any such modifications and final assembly, One (1) meters selected out of the lot by the Owner's representative shall be subjected to the full range of type tests. The lot shall be accepted by the Owner only after successful type testing.

8.2 The meters used for type testing shall be separately identified, duly marked, and supplied to the Owner in case they are fully functional and as good as other (new) meters, after necessary touching up/refurbishing. In case this is not possible, the bidder shall provide their replacements at no extra cost to Owner.

8.3 The Bidder shall arrange all type testing specified above, and bear all expenses for the same.

8.4 Copy of Test certificate shall be submitted to MSEDCL/OWNER.

9. Installation and Commissioning

The static energy meters specified above shall be installed at various Substations owned by the DISCOMs throughout Maharashtra. The tentative list of substations along with the required number of meters to be installed is enclosed as Annexure-AD.

The Bidder shall be responsible for total installation and commissioning of the meters (along with test blocks, if supplied separately) as per Owner's advice, including unpacking and inspection on receipt at site, mounting the meters on existing control and relay panels at suggested height, connection of CT and VT circuits including any required rewiring, functional testing, commissioning and handing over. The Bidder's personnel shall procure/carry the necessary tools, equipment, materials and consumables (including insulated wires, lugs, ferrules, hardware etc.)

9.1 As part of commissioning of DCDs the Bidder shall load the software specified in clause 6 into the PCs at the respective substations, and fully commission the total meter reading scheme. He shall also impart the necessary instructions substation engineers. At least 2-hour training session shall be arranged for substation staff. Also, an operating manual (pdf as well as hard copy) of the meter containing all details of the meter, various data downloading features, etc. shall be made available at site and SLDC.

9.2 Bidders to check the dimensions of the existing SEM's. IEMs shall fit in the same location in the panel, wherever feasible.

9.3 Following technical information shall be furnished by the Bidders in their offers:

9.3.1 Foreseen dimensions of proposed meter.

9.3.2 Expected weight of proposed meter.

9.3.3 Dimensions and weight of the test block, if supplied separately.

9.4 At the time of commissioning, the meters shall be either time synchronized through GPS signal or time set through HHU/BCS (BASE COMPUTER SOFTWARE) before installation in the panel to avoid the large time mismatch. Every meter installed shall be time synchronized.

10. General

10.1 The meter shall be supplied with latest/compatible software. Any new software as required to be installed within warranty period are to be done by party or through remote support to client.

10.2 The total arrangement shall be such that one (1) operation (click on "data down load from meter" button on software) can carry out the whole operation in about five (5) minutes per meter or preferably faster.

10.3 Above specification is minimum only, any higher standard required for the purpose intended (meter data handling) would be assessed by vendor and would be supplied accordingly. The detailed architecture shall be approved during drawing approval stage.

10.4 Meter shall be accommodated in existing C&R panel of standard size (Alstom/ ER/ABB/Siemens) in kiosk or C&R panel with door closed. If IEM cannot be accommodated in the existing C&R panel then a separate panel for IEMs is to be provided. Requirement will be ascertained during final survey. If required before bidding, bidder may collect necessary data.

10.5 Step by Step procedure (on screen shot type and desktop video capture) shall be provided for

10.5.1 Installation/Re-installation of Database handling software in to Laptop / PC

10.5.2 Meter maintenance/site-testing procedure as per relevant IS/IEC standard.

10.5.3 Procedure for data downloading from Meter by HHU/Laptop/Desktop PC.

10.6 As on date of delivery, the supplied meters shall comply with all statutory regulation as required under CERC/MERC/CEA/IEGC as applicable and the same should be declared by the vendor during delivery along with warranty certificate. Delivery schedule shall be extended in case of any modification in specification required by CERC/MERC/CEA/IEGC during the delivery period.

10.7 Dismantling of existing SEMs and handing over the same at nearest owner location, shall also be in the scope of bidder. (format for dismantling and handing over of old meter shall be given at time of order/LOI) .

CHAPTER – II: DATA CONCENTRATOR UNIT (DCU), COMMUNICATION & AUTOMATED METER DATA READING (AMR) SYSTEM

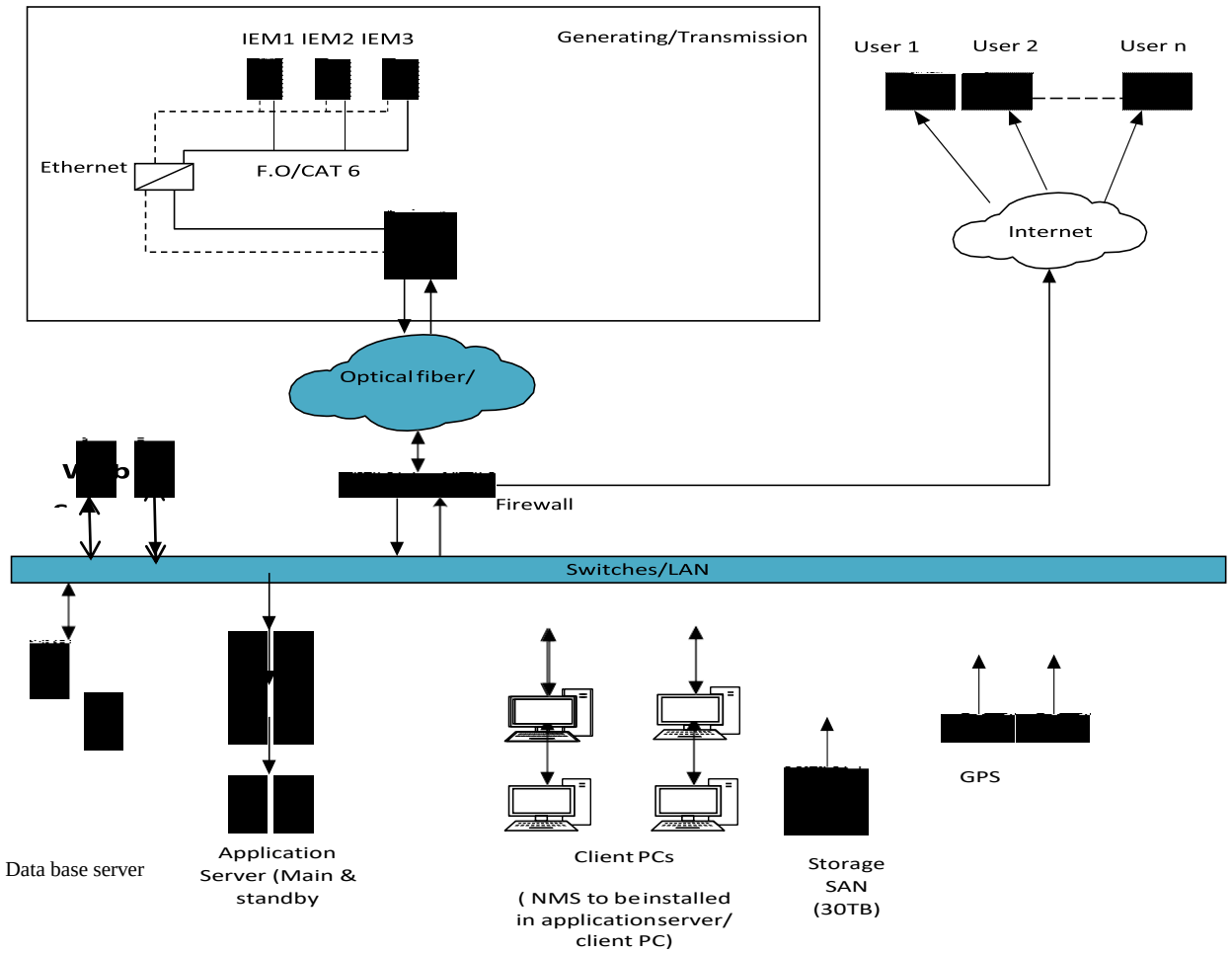
This section describes the envisaged system architecture of Automated Meter-data Reading within the Region.

1. Intent of AMR

The intent of AMR scheme proposed in this document is to automate the task of data collection from each meter/location to the Central Data Collection System (CDCS) followed by validation, processing and generation of customized reports. The data shall be stored in ORACLE Enterprise Edition database latest available version with RAC storage to provide 99.9% availability located at State Load Dispatch Centre located at Airoli, Navi Mumbai.

The communication system for data transfer from IEM to SLDC be in the scope of Bidder. Concept diagram of the envisaged AMR system is given **in Figure-2:**

Concept diagram of the envisaged AMR system:



1.1 Energy Meters

Energy Meters to be covered under proposed AMR system are Interface Energy Meters (IEMs) manufactured as per Technical Specification illustrated in this document.

1.2 Data Concentrator Unit

A Data Concentrator Unit (DCU) installed at each location will act as interface between Central Data Collection System (CDCS) at SLDC and IEMs installed at that location. DCU shall collect data from energy meters and sent the same to CDCS at SLDC. DCU shall also report diagnostic information of the energy meters to CDCS. DCU shall have following functions:

1.2.1 Acquiring energy data and status from energy meters.

1.2.2 Providing energy data and status to CDCS.

1.2.3 Intelligence to synchronize IEMs clock with GPS clock located at Station/CDCS. Each meter has a unique identification number and each meter location has unique identification code. DCU shall collect data from a single or group of meters based on meter number or meter location code. DCUs shall collect data from energy meters and transfer the same to CDCS. DCUs should provide a RS-485/LAN/USB port for communication with local personal computer or terminal, if available

1.3 Communication System

Communication system to be used for transfer of data from DCU to CDCS may be Optic Fiber / VSAT/ G S M / Internet/3 G / 4G/2G. Bidder is free to suggest alternative communication media if it is more efficient and cost effective.

2. Scope of Work

This section provides detailed scope of work included in the bidder's scope, excluded from the bidder's scope, facilities to be arranged by bidder and facilities to be provided by station owner.

2.1 Bidder's Scope of Work

The scope of work in complete conformity with subsequent sections of the specification shall include site survey, planning, design, engineering, manufacturing/integration, testing, supply, transportation & insurance, delivery at site, storage, installation, commissioning, demonstration for acceptance and documentation of AMR system

including:

2.1.1 Design Document for complete AMR System.

2.1.2 Software Requirements Specifications for DCU.

2.1.3 Making data available up to CDCS system at SLDC.

2.1.4 SAN storage for storage of meter data for 5 years

2.1.5 Data Collection Unit (DCU).

2.1.6 Connection and interfacing of meters with DCU.

2.1.7 Supply and laying of optical fiber at the stations for connection of IEM to DCU.

2.1.8 GSM/GPRS/ Modems, Media converter, Switch

2.1.9 All cabling, wiring, terminations and interconnections of the equipment.

2.1.10 Database development, Displays and Reports.

2.1.11 Archival and retrieval of data through ORACLE Enterprise Edition database latest available version with RAC and with HA (High availability provided by remote mirroring of database storage) database at SLDC.

2.1.12 Periphery segregation shall be in line with established cyber security standards.

2.1.13 Warranty and support & maintenance as per Sec-VII. The intent of the project is that the bidder shall ensure 100% data availability at SLDC within the stipulated time as per IEGC within the warranty period. The successful bidders have to maintain adequate spares during seven years of the warranty period.

2.1.14 To maintain extra 20% quantity of AMR equipment as backup and future requirement.

2.2 Exclusions from Bidder's Scope of Work

Followings are not included in the scope of the bidder and shall be provided by local station without any extra cost to bidder:

2.2.1 Space for installation of IEMs, DCU at respective locations.

2.2.2 Auxiliary Power Supply for IEMs, DCU at each location.

2.2.3 Communication channels between DCU and CDCS

2.2.4 Any other work which is not identified in 2.1 & 2.2 or in the specification but is required for completion of the project within the intent of this specification shall also be in the scope of the Bidder without any extra cost.

3. Functional Requirements

Major components of the AMR System to be implemented under the scope of this specification document are Data Concentrator Unit,. This section enumerates the functional requirements of each component.

3.1 Data Concentrator Unit (DCU)

DCU is to function as a gateway between Central Data Collection System (CDCS) and energy meters installed at DCU location. DCU shall have following functions:

3.1.1 Acquiring energy data and status from energy meters.

3.1.2 Providing energy data and status to CDCS.

3.1.3 Providing energy data and status to local computer, if available.

3.1.4 Time synchronization of IEM's, either through GPS installed at site or through CDCS.

Application Requirement: Data Concentrator Unit (DCU) along with the suitable enclosure shall be placed in the control room in the Substation/ Generating Plant. DCU is functionally requires to acquire the IEM data and transferring the same to Data Control Center using communication system and AMR software.

3.2.0 General Construction

- DCU shall be a self-contained, standalone box with minimum 1 serial (RS485) port for meter connection and with one RJ45 Ethernet 10/100/1000mbps port. DCU shall be IEC 61850-3 compliant. DCU shall have in built modem or external modem facility. DCU shall have Modbus port in addition to DLMS.
- DCU should be flush mounted or surface mounted and to be supplied with suitable enclosure for installation in the control room. The enclosure shall be complete with the internal wining and have all the necessary arrangement for the termination of various communication and power cables in the enclosure.
- DCU should not have any moving parts such as a hard disk, to ensure smooth and reliable operation for long term.
- The DCU shall be normally powered from the station battery backup supply rated at 110/220 VDC/ 230VAC.

- DCU should have protection against entry of dust.
- Substantial EMI (Electro Magnetic Interference) and ESD (Electro Static Discharge) will be present at DCU site, effect of which shall be duly considered while designing the system. Performance of the overall system shall not be hampered by such interference. EMI/ESD tolerance shall comply with IEC61850-3 standard.
- DCU should be able to operate in environment with temp up to 45ºC and humidity up to 90% without any significant effect on its performance.
- The mechanical design and construction of each unit sub-assembly shall be inherently robust and rigid under various conditions of operation, adjustment, replacement, storage and transport.
- DCUs shall also withstand without any damage or mal-operation reasonable mechanical shocks, earthquake forces, ambient temperature variations, relative humidity etc. They shall have an IP-54 or better category dust-tight construction, and shall be capable of satisfactory operation in an indoor, non-air conditioned installation.

3.3 Local Display and LEDs

LEDs for status like power on, communication activity etc. should be provided on the face of DCU.

4.0 Communication with MDAS

Entire project has to be primarily based on GPRS/Internet/VSAT/2G/3G/4G network and OPGW where ever available.

Communication system should meet following requirements:-

- All communication between DCUs and MDAS should be through secured Virtual Private Network (VPN) tunnel (encrypted data) which shall be transparently managed between each DCU and the MDAS.
- For communication with MDAS, each DCU should be provided with Ethernet port. This is needed even for substation that presently does not have OPGW since OPGW is likely to be added in the future. For locations that does not presently have OPGW, built-in GPRS modem capable of transferring the data to MDAS using TCP socket communication using DLMS/COSEM protocols. In both cases there shall be no requirement to assign public static IPs to this GPRS device.

- A fixed public IP shall be provided for the internet landing point at central location where MDAS to connect the GPRS/3G/2G/Intern et network to MDAS.
- Transfer of data from DCU to MDAS should be on physical Ethernet and secured VPN form**.**
- The DCU should be able to run the meter protocol drivers to read each type of meter and transfer them to the Control Centre. The DCU must support DLMS/COSEM (HDLC & TCP) as well as MODBUS to communicate with meters.
- DCU should be capable of GPRS/3G operating at 900, 1800, 2100 MHz should support both Data and SMS transmission. It should have both GSM and GPRS/EDGE/3G/2G/Internet features.
- DCU should support TCP, UDP, HTTP, FTP, SMTP, Max.
- DCU should have capacity to report to different three masters. (one MDAS & another on IEC104 protocol to SCADA server and one spare)

4.1.1 Acquiring energy and status data from energy meters

DCUs shall be connected with local energy meters through optical fiber with suitable media converter (which shall be DC powered) / switch in between. Connection to the local energy meters shall be firm and secure from any unintended disconnection. DCU should implement IEM protocols. It shall be possible to change/update the energy meter protocol driver from CDCS. DCUs shall not send any command other than the command to read the energy data, status data and GPS clock synchronization of IEM clock. Several RE pooling stations are expected to come in Maharashtra. It is envisaged that the number of meters at RE pooling stations would be very high. Thus high speed fiber optic connection between IEM and DCU is desirable to ensure timely collection of data.

4.1.2 Providing Energy Data and Status to CDCS

DCUs shall be provided with suitable SIM/modem etc. in order to have connectivity over Optic Fiber/VSAT/ G S M /2G/ 3 G / 4G/Internet with SLDC. All communication between DCU and CDCS shall be on secure VPN. DCU shall accept following commands from CDCS/GPS Clock and shall function as per the command:

4.1.2.1 Energy data collection from energy meters.

4.1.2.2 Acquiring status and alarm from energy meters.

4.1.2.3 Modification of DCU Configuration

4.1.2.4 IEM clock synchronization with GPS clock.

5.1.1 Energy Data Collection

DCUs shall query energy data and transfer the same to CDCS based on the command received from CDCS. Command may be for one time demand of data or it may be on cyclic 24 bases. DCU shall be able to query data from all or selected energy meters for the selected period based on the command from CDCS. DCUs shall be able to read energy data from all make of energy meters available in the market like L&T, Secure and Elster, etc. supplied as per this Technical Specification.

Each meter has a unique identification number and each meter location has unique identification code. DCU shall collect data from a single or group of meters based on meter number or meter location code. DCUs shall collect data from energy meters and transfer the same to CDCS. As DCU functions on read and forward philosophy for energy meter data, no storage is envisaged in the DCUs for energy data. However, if vendor thinks that provision of storage in DCUs may be required to meet the requirements of the AMR system, storage may be provided. However, such storage shall take care of currency of data while responding to commands from CDCS.

5.1.2 Status Data Collection

DCUs shall query periodically all energy meters connected to it for status or any alarm etc. Any change in status or alarm shall be reported to CDCS immediately.

DCUs shall acquire connected energy meter details like meter identification number, make, Low Voltage flag etc. periodically as well as whenever it's powered on. Any meter change activity like meter number, Low Voltage flag etc. shall be reported to CDCS immediately.

DCUs shall be self-monitoring for alarm like power failure, communication disconnection, and disconnection from energy meters and report the same to CDCS immediately.

DCUs shall have non-volatile memory for storing status data of energy meters duly time stamped, details of connected meters like make, meter number, status change. Non- volatile memory should be able to store such data for at least one month in round FIFO buffer.

5.1.3 DCU Configurations change

Each DCU shall have a unique identification number normally not required to alter at site. DCUs shall accept and respond command for making configuration changes in DCU like periodicity of energy data/status data collection/GPS clock signal for IEM clock synchronization. For each configuration change, DCU shall respond with task successful or failure message to CDCS. Configuration commands from CDCS may be in the form of single command or multiple commands in a command file. DCU shall accept and make changes in configuration through data command on GSM / 3G / 4G/2G/Internet. DCU shall receive the configuration command from CDCS on same channel used for transfer of data to CDCS. DCUs shall store all configuration data locally in a separate non-volatile memory. All changes to configuration shall take place first to this memory. Only after receiving a specific command from CDCS, the saved configurations should come into effect. However, any other functionality should not get affected during accepting and responding to configuration commands from CDCS. DCUs are not required to store history of configuration changes as all history shall be maintained in CDCS.

5.1.4 IEM clock synchronization with GPS clock

DCU shall have the intelligence to synchronize the IEM clock time with GPS clock time. Input GPS clock signal to DCU shall be from CDCS (at SLDC) GPS clock. If CDCS clock synch signal is not available to DCU, DCU will get GPS clock reference from station GPS.

6.1.1 Providing energy data to local computer/Laptop

DCUs shall have provision for communication with local personal computer/laptop. DCU shall provide meter status, alarm etc. and energy data to local personal computer, if required. Local PC shall be able to query energy data from selected or all energy meter by using web browser and intuitive user interface. The web browser shall be same as CDCS web browser to access the IEMs installed at local station. No special software should be required to be installed at local computer for this communication. All communication with local computer shall be password protected. PC for data downloading at each DCU location shall be arranged by respective site/ utility. (Local PC is not considered under present scope)

6.2.1 Communication with DCUs

The CDCS shall have a dedicated Communication Server – This shall manage the VPN Connections, DCU Communication, Alarm management, Logging, DCU Configurations as well as GPS clock signal to DCU. The Interface of the Communication Server shall be standards based such that, up gradation of either Communication System or Application Server will not need a commensurate replacement of the other. The CDCS shall have a Network Management Interface that provides a Dash Board of the DCU's and their status / Alarms and Meter's that are not communicating.

6.2.2 Collection of energy data from DCUs

CDCS shall collect data from energy meters through DCU for selected/configured meter location periodically or on demand at any time. CDCS shall have scheduler software, which shall issue command to the concerned DCU and collect the required energy meter data. It shall be possible to schedule data downloading on hourly basis.

6.2.3 Collection of status data from DCUs

CDCS shall have a DCU monitoring module. This module shall monitor each DCU for its working status, parameters and any alarm etc. The monitoring data shall be collected periodically or on demand at any time from all or selected DCUs. Possible periodicity of data collection would be once in a day.

6.3.1 Remote Configuration of DCUs

CDCS shall be provided with software module for remote configuration of selected or batch of DCUs. Remote DCU configuration module should be able to configure each parameter of DCU individually or in batch mode. It shall be possible to download the following changes to the remote device in addition to other required changes:

6.3.1.1 Poll cycle for collection of energy data.

6.3.1.2 Fixed public IP of CDCS server of the Control Centre

6.3.1.3 Changes in meter protocol driver.

6.3.2 Processing of energy data

Collected energy meter data (5-min) shall be provided to the data processing module. The time block period of the raw output from CDCS shall be used defined (5/15-min). This

module shall check the data for completeness, error etc. and if any error is found, the same shall be displayed as an alarm.

6.3.3 Storing of data

If collected data is error free, it shall be provided to a data storage module. Data storage module shall load the collected energy data in to the database as per its structure. Archival of data shall be through ORACLE Enterprise Edition database latest available version with RAC and with HA.

MSEDCL is the absolute owner of all data collected and stored in the database and all data should be made available to authentic MSEDCL user using ORACLE DATABASE access or in any open format like XML or JSON.

Any changes in data by the human should be properly audited with all details and system should be made completely full proof from external tampering

7. General Requirements

Components of AMR system shall meet following physical requirements:

7.1 Data Concentrator Unit (DCU)

7.1.1 General Construction

7.1.1.1 DCU shall be a self-contained, stand-alone, tamper proof sealed box with necessary ports for external connection. It shall be flush mounted or surface mounted without requirement of a separate panel.

7.1.1.2 DCU shall not have any moving parts such as a hard disk, to ensure smooth and reliable operation for long term.

7.1.1.3 All external connections to DCU should be secure so as to avoid accidental disconnection.

7.1.1.4 The DCU shall be powered from the station battery backup supply rated at 220V/110V DC supply or normal AC supply.

7.1.1.5 DCU shall have protection against entry of dust, lizards etc be IP54 compliant. Ingress protection level may be decided on the basis of Indoor/outdoor installation.

7.1.1.6 DCU shall be able to operate in environment with temperature up to 50ºC and humidity up to 90% without any significant effect on its performance.

7.1.1.7 The mechanical design and construction of each unit sub-assembly shall be

inherently robust and rigid under various conditions of operation, adjustment, replacement, storage and transport.

7.1.1.8 DCUs shall also withstand, without any damage or mal-operation, reasonable mechanical shocks, earthquake forces, ambient temperature variations, relative humidity etc. They shall have an IP-54 category dust-tight construction and shall be capable of satisfactory operation in an indoor, non-air conditioned installation.

7.1.2 Local Display

A local display for status like power on, communication activity etc. and alarms like power failure communication fault etc. shall be provided on the face of DCU. A web based display of DCU dashboard displaying all status; logs of activities, logs of alarm etc. shall be provided which shall be accessible from local PC as well as on CDCS.

7.2 Communication System

7.2.1 DCU shall have in-built modem or external modem facility. In case of in-built modem all modem/SIM installed shall be securely and firmly mounted on DCU itself.

7.2.2 It shall be possible to change modem/SIM without uninstalling DCU.

7.2.3 Mounting or un-mounting of modem/SIM shall be accessible from front of DCU.

7.2.4 The Modem shall meet the following environmental specifications, IP55 housing, Storage Temperature: -20 degrees to +70 degree Celsius, Operating Temperature: - 10 degrees to +60 degree Celsius, Humidity: - 95% RH (Non - Condensing).

8. System Sizing and Performance Requirements

AMR System shall meet the following system sizing and performance requirements. The system sizing and performance requirements are specified for main subsystem. Standby subsystem shall have the same sizing and performance requirements. The Acceptance of the product shall be based on the Owner/SLDC approved test protocols/ schedules to be submitted in advance by the Bidder ahead of factory/site inspection.

8.1 System Sizing

The system sizing for AMR System is only specified for initial sizing. The delivered system shall be expandable as the input and output requirements grow. Vendor is required to demonstrate their system's expandability in FAT (Factory Acceptance Test).

8.1.1 DCU

The number of meters at site may vary from 2 no. to 36 nos. Bidder shall decide the DCU requirement accordingly with sufficient future expansion capability. The detailed list of meters installed at substations as on date is attached in Annexure – AD.

CHAPTER – III: GENERAL SOFTWARE AND HARDWARE REQUIREMENTS

I. GENERAL SOFTWARE REQUIREMENTS

AMR System software shall meet the following general software requirements.

1. Upgradability and updates

Software which shall be provided as a part of present scope shall receive updates, patches, bugs, fixes to keep software up to date all the time. All software kernel/OS and application programs supplied shall be fully up-gradable through firmware upgrade and/or other software upgrade methods. The firmware/software upgrade may include

1.1 General software updates.

1.2 Adding new features and functionalities, such as supporting new data format and communication protocols.

1.3 Fixing bugs and deficiencies.

The Vendor shall keep MSEDCL informed of the latest software updates of revisions available after the system is shipped.

Users shall be able to perform the necessary software update in the field.

2. Software Security Requirements at Delivery

The development of the software for AMR system shall be done in consultation with MSEDCL. Software at delivery shall meet following requirements in accordance with general software security assurance practices.

2.1 Security Tested and Configured

All software and associated application software modules shall be the most secure version of the software available at the time of start of the Factory Acceptance Test. The delivered software shall to be tested to ensure the followings:

2.1.1 Free of computer viruses, worms, Trojan horses, and other software contaminants

2.1.2 Unused services are disabled / removed; this includes device drivers for devices not included in the hardware.

2.1.3 Unused networking protocols.

2.1.4 Unused administrative utilities, diagnostics, network management, or system management functions.

2.1.5 Administrative utilities, diagnostics, network management, or system management functions or workstations unused by administrators.

2.1.6 Backups of files, databases, and programs, used during system installation/upgrade but not needed in the operational system

2.1.7 Accounts that are not End-User Administrator shall be removed, this include any guest accounts (with and without passwords) or default administrator or maintenance accounts other than the initial system administrator account for Procurement Entity or any guest accounts or default administrator or maintenance accounts for any third party software.

2.2 Maximum Initial Security Settings

The software shall be shipped with all security settings at their maximum setting. All software shall be delivered with all the latest relevant patches installed.

All security-related parameters and options shall be placed at their most restrictive settings at the delivery, i.e. affording the access and execution privileges to the smallest class of users consistent with meeting the functional specifications, and restricting their rights to the narrowest range of privileges.

2.3 No Automatic Downloading and Execution of Executable Code

It shall not be possible to download any executable code into the DCU and execute the downloaded software code automatically without system administrator's (MSEDCL) approval. All software shall be removed that would otherwise make it possible to execute a scripting language (such as Active X, Java, Java scripts, etc.), including software in the browser and e-mail processor, where applicable.

2.4 File Access Control

The DCU software shall support controlled access privileges for files, including at least access, read, write, execute and combinations of these. The access privileges for each user can only be assigned by system administrator of /DCU as the case may be, and shall be assigned on an individual user account basis.

The default access privileges for each new user account shall be no access to any file on the system at all.

No user, including system administrator, shall be given the privilege of modifying

operating system files and other files that are never supposed to change while the system is running.

2.5 Free of "Electronic Self-Help" Enabled Software

It shall be strictly prohibited for delivered software to contain embedded faults or back-door mechanisms that allow the software manufacturer to remotely disable some or all of the functions of the software, or affect their performance, or in any way degrade its operation (so-called "electronic self-help" in the terms of the Uniform Computer Information Transactions Act). The software shall not contain any mechanism that automatically disables some of all of its functions or degrades their operation on a certain date or upon the occurrence of a specific event.

3. Application Software Modification

Modifications in application software to comply with the prevailing CERC/MERC regulations for energy accounting and/or to implement the decisions at the WRPC level shall be in the scope of the vendor. These modifications shall be considered as a part of Scope. The modification shall be done in consultation with MSEDCL.

4. Source Code

After completion of the project, Table Structures, data structure and functional modules (with proper detail documentation) with ER diagram/Table description diagram shall be handed over to MSEDCL. Interface for any required changes in the configuration for ex. Addition/deletion of interface points, data extraction in the required format etc.

As per MSEDCL requirement all the credential (user name & password) of any software (Standard/customized)/hardware/OS/database developed should be share with MSEDCL through proper channel.

5. Essential characteristic of system

Target system provides following essential properties

1) **Accessibility**: The system should able to provide all access to all data in open format which is generated by all entities which is required for decision making irrespective of the support of vendor who has supplied the component.

2) **Durability**: The system should provide full data guarantee irrespective of any type of hardware, network or any such failure. The system should sustain for all types of failure and

provide plan to overcome from such failures. The system should also ensure that there should not be any data loss due to operating conditions.

3) **Security:** The system should ensure be full proof for any security hacks.

4) **Scalability**: The system should be scalable system at each level so that scalability should be achieved by adding component not by replacing them.

5) **Functional Completeness**: The target system should be fully functionally complete and provide data & processing for all external systems like accounts and finance.

6) **Performance:** The system should have real time response and such measures should be provided for each level

7) **External interfaces**: The system should be able to interact with external system like MIS and GIS system to accomplish total system optimization. It should also accommodate the external system and should provide uniform data views.

8) **Standard**: The component which will be used to provide build the system should indicate and maintain standards.

9) **Maintainability:** The system can be fully maintained by the MSEDCL in future. The vendor should provide the source code, full configurable software, data dictionary, data flows, documentation to incorporate new changes as well as operations, adequate training at each level.

II. GENERAL HARDWARE REQUIREMENTS

AMR System shall meet the following hardware requirements.

1. Operating Environment

AMR system & hardware shall be supplied that shall be suitable to operate in environment indicated in the service conditions without any significant effect on its performance.

2. Security Requirements

AMR System & hardware and packaging design shall meet physical security requirements like measures to prevent unauthorized access to certain system hardware components.

3. Network Monitoring Tool

MIS Reports: Bidder shall submit the following reports on a weekly basis in a mutually decided format.

1. Summary of issues/complaints logged with the OEMs.

2. Summary of changes undertaken in the Data Centre including major changes like configuration changes, patch upgrades etc.

3. Summary of any configuration changes or any service/hardware installed in primary Data centre.

4. Summary of system's rebooted.

5. Detail report of issues/complaints which are un-resolved with appropriate reason.

6. All relevant reports required for calculation of SLAs.

7. Consolidated report for resource wise availability and resource utilization.

8. Report showing resource wise exceed of pre-defined threshold parameter.

CHAPTER – IV: DOCUMENTATION REQUIREMENTS

Documentation of AMR system shall meet following requirements. All documents shall be supplied in hard copies as well as computer readable soft version:-

1. Design Documents

Before starting the manufacturing of the AMR system components, a design document shall be submitted. The design document must essentially (but not limited to) included:-

- System Overview
- Functional diagram
- Flow diagram
- Functions of each major component
- Physical details of each major component
- Overall networking scheme
- System configurations
- Cyber Security Provisions

2. Software Requirement Specifications Document

After approval of Design document software requirements specifications (SRS) document for the application software for DCU should be prepared and submitted for approval. This SRS should be prepared as per IEEE standard 830 of latest version for recommended practice for software requirements specifications. Software should be designed as per approved SRS.

3. User Manuals

Following user manuals shall be prepared and supplied for the system:-

3.1 User Manual for Sub-station

Separate user manual shall be provided which shall be used by the users located at DCUs site. This user manual shall contain details of IEMs, external connections to DCU, communication system, block diagram of system at DCU site, instructions of using DCU system, trouble shooting of DCU system etc. This user manual should be self-contained and shall not require any external reference document in order to use and trouble shoot DCU system.

3.2 Training Documents

Training document to be used during training of site personals shall contain major functional details of the overall metering system, its features and major instructions for understanding the overall working of the system.

3.3 Testing Documents

Testing documents shall be prepared and submitted as per Testing Requirements section of this specification.

CHAPTER – V: ACCEPATANCE TEST PLAN & PROCEDURE (SAT / FAT)

All equipment, materials and software for AMR shall be subject to both Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT). The purpose of Acceptance Testing is to determine compliance to this specification in every respect in regard to the delivered and installed system.

1. Acceptance Test Plans and Procedures

The Vendor shall develop and document proposed Test Procedures and Test Plans for Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT) of the delivered and commissioned system and its components. Vendor shall finalize the proposed FAT and SAT acceptance test plans and procedures. The final Test Procedures and Test Plans shall be subject to review and approval prior to testing.

The Acceptance Test Plans (ATP) shall enable MSEDCL to verify the ability of the delivered and commissioned system and its components to individually and simultaneously fulfill all functional and performance requirements of the system set forth in the contract through a series of mutually agreed to structured tests.

All system documentations shall be completed, reviewed and approved by MSEDCL in consultation with SLDC before any testing.

The ATP shall include, but not be limited to, functional tests that demonstrate compliance of the functional, performance, software, hardware, communication, interface, and operational aspects of the delivered and installed system.

2. Factory Acceptance Test (FAT)

The Vendor shall perform a preliminary FAT (Pre-FAT) prior to the FAT. The pre-FAT shall be a complete dry run of the FAT, following the test plans and procedures. The intent is for the Vendor to detect and correct most design, integration, and database, display, and performance problems prior to the FAT. The representatives of MSEDCL shall have the right to witness all or parts of pre - FAT for which vendor shall intimate MSEDCL in sufficient advance.

Test results (including documentations and certifications) for tests conducted by Vendor or third parties that are not included in the FAT test plan and procedures shall be furnished to MSEDCL prior to FAT for review and evaluation. Vendor and/or third parties conducted tests deemed inadequate shall be repeated until accepted by MSEDCL

Vendor's project manager shall sign off each test of Pre-FAT. The completed test results shall be sent to MSEDCL for review before their representative's travel to the Vendor facilities for the FAT. All tests shall be conducted using the contract-specified databases unless MSEDCL authorizes the Vendor to use a test database.

The FAT shall be conducted according to the FAT Test Plan and Test Procedure documents approved by MSEDCL in consultation with SLDC shall cover, as a minimum:

- **Visual Inspection** – To verify that the system to be delivered has all required components and is properly configured. Visual inspection shall verify acceptable workmanship and that all equipment, including cables and connectors, are appropriately labeled

- **Hardware Diagnostic Test** – Individual tests of all system hardware. These tests shall consist of running standard hardware diagnostic programs, plus all special diagnostic programs used by the Vendor.

- **Communications and Interfacing Test** – Verify that all interconnected system components, such as data acquisition, control, monitoring, and data management functions are operating properly when correctly connected.

- **Software Development Tools** – Verify that all required software development tools, utilities, software diagnostics, and debugging tools for the system, including the UI and database, are included in the system and are functioning correctly.

- **Functionality verification** – Verify that all system functions are working normally as set forth in the contract.

- **Performance Testing** – Verify that the system throughput, timing and response time requirements are satisfied. Tests shall include verification of:

✓ Data exchange times

✓ Local and remote request response times

✓ Communication latency

✓ User Interface function response time

- **Security Testing** – Verify that the system meet the software at delivery security requirements and other aspects of secure operation and system access including:

✓ Communication error detection capabilities

✓ Correct operation of system configuration, control, maintenance, and management procedures

✓ Safe system recovery with no erroneous data or control operation generation after system restarts.

✓ Protection against unauthorized access to the system and control functions

- **Environmental Testing** – Verify that

✓ All system functions shall operate correctly over the specified temperature range.

✓ The accuracy of the inputs and outputs remain valid over the specified temperature range.

The test schedule shall allow sufficient time for verification and/or additional unstructured testing by the SLDC/MSEDCL's representative, who shall be able to schedule unstructured testing at any time, including during structured tests.

3. Site Acceptance Test (SAT)

The SAT will be conducted by the OWNER with support as required from the vendor after the system has been installed and commissioned. The system will be subjected to a subset of the functional and performance tests. The SAT will also include any type of testing that could not be performed in the factory. Unstructured tests will be employed by the MSEDCL and SLDC's representative, as necessary, to verify overall system operation under field conditions. Any defects or design errors discovered during the SAT shall be corrected by the Vendor. The SAT includes the commissioning test, the functional and performance test, and the cyber security audit after the installation of the delivered system.

3.1 Commissioning Test

The commissioning tests shall be conducted by the vendor and include:

- The same visual inspection and verification as in FAT
- Loading of the software and starting the system. At the option of the MSEDCL, all software shall be recompiled from the source or distribution media.

- Interface of the AMR System to communications facilities for all data sources and other systems that interface with the AMR System.

- Initialization and preliminary tuning of application software as needed.

3.2 Site Functional and Performance Test

The site functional and performance test ("site test") shall be comprised of a subset of the functional and performance tests conducted in FAT. The tests to be performed shall be proposed by the Contractor and approved by MSEDCL in consultation with SLDC. These tests shall be extended as necessary to test functions simulated during the FAT, such as communications with all field devices and all other systems that interface with the CDCS.

3.3 Site Cyber Security Audit

The site cyber security audit shall repeat the audit performed during factory testing.

3.4 Test Approval

The Vendor shall maintain a complete computer record of all test results with variance reporting and processing procedures for approval by MSEDCL and SLDC. In the event that the AMR system does not successfully pass any portion of the Acceptance Testing, the Vendor shall notify the MSEDCL and SLDC of the specific deficiency. The Vendor shall promptly correct the specified deficiency, which will then be re-tested until successful.

CHAPTER – VI: SCOPE OF WARRANTY

SUPPORT AND MAINTENANCE REQUIREMENTS

Vendor shall provide onsite as well as remote support in order to keep system operational with system functionalities and performance in accordance with the specifications.

1. Scope of Warranty

During warranty period, vendor would be responsible for repair/ replacement/ modification/ rectification of software, hardware either manufactured or bought out. Warranty covers all IEM, DCU, switches, severs, software and all other equipment of AMR. It will be bidder's responsibility to update the software's used in AMR scheme including data availability throughout the warranty period without any extra charges to MSEDCL.

Addition/Deletion of IEMs in the MDAS database and application software shall be the responsibility of the Bidder without any extra cost to MSEDCL during the warranty period.

The bidder should provide ATS (Annual Technical Support) for ORACLE & other application software's during the warranty period (7 years).

2. On-Site Support and Maintenance

Vendor shall maintain a team of skilled personals having sufficient knowledge of the system in order to diagnose and set right any problem in AMR system in minimum time. Since, the locations of DCUs under this AMR system is geographically spread across entire Maharashtra, the vendor shall locate its supporting personals so as any problem may be rectified within 48 hours of reporting.

Vendor shall maintain an online web based help desk system on its own website for logging complaints and checking the resolution status round the clock on all days of the year. Web based help desk shall be accessible to the user through browser via Internet. Separate username and password shall be provided with separate privileges for users of central site as well as DCUs site. DCUs site user shall be able view logs of complaints and status logged by that user only. However, MSEDCL shall be able to view logged complaints and their status irrespective the initiator of compliant. Any complaint shall remain open until and unless approved its closure by MSEDCL. All logs shall be suitably time stamped. The severity level of the complaint shall be assigned by MSEDCL

Vendor shall post one Full Time Equivalent (FTE) resident engineer to central site

throughout the warranty period in order to diagnose and set right any problem in AMR reporting system in minimum time. He/she shall coordinate with the substation personnel and the back end team of the vendor for complaint resolution. Resident engineer shall be provided with mobile phone for communication for escalation of complaint.

Vendor shall maintain this mobile phone live and shall maintain same number throughout the contract period.

3. Remote Support and Maintenance

No remote login shall be permitted.

4. Updation and Patches

Vendor shall keep updated all supplied software kernel/OS and application software with all latest patches and upgrade. There shall be no separate liability for License renewable on the system user.

5. Maintenance and Support Of Brought Out Items

Vendor shall take back-to-back support from manufactures of bought out items like servers, printers and like items. However, vendor shall be responsible for all coordination work from OEM for all types of support and maintenance.

6. Charges for support services

All recurring expenditure for support services shall be borne by the vendor.

7. Problem/Defect Escalation Order

The successful bidder shall submit their organization's escalation order for this project in the following format:

Details of Vendor Executive	**Description**	**Escalation Order**
Name Designation Email ID Mobile number	Overall accountability	4th level

Name Designation Email ID Mobile number	MSEDCL Department head to interact if there is any change in business requirement or some change request need to be implemented within the existing contract or any other issue that need to have a mutual consent to move forward and if the problem/defect in the existing software is not resolved within the specified resolution time.	3rd level
Name Designation Email ID Mobile number	MSEDCL Team Lead to report if any concerns and some items within the scope need to be fixed in priority	2nd level
Name Designation Email ID Mobile number	Interactions with MSEDCL Team, to provide support, resolve the defects and work together for seamless operation.	1st level
TABLE-1: ESCALATION MATRIX		

8. System Availability

The nature of maintenance support required for systems and components are described in the Table – II below:

Sr. No.	System	Scope	System Availability
1	AMR system (Data collection and storage in database)	Hardware and software	98 %
2	MDAS & Meter Data Processing	Hardware and software	98%
TABLE-2: SYSTEM AVAILABILITY REQUIREMENT			

Bidder shall be responsible for coordination with the OEM for all matter related to that equipment. The bidder shall also be responsible for meeting the overall response times and availability requirements as specified in the specification.

The maintenance of the System shall be comprehensive and shall comprise of the following category of works which is further elaborated for each of the different subsystems:

- **Preventive Maintenance Activity** (performance monitoring, system backup, patch management, updates, emergency response and troubleshooting)
- Maintaining a minimum no. of specified spares.
- Integration of new module etc.

9.1 Preventive Maintenance Activity

The preventive maintenance activity to be performed by the Vendor to keep the system running at optimum level by diagnosis and rectification of all hardware and software failures would broadly include:

- **Repair / replacement of defective equipment** -The bidder shall be responsible for repair/replacement of all the hardware including consumables required for the various systems **within 48 hrs.**
- Monitoring of the performance of the system and doing necessary tuning for optimum performance to accommodate any changes such as addition of new components.
- Providing all necessary assistance to Owner for addition and modification of database, Database sizing activities including Backup and restore of the system.
- Restoration of the systems upon its failure and to restore the functioning of the various systems.

9.2 Hours of Cover

The vendor shall provide engineers who have an experience and skill to maintain the AMR system to the desired level of availability. The vendor's on-site support for Control center shall be standard hours of service i.e. Monday to Friday- 9:00 am to 5:30 pm local time (IST) throughout a year.

One expert Engineer on FTE basis having expertise in metering system shall be available during the standard hours of service at SLDC. The timings for Emergency Support shall be 24 hours a day, 7 days a week throughout the year.

Vendor and its personal have to follow all rules and regulations of owner's office premises in view of owner's certifications of ISO-9001, ISO-14001, OHSAS-18001 and ISO-27001 including any other future certification.

9.3 Problem/Defect Reporting

The bidder shall submit an appropriate problem/defect reporting procedure to meet the

requirement of all severity level cases to get the approval of the same from MSEDCL/SLDC.

The problems will be categorized as follows:

Severity 4 – Emergency	Complete system failure, severe system instability, loss or failure of any major subsystem or system component such as to cause a significant adverse impact to system availability, performance, or operational capability. For e.g. system crash/both servers are not working.
Severity 3 – Serious	Degradation of services or critical functions such as to negatively impact system operation. Failure of any redundant system component such that the normal redundancy is lost. For e.g. meter data of a whole station is not available/both main & standby meter data not Available / Main server not working, system shifted on standby server.
Severity 2 – Minor	Any other system defect, failure, or unexpected operation. For e.g. Main meter data is not available, however standby/check meter data is available.
Severity 1 – General	Request for information, technical configuration assistance, "how to" Guidance, and enhancement requests.
TABLE-3: SEVERITY LEVELS	

9.4 Response and Resolution Time

This section describes the target times within which the bidder shall respond to support requests for each category of severity. The Initial Response Time is defined as the period from the initial receipt of the support request (email/telephone/fax or any other communication channels) and the acknowledgment of the vendor subject to the Maximum time defined in Table -4. The Action Resolution Time shall be computed after the expiry of the ideal initial response time subject to the Maximum time defined in Table -4.

This period includes investigation time and consideration of alternative courses of action to remedy the situation. The Action is defined as a direct solution or a workaround.

Except for Severity Level 4 all response and resolution times (hours and days) specified below are working hours only:

Severity	Ideal Initial Response Time	Action Resolution Time (to be commenced after end of ideal initial response time)	Action
4	1 hrs.	6hrs.	An urgent or emergency situation requiring continuous attention from necessary support staff until system operation is restored – may be by workaround.
3	3hrs.	12hrs.	Attempt to find a solution acceptable to Owner (dependent on reproducibility) as quickly as practical.
2	8hrs.	2days	Evaluation and action plan. Resolution time is dependent on reproducibility, ability to gather data, and Owner's prioritization. Resolution may be by workaround.
1	1days	4days	Report on the problem/query is to be Furnished.
TABLE-4: EMERGENCY SUPPORT RESPONSE/RESOLUTION TIME			

The bidder shall submit the detailed format and procedure for all the activities such as Reporting time, Resolution time, Downtime etc. along with the bid proposal.

9.5 Availability Calculation

It is the endeavor of both the bidder and owner to maximize system availability to the extent possible. The bidder shall provide guaranteed availability for various types of Systems as specified in Table - 2. The non-availability hours for availability calculation shall be counted from the end of the allowed Action Resolution time. The web based help desk software application shall have features for complaint reporting, severity level assignment, initial response time stamping, remarks of the resident engineer regarding actions taken, complaint resolution time stamp and statistics for computing duration of system outage under different severity level categories. There shall be separate login for MSEDCL for certification of the complaint resolution time. The complaint resolution time

stamp shall be generated only after endorsement/acknowledgement by SLDC engineer in-charge.

Duration of outages over and above the Action Resolution time, as defined in Table - 4 in each of the Severity levels shall be counted for the non- availability computation and shall be clearly brought out in the web based help desk. The resolution may be accomplished by a work around, and such solution shall mark the end of non-availability.

In the event of frequent failures at a site, due to a common cause, the first FPR (Field Problem Report) logged shall be used for the purpose of availability calculation. However, simultaneous multiple outages due to unrelated cause would be counted separately.

9.6 Availability computation for AMR System

Availability shall be computed on weekly basis. The formula to be used for availability computation would be as under:

$$\text{Availability for per week} = \frac{\{THQ - (S4 + S3 + S2 + S1)\} \times 100\%}{}$$

Where THQ is Total hours in week

S1 is the total non-availability hours in severity level-I in the week

S2 is the total non-availability hours in severity level-II in the week

S3 is the total non-availability hours in severity level-III in the week

S4 is the total non-availability hours in severity level-IV in the week

The target availability would be 98% or better. The monthly availability will be calculated as average of weekly availability of the month. For availability calculations non-availability of data due to equipment (Hardware and software) failure will be considered. Non-availability of data to SLDC due to communication issues will not be considered for availability calculations

9.7 Reliability Indices

The following reliability indices shall also be automatically generated on weekly basis from CDCS and archived for download on demand.

9.8.1 System Average Interruption Duration Index

The System Average Interruption Duration Index (SAIDI) shall measure the average

duration for which the meter data was unavailable during a week. An Interruption shall be defined as the non-availability of meter data at SLDC end at the scheduled hour (for e.g. at 09:00 hrs everyday)

To calculate SAIDI, each interruption during a week shall be multiplied by the duration of the interruption to find the interruption time during which meter data was not available at SLDC. The time duration of all such interruptions would then be summed up to determine the total unavailability minutes. To find the SAIDI value, the total unavailability minutes would be divided by the total no. of meters. The **formula is**

$$\textbf{SAIDI} = \frac{\Sigma(ri * Ni)}{NT}$$

Where,

SAIDI = System Average Interruption Duration Index in minutes.

Σ = Summation function.

ri = Restoration time, in minutes.

Ni = Total number of meters interrupted.(due to failure/faulty)

NT = Total number of meters in the system.

For example the SAIDI for a sample week having three cases of interruptions is computed in the table below. It is assumed that the interruption and restoration in each case occurred simultaneously. It is further assumed that the system has a total of 1,500 meters.

Date of Interruption	**No. of meters whose data was unavailable at SLDC after 48hrs of reporting of failures**	**Interruption Duration (minutes)**	**Unavailability (minutes)**
Date-1	50	120	6000
Date-2	25	240	6000
Date-3	100	30	3000
Total			**15000**

TABLE-6: CALCULATION OF UN AVAILABILITY MINUTES

The SAIDI for the above case would be

$$\text{SAIDI} = \frac{15000}{1500} = 10 \text{ min}$$

This implies that on an average, each meter was out for 10 minutes in the above week.

9.8.2 Average Service Availability Index (ASAI)

The Average Service Availability Index (ASAI) would be the ratio of the total number of minutes that meter data was available during a week to the total minutes in the week (7 x 24 x 60 = 10080). This is sometimes called the service reliability index. The ASAI shall be computed as

$$\mathbf{ASAI} = \left[1 - \frac{\Sigma\,(ri * Ni)}{(NT * T)}\right] \times 100$$

Where,

ASAI = Average System Availability Index, percent.

Σ = Summation function.

T = Time period under study, minutes.

ri = Restoration time, minutes.

Ni = Total number of meter data interrupted.

NT = Total number of meters installed in the system.

The ASAI value for the sample week based on the interruption data reported in Table-2 would be as under

The meter data unavailability minutes = 15000.

Study period = 7 x 24 x 60 = 10080

$$\textbf{ASAI} = 1 - \left[\frac{15000}{(1500 * 10080)} \right] \times 100$$

= 99.90%

10) WARRANTY

Part-A (Meter)

10.1 The IEM shall be under warranty for **7 Years** from the date of handing over of project. The bidder shall be responsible for meter testing as per CEA metering regulations. Support and maintenance during 7 years of warranty period is bidders responsibility.

10.2 The warranty would include repair, replacement, part material replacement cost and both way (return) transportation cost (including insurance of transit).

10.3 Meter software, if upgraded by OEM should be supplied free of cost with initiation taken from party. Remote service person name to be indicated during bidding.

10.4 Meters which are found defective/inoperative at the time of installation or become inoperative/defective within the warranty period, these defective/inoperative meters shall

be replaced within 48 hrs. of receipt of report for such defective/inoperative meters.

10.5 Copy of warranty certificate shall be submitted to owner as per applicable standard.

10.6 Bidder has to test the IEM in NABL accredited LAB and submit test report to MSEDCL engineer before installation of IEM. Type test will be only for random sample (1 nos. For each lot) & all the meters will be required to be tested at NABL accredited lab for routine test.

Part-B (AMR)

10.7 The AMR system shall be under warranty for a period of 7 years from the date of handing over of project.A bidder has to give support for Ten (10) years.

10.8 The warranty shall include repair, replacement, part material replacement and both way (return) transportation cost (including transit insurance) of the hardware items in the AMR system.

10.9 The software developed shall be kept under warranty for a period of 7 years from date of handing over of project to MSEDCL. Necessary support towards un-interrupted operation of the software along with support for integration with third party software shall be ensured during warranty period and also for future three years. For the warranty period, bidder shall provide on-site, web and telephonic support for application support, as & when required, on all days of the week. In case site visit is necessary for the software system restoration/ updating, all such required visits shall be free and without any additional financial implication.

10.10During the warranty period, the bidder shall implement the modifications in the software to implement amendment in CERC/MERC Regulations regarding metering and energy accounting.

1. PENALTY DURING WARRANTY

Bidder has to replace the faulty equipment's (Hardware &software) in project within 48 hours from the date of information to bidder by mail or on phone or a mechanism developed by bidder. If bidder fails to replace/rectify the equipment`s (Hardware & software) with in 5 (Five) days then penalty will be levied as per table given below. The period of 5 days will be calculated from 00.00 hrs of next days of intimation to bidder. The penalty will be limited to the cost of equipment ordered in PO**.**

Sr. No	Name of Equipment	Penalty in Rs. per day per equipment
1	Interface Energy Meter	500
2	Data Concentrator	500
3	LIU	100
4	Control Cable	100
5	Communication Cable	100
6	Network Switch at substation	100
7	Network switch at control center	100
9	Software	1000
10	GPS	500
12	KVM switch	100
13	Any other equipment not covered in above but affects data	100

2. Procedure for calculation of penalty and recovery thereof

The bidder has to submit quarterly report of non-availability of data at CDCS due to faulty/failed/nonfunctional equipment (software and hardware).The report should be equipment-wise/location-wise and with duration in days for which data was not available. Based on quarterly equipment failure report , the penalty calculation should be done as per table given at Sr. No 9 above. Bidder should submit the quarterly equipment failure report to Chief Engineer (RE) MSEDCL. This report will be confirmed by the Superintending Engineer (EA) SLDC from the system. The necessary correction if any will be done by bidder and resubmit it to Chief Engineer (RE) MSEDCL.The bidder and Chief Engineer (RE) MSEDCL or his representative will jointly sign the report along with penalty levied to the bidder.

Office of the Chief Engineer (RE) will maintain record of quarterly penalties levied till end of warranty period of seven years. At the time of refund of Performance Bank Guarantee ,the penalty amount (Accumulated in Seven years) will be deducted from the Performance Bank Guarantee and balance will be returned to the bidder.

3. SPARES/FUTURE REQUIREMENT

Bidder shall maintain sufficient number of IEMs as spares/future requirement at each substation/Utility sub-station/ Generating station.

4. REFERENCE STANDARDS TO BE COMPILED WITH

Sr. No.	Reference Details	Reference Title
1	IS-15959:2011	Data Exchange for Electricity Meter Reading Tariff & Load Control – Companion Specification
2	IS-14697:1999	Specifications for AC Static Transformer operated Watt Hour & VAR-Hour meters, class of 0.2S and 0.5S
3	IEEE 830-1998	IEEE Recommended Practice for Software Requirements Specifications
TABLE-7: IS / IEEE STANDARD		

REFERENCES

1 CEA (Installation & Operation of Meters) Regulations 2006 available at http://www.cea.nic.in/meteringreg.html

2 Functional Requirement of AMI – CEA report available at http://www.cea.nic.in/reports/others/god/dpd/ami_func_req.pdf

3 CERC Regulations on IEGC, DSM, Congestion Alleviation, Ancillary Services, Sharing of Transmission Charges as available at http://www.cercind.gov.in/updated_consolidated_reg1.html

4 Report on Scheduling, Accounting, Metering and Settlement of Transactions in Electricity "SAMAST", http://www.forumofregulators.gov.in/Data/WhatsNew/SAMAST.pdf

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