

### Scope of Work, Terms and Conditions & Technical Particulars

This section describes the scope of work and the services to be offered by the selected bidder.

| Sr. No. | Location  | Scope of Work   |
|---------|---|---|
| 1       | PuVVNL, Varanasi<br>PVVNL, Meerut<br>DVVNL, Agra<br>KESCO, Kanpur<br>MVVNL, Lucknow | Upgradation of existing ZERA make Energy Meter Test Bench (ID12025, ID12026, ID12027, ID12028, ID12029). For testing of DLMS compliant (communicable) energy meters as per IS15959. |

Upgradation of existing Energy Meter Test Bench for testing of communicable Energy Meters (DLMS compliant) with communication on prevailing communication mode, such as GPRS, GSM, 4G, LTE etc., and optical port of communicable energy meter. The upgradation shall include replacing required new measuring system with communicable facility including necessary hardware. Following old equipment and accessories shall be replaced from new component and accessories:

- Old measuring system with its power supply section, controller, warning lamp and wiring shall be replaced with new measuring system along with necessary power supply, controller, warning lamp and wiring suitable for communicate with IS15959 (DLMS) compliant energy meter.
- Old optical communication cable shall be replaced with new optical communication cable suitable with new measuring system for communication with IS15959 (DLMS) compliant energy meter.
- Necessary mounting arrangement of new measuring system with existing test bench shall be supplied by supplier.
- Necessary upgradation of Software for test bench with communicable (DLMS compliant) energy meter testing features as per Cl. No. 1 to 17 of this tender document, necessary scripts & upgraded software shall be provided to test DLMS compliant energy meter as per IS15959 (test mentioned in Cl. No. 1 to 17 of this tender document)

**Following tests shall be performed on communicable DLMS compliant meter as per IS15959 after Upgradation**

**Test for DLMS Compliant Meters:** Communicate with all connected DLMS compliant meters on its optical port mounted on the test Bench.

**1.0 Functional test**

The Test system shall perform all the routine functional test as mentioned below simultaneously on all connected meters on the test bench over the optical port

**1.1 As per Table A30 of IS15959 Part2 and Table 29 of IS15959 Part3**

**1.1.0 Associations test**

The associated test system software shall have facility to check object list of the current association of all connected DLMS compliant meters on meter test bench.

The test shall be conducted using each association at a time such as Public Client, MR and US (LLS) via optical port by sending OBIS code to read the object list.

The report for each association shall be generated for its accessible attributes i.e. object list using associated test system software

**1.1.1 Data read as per IS15959 Part2 (Table A1 and Table A14) and IS15959 Part3 (Table 1 and Table 14)**

The associated test system software shall have facility for selecting any five or more readouts from instantaneous parameter list table of IS15959 Part2 (Table A1 and Table A14) and IS15959 Part3 (Table 1 and Table 14). The user can select/ deselect the random parameters from the instantaneous parameters list table as per requirement of the specification using associated test system software.

The test shall be conducted using any suitable association such as MR and US (LLS) via optical port and sending OBIS code command for individual parameter read (instantaneous Voltage, PF, frequency, energy etc.). The report for each readout shall be generated for its response from the DLMS compliant meter using associated test system software

**1.1.2 Profile read as per Table A17 and Table A4 of IS15959 part 2 and as per table 4 and table 17 of IS15959 part 3**

The associated test system software shall have facility to readout the Billing profile parameter of all connected DLMS compliant meters simultaneously with the test bench.

The report for Profile read shall be generated using associated test system software

**1.1.3 Selective programmability as per Table A13 and Table A27 of IS15959 part 2 and as per table 13 and table 26 of IS15959 part 3**

The associated test system software shall have facility perform execution of any two or more parameter (except the image transfer) from list table of IS15959 Part 2 (Table A27 and Table A13) and IS15959 Part 3 (Table 13 and Table 26). The user can select/ deselect the random parameters from the list table as per requirement of the specification using associated test system software.

**1.1.4 Connect/disconnect status**

The associated test system software shall have facility to readout and operate the status of connect/disconnect load switch of all connected Energy meters simultaneously with the test

bench. The test shall be conducted using any suitable association such as MR and US (LLS) via optical port and communication channel port, sending OBIS code command for reading the status of load switch and operating the load switch. The report for readout status of load switch shall be generated using associated test system software

#### **1.1.5 Name plate details (IS 15959 Part2 (Table A12 and A26), IS15959 Part3 (Table 12 and Table 25).**

2. Verification of electrical tamper conditions.
3. SNRM/UA as per clause 4.1 and 4.2 of IS 15959 part1
4. Security as per clause 7.5 of IS 15959 part-1
5. Block load profile parameters table A2 and A15 of IS 15959 part 2 and table 2 and table 15 of IS15959 part -3
6. Selective access by range of Block load profile parameters as per clause 11.3 of IS 15959 part-1
7. Daily load profile parameters s per table A3 and A16 of IS 15959 part 2 and table 3 and table 16 of IS15959 part -3
8. Selective access by range of Daily load profile parameters as per clause 11.3 of IS 15959 part-1
9. ToU setting as per clause 9 of IS 15959 part-1
10. Billing period and billing period counter as per clause 10.1 and 10.2 of IS 15959 part-1
11. Selective access by Entry for billing load profile as per clause 11.3 of IS 15959 part-1
12. Events and event log profile other than mentioned in functional test as per clause 8.1, 8.2 of IS 15959 part-1, table A-11 & A-25 of IS15959 part -2 and table 11 & table 24 of IS 15959 part-3
13. Selective access by entry for event log profile as per clause 11.3 of IS 15959 part-1
14. Following Tests are also required to perform on each and every DLMS compliant energy meter to check the functionality these tests are in addition to above mentioned tests.
- 14.1 Facility for Burden measurement of the DLMS compliant meter:  
As mentioned vide clause no. 16.1

#### **14.2 Stress test**

Test bench should be able to create the metrological stress conditions to all connected meters on the test bench as mentioned below:-

- (a) 10% third harmonics in phase in current, as per IS13779/IS 14697
- (b) 10% of 5<sup>th</sup> harmonics in voltage and 40% 5<sup>th</sup> harmonics in current.
- (c) 120% of Vref.
- (d) I<sub>max</sub> applied to the meter.
- (e) 60% of Vref
- (f) Frequency variation +10% to – 10%
- (g) Low PF such as 0.1 PF

All above conditions shall be simulated by test system and communication of DLMS compliant communicable meters shall be verified in the influenced conditions through performing data read via communication channel and optical port. The test system software should be having facility to report any discrepancy in the response from meter in normal condition and stressed condition.

#### **14.3 Communicate with DLMS compliant communicable meter over its prevailing communication mode, such as GPRS, GSM, 4G, LTE, etc.**

The Test bench shall be integrated with prevailing communication mode, such as GPRS, GSM, 4G, LTE etc for communication with all connected communicable DLMS compliant Meters. Response from each connected meter shall be received by associated test system software using prevailing communication medium through provided receiver/gateway/cloud or server interface. The received output can be compared with the response received from the optical ports for each connected meter.

The facility shall be provided in the associated test software to log and analyze each sent command and response received from each energy meters. Discom shall provide the sample meters, keys, Password, communication cord with its pin diagram if specific to meter manufacturer or other than any standard mechanical/electrical arrangement and Necessary requisite to establish communication with meters.

**15. Additional facility shall be provided as below:**

**15.1 Burden measurement unit:** For measurement of burden in voltage and current circuit of meter The power consumption in voltage circuit shall be measured in following conditions:

1. During idle mode of communication module
2. During data transmission per communication module.

Burden measurement unit shall be supplied for measuring the voltage circuit and current circuit burden.

The Specification and feature of Burden Measurement Unit shall be as follows:

- a. Integration of measured power and reporting & Measurement of peak power during the test.
- b. Automatically reading through test bench associate software.
- c. Measurement of current in voltage circuit using clamp on CT and without breaking the voltage connection.
- d. Accuracy for measuring active and Apparent power (Voltage Circuit) at UPF shall be  
< 0.25% for drawn current 0.2 A to 30A at 60 V to 300V voltage  
<0.5% for drawn current 0.05A to <0.2A at 60 V to 300V voltage
- e. Accuracy for measuring active and Apparent power (Current Circuit) at UPF shall be  
< 0.5% for voltage drop 100mV to 10V at 80A to 1A current  
<1% for voltage drop 20mV to <100mV at 80A to 1A current

**16. Integration of communication:** The test bench shall be integrated with prevailing communication mode, such as GPRS, GSM, 4G, LTE etc or server interface of Discom to communicate with meters. Supplier shall perform integration of available IS15959 (DLMS) compliant meters with upgraded test bench.

**17. Additional facility for Testing of Important functionality**

- I. Checking and comparing RTC of smart meters.  
The test bench software shall be capable to read RTC of all connected meters and able to find out the drift. If the drift shall be more than permissible limits of the Standards / Utility specifications, the software shall do evaluation of results and declare Fail or Pass. The reporting of RTC drift shall be done using test bench associate software. The test bench software also shall be capable to set the RTC of connected smart energy meters.
- II. Verification of display by comparing RTC of smart meters.  
The test bench software shall be capable read out with Display of connected smart energy meters. The software shall have facility to enter the visible display readings. The reporting of comparison of display values shall be done using test bench associate software
- III. Verification of Security.  
The test bench software shall be capable change LLS password and again meter shall be accessible with the new set password. Necessary selective readouts as mentioned in above clause shall be read after changing of password (i.e. with new password). The reporting of this functionality shall be done using test bench associate software.
- IV. Load limit verification.  
The test bench software shall be capable to verify the load Limit of smart meters. The test bench

software shall read the load limit defined at energy meter. After that Test bench shall set to the necessary load so that meter shall detect load limit condition and cutoff stage shall be occur. The reporting of this functionality shall be done using test bench associate software.

V. Bill generation verification.

The test bench software shall be capable to verify the bill generation of smart meters. The test bench software shall set the date and time of connected energy meters and verify the bill generation by reading of billing count before and after. The reporting of this functionality shall be done using test bench associate software.

VI. First Breath and Last Gasp verification.

The test bench software shall be capable to verify First Breath and last gasp functionality of smart meters. The test bench software shall create the necessary condition on connected energy meters and verify the First breath and last gasp functionality. The reporting of this functionality shall be done using test bench associate software.

VII. Tamper Data verification.

The test bench software shall be capable to verify the Tamper Data of smart meters. The test bench software shall set the metrological (electrical) tamper condition connected energy meters and verify logged tamper by meter and the logged data by meters. The reporting of this functionality shall be done using test bench associate software.

**18. Automatic testing of Communication:**

The associated test bench system software shall communicate with all connected meters mounted on the test bench either as a single communication command OR combination of several communication commands included in one test sequence i.e. for meter read out and generation/simulation of the tamper conditions/ stress conditions by the test bench. The testing shall be carried out in automatic mode to test the communication correctness on both communication ports (Optical and RF/GPRS) between all connected smart meters and the test bench.

**19. Calibration facility for 5 reference meters simultaneously:** The facility shall be provided to test 5 reference meters simultaneously. Necessary cables to connect in direct mode up to 12A and shorting cables to connect reference meter with clamp on CT shall be provided. Input for Reference meter pulses shall be provided at suitable connector at new measuring system.

The existing Meter testing functions shall remain as it is with the upgraded test bench. Replaced components shall be taken back by bidder at his cost.

**20. Validity of offer:**

180 days from the date of submission.

**21. Delivery/Completion period**

Work shall be completed within 4 months from clear purchase order.

**22. TRAINING:**

The Training shall be given to the personnel of Testing Lab Staff. The training shall cover operation and safety aspects of all Testing equipment.

Necessity of training on test system:

1. For effective use of all provided features in the test system.
2. Generation/simulation of field condition in laboratory and testing of meters in such condition to check the meters reliability.
3. Generation of special condition in laboratory such as odd harmonics/sub harmonics and analyses the energy meter error and behavior in presence of the same to check the reliability of energy meters.

4. Minimize the operational mistakes and ensure safety of operator and testing equipment.
5. Increase proficiency of operator staff for testing according to Indian standards.

The training shall be given in three stages at site.

- a) Stage-1 (Basic training): Training shall be given on the basic operational features of all equipment. This training shall be cover following test to be performed:
  - 1) Accuracy testing of energy meter on Balance and unbalance load as per metering standards.
  - 2) Accuracy testing of bidirectional meters such as import and export mode.
  - 3) Accuracy testing of energy meters in dial test mode.
  - 4) Accuracy testing of energy meters in presence of influence quantities such as voltage variation, frequency variation and reverse phase sequence.
- b) Stage-2: (Intermediate Training) After usage of equipment in one month, extensive training shall be given on advance features of the supplied equipment. This training covers the advance operation of Meter Testing equipment as follows:
  - 1) Accuracy testing of energy meter in presence of 3<sup>rd</sup> harmonics in current circuit as per IS metering standards.
  - 2) Accuracy testing of energy meters in presence of 5<sup>th</sup> harmonics in voltage circuit and current circuit as per IS/IEC metering standards.
  - 3) Accuracy testing of DLMS compliant energy meters by reading initial and final energy from meters using optical port in dial test mode.
  - 4) Accuracy testing of energy meters in presence of influence quantities such as voltage variation, frequency variation and reverse phase sequence.
- c) Stage-3: (Advance Training) After 3 months of first stage training further interactive session shall be organized to understand problems regarding technical and documentation requirement of the lab. The interactive Training shall also cover the complete operation and safety aspects of the equipment. This training shall cover special test and smart meter testing as follows:
  - 1) Accuracy testing of energy meter in presence of ODD harmonics waveform as per IEC standard.
  - 2) Accuracy testing of energy meters in Sub Harmonics waveforms as per IEC standard.
  - 3) Testing of Smart meters as specified in Cl. No. 2 to 17 of this tender document.
  - 4) Voltage dips and interruption test as per IS/IEC metering standards
  - 5) Power consumption testing of energy meters.

### **23. Demonstration after upgradation:**

Demonstration shall be made on provided meters by Discom with all requisite details for integration and establish communication.

### **24. Warranty/guarantee**

The upgraded part / replaced under upgradation shall be covered by 12 months' manufacturer warranty from Date of completion of upgradation work.