

Annexure to Tender No.40175018

TECHNICAL SPECIFICATION FOR SUPPLY , INSTALLATION & COMISSONING OF THREE PHASE SINGLE SOURCE - PRE PAID METERING SYSTEM

Brief Scope of Work

The project has to be executed as a turnkey project for delivery of the following products/ services

- i. Supply, installation & Commissioning of 3-phase Single Source (10-60A) direct connect Pre-paid meters along with In Home display unit (CIU) and STTD..
- ii. Installation & commissioning including functional check of prepaid meters at consumer sites.
- iii. An in-Home display unit (Consumer Interface Unit) has to be installed and commissioned after wiring in all cases including replacement of existing meters.
- iv. STTD is to be provided for the recharging of the unit for Hassle for free recharge.
- v. Bidder has to establish required no. of vending station as specified by the customer.

TECHNICAL SPECIFICATION FOR SUPPLY, INSTALLATION & COMMISSIONING OF THREE PHASE SINGLE SOURCEKEYPAD PRE PAYMENT METER WITH VENDING / TRANSACTION SERVICE

1. SCOPE:

This specification covers design, manufacture, testing, supply, installation, and commissioning of **three phase electronic, accuracy class 1.0 keypad Prepaid meters** with CIU and STTD The meter shall be programmable for tariff structure, tax / rebate, duty, tariff slabs, etc. as per the orders given by state electricity regulatory commission from time to time.

The requirements of the online Vending/Transaction system to be provided for the keypad prepaid metering system are also covered in the scope. The meter shall use keypad technology for the transfer of credit from the vending system to the meter. The meter shall contain the measuring element, display and keypad and comply with the requirements of the standards. The meter should have the inbuilt latching switch to disconnect customers supply depending on their sanctioned load or on the state of their account balance and shall be capable of operating over the life of the meter.

2. Separate home display unit shall be provided with each meter. However recharging & parameter display facility should be available on both the units i.e. The display unit shall also

have provision to enter the recharging encrypted code. There should be a provision to use electronic device (STTD) to transfer the credit token from vending station to the home display unit, thereby avoiding human error.

3. SPECIFICATION FOR THREE PHASE SINGLE SOURCE PRE PAID KEY PAD TYPE ENERGY METER:

3.1 STANDARD:

The meters with accuracy class-1.0 are required for measurement of Active Energy and shall conform to the latest edition of following standards:—

IS:13779	:	A.C. Static Watt Hour Meters (Class-1.0)
CBIP Report No. 325 with latest modification	:	Specification for AC static Electrical Energy meters
IS:15884	:	AC Direct Connected Static Prepaid Meters for Active Energy (Class 1)

3.2 BIS MARK:

The offered Prepaid meter should be approved as per IS 15884:2010.

3.3 CLIMATIC CONDITIONS:

The meter is required to operate satisfactorily and continuously with specified accuracy under hot, dusty and tropical conditions and other climatic condition specified as herein after:—

i)	Specified operating range	:	-10°C to + 55°C
ii)	Limit range of operation	:	-25°C to + 55°C
iii)	Limit range of storage and Transport	:	-25°C to + 70°C
iv)	RELATIVE HUMIDITY:		
	(a) Annual Mean	:	<75 percent
	(b) For 30 days (spread over one year)	:	<95 percent
	(c) Occasionally on other days	:	<85 percent
v)	Maximum altitude above M.S.I.	:	1000 Meter
vi)	Average Annual rain fall	:	1200 mm.

3.4 CURRENT AND VOLTAGE RATING:

Rated Voltage (Vref) : 240 V Phase to Neutral

Rated Current : Basic Current 10A (Ib)
Maximum current 60A (Imax)

3.5 VARIATION IN POWER SUPPLY:

The meters shall be suitable for working satisfactorily with the following power supply system variations:—

3.5.1 VOLTAGE RANGE:

(i)	Specified Operating Range	:	0.7 to 1.3 Vref (-30% to +30%)
(ii)	Operating voltage range for accuracy requirement	:	0.85 to 1.15 Vref i.e. -15% to + 15%

3.5.2 FREQUENCY VARIATION:

The standard reference frequency for performance shall be 50 Hz with tolerance $\pm 5\%$.

3.6 POWER CONSUMPTION:

3.6.1 VOLTAGE CIRCUIT:

The active, apparent Power consumption in voltage circuit including the power supply of the meter at reference voltage, reference temperature and reference frequency shall be within limits as specified in relevant IS.

3.6.2 CURRENT CIRCUIT:

The apparent Power taken by each current circuit at basic current, reference frequency and reference temperature shall be within limits as specified in relevant IS.

3.6.3 STARTING CURRENT:

The meter shall start registering the energy at 0.2% of I_b .

3.7 ACCURACY:

Class of accuracy of meter shall be 1.0 and shall conform to accuracy requirement as per specified IS.

3.8 KEYPAD PREPAID METER:

The keypad buttons shall have numbers/letters on them, which shall be clearly visible and resistant to wear. The layout of the numbering shall be same as that used on standard telephones for numbers '1' through '9' and buttons such as '*', '0', and '#'. Button '5' shall have some form of physical identification (raised printing or a pip) to aid customers with poor sight.

The keypad IP rating shall be adequate to permit use with moist or wet hands whilst ensuring the safety of the user and preventing ingress of dirt and water to the unit. The entry of codes for credit or commands associated with programming functions such as tariff change shall be via encrypted numeric codes. Code encryption / decryption must be carried out using an internationally recognized standard (e.g. Triple DES). The meter has Keypad buttons which enables the user to view various displays available on the meter.

3.9 Display Parameter for Three Phase single source Pre Prepaid meters:

A. Auto Scroll: The following parameter shall be displayed in Auto scroll mode:

1. Cumulative kWh and Balance Amount

B. Push Button Mode: The following parameters will appear one after another while pressing the push button:

1. LCD Segment Check
2. Meter Serial Number
3. Real Date and Time
4. Instantaneous Voltage (R,Y,B)
5. Instantaneous Current (R,Y,B)
6. Instantaneous system Power Factor
7. High Resolution kWh
8. Total Power On Hours
9. Maximum Demand in kW
10. Maximum Demand date & time
11. Last month Maximum Demand in kW
12. Last month Maximum Demand date & time
13. Cumulative energy in kWh with current month consumed amount
14. Bill 1 Cumulative kWh with Bill 1 consumed balance amount
15. Bill 2 Cumulative kWh with Bill 2 consumed balance amount
16. Bill 3 Cumulative kWh with Bill 3 consumed balance amount
17. Cover open status (If cover closed)

C. Keypad Mode: This displays the various attributes / parameters pertaining to Credit token entries, Tariff structure, Slab no , Present Load and Cost of the Load, Total Amount Vended in the meter, Load Limit (KW) set in the meter, Maximum Recorded load(KW), Fixed charges, Minimum Charges, Meter Rent etc. These are displayed by pressing the predefined keys on the keypad (for details, please refer the operation manual of the meter.

Keypad Display for Three Phase Prepaid Meter:

Key No.	Parameter
1	Last 3 credit Token with Date & Time.
2	Days Left (Based on consumption of last seven days).
3	Tariff Slab range Like. 0-100 kWh
	Energy consumption in each slab For e.g. Slab 1 = 100 kWh
	Current Slab rate & Current Slab No.

	with consumed amount
4	Current load (KW) & the cost of that load
5	Total cumulative amount vended in meter
6	Previous Day Consumption
7	Load Limit Set in Meters in KW
	Max. Recorded Load(kW)
8	Cumulative kWh
9	Balance Amount
0	Fuel adjustment charges
	Fix Charges (Monthly)
	Minimum charges
	Meter rent (Monthly)

3.11 **TARIFF:**

Following are the features required in the meter for Tariff. It shall be possible to change the tariff related parameters through vend code.

Minimum charges: Using the online vending system it shall be possible to define the minimum charge for the applicable tariff category. If the consumer consumes electricity equivalent of amount less than the minimum charge then at the end of the billing period the meter shall deduct the difference of the minimum amount and the monthly consumption (Amount).

Fixed Charges: Meter shall be able to deduct fixed charges on daily basis such as meter rent, sanctioned load based charges etc. The fixed charges shall be defined using the online vending system.

Slab Tariff: The meter shall have capability for defining minimum tariff slabs as per prevailing tariff of utility. It shall be possible to change the slabs through the portable device or through the online vending system.

Tax/Duty: It shall be possible to define the tax percentage through online vending system which has to be levied on the amount of the energy consumed.

Rebate: The meter shall have facility to record energy consumption at the rates applicable after deducting the rebate percentage on the energy consumption as per prevailing tariff.

3.12 **COMMUNICATION CAPABILITY:**

The meter shall be provided with an RS232 port/ Optical Port. It shall be possible to read the meter through this RS232 port / Optical port with a hand held device.

3.12 **GENERAL REQUIRMEENTS**

Meter shall be designed and constructed in such a way as to avoid introducing any danger in use and under normal conditions so as to ensure specially the following:—

- Personnel safety against electric shock
- Personnel safety against effects of excessive temperature.
- Protection against penetration of solid objects, dust and water.
- Protection against spread of fire.

3.12.1 All the material used in the manufacturing of meters shall be of highest quality. The entire design and construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation.

3.12.2 All insulating material used in the construction of meter shall be non-hygroscopic, non ageing and of tested quality and shall conform to tests as specified in relevant Standards.

3.12.3 The meter shall be designed on application specific integrated circuit and shall be manufactured using SMT (Surface Mount Technology) components.

3.12.4 The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They should not be ignited by thermic overload of live parts in contact with them.

3.12.5 The meter shall conform to the degree of protection IP 51 against ingress of dust, moisture and vermin

3.12.6 All parts which are subject to corrosion under normal working conditions shall be protected effectively. Any protective coating shall not be liable to change by ordinary handling due to exposure to air under normal working conditions.

3.12.7 The meters shall be designed such that their working remains unaffected by electromagnetic interference, electrostatic discharges and high voltage transients as specified in standard.

3.12 **CONSTRUCTIONAL REQUIREMENTS:**

3.13.1 Meter Case:

- a. The meter shall have completely insulated body and be of wall mounted projected type. The meter shall have a case made of unbreakable high grade fire resistant, reinforced polycarbonate or equivalent high grade engineering plastic which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the meter cover

seals. The meter cover shall have at least two sealing screws, each screw having the sealing holes.

- b. The meter case shall have at least three mounting holes. Two holes for mounting screws on the terminal block sealed beneath the terminal cover and one for hanging screw on the top.

3.13.2 LCD Unit:

The display unit shall be Pin type built-in liquid crystal display. The measured value(s) shall be displayed on minimum six digit Liquid Crystal display (LCD) i.e. display unit, having minimum character size of 8mm X 4mm.

3.13.3 Window:

The meter cover shall be of high grade, fire resistant, reinforced polycarbonate or equivalent high grade engineering plastic with one window made of UV stabilized, silicon coated polycarbonate or equivalent high grade engineering plastic for reading the register. The window shall be integral part of the meter cover such that it cannot be removed undamaged without breaking the meter cover.

3.13.4 Terminals and Terminals block:

- a. The terminal block shall be made from best quality non-hygroscopic, fire retardant, reinforced polycarbonate (not Bakelite) or equivalent high grade engineering plastic which should form an extension of the meter case. It shall have terminal of minimum internal diameter 8.5mm
- b. The meter shall be provided with terminal to connect the cables. The screws shall not have pointed edge at the end of thread. The clearance and creep age distance of terminal block and tips between the terminal and the surrounding parts of metal enclosure shall be as per relevant IS standard.
- c. All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.
- d. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

3.13.5 Terminal Cover:

- a. The meter terminal Block shall be provided with an extended terminal cover with independent sealing arrangement in such a way that it shall cover the terminals, the conductor fixing screws, the external conductors and their insulation i.e. no part of meter or cable accessories shall be visible from the front of the meter.
- b. When the meter is mounted, no access to the terminals shall be possible without breaking the seal of the meter terminal cover.

3.13.6 Terminal Arrangement:

A diagram of connections should be provided inside the cover the terminal block. The terminal cover shall be extended such that when it is placed in position it is not possible to approach the connections or connecting wires.

3.13.7 Name Plate Marking:

The name plate shall have following markings which shall be indelible, distinct and readable from outside the meter:—

- Manufacturer's name and/or trade mark and the place (with country) of manufacture;
- Designation of type;
- The no. of phases and no. of wires for which the meter is suitable for;
- The manufacturer's serial number and year of manufacture;
- Reference voltage;
- The basic current and the maximum current;
- The principal unit in which the meter reads;
- Meter constant;
- Class index of the meter;
- Reference Frequency;
- Guaranty period

3.12 **TAMPER AND FRAUD PROTECTION:**

The meter shall operate normally under the following conditions:

- 3.14.1 Phase current reversal: The meter shall record forwarded energy.
- 3.14.2 Neutral current reversal: The meter shall record forwarded energy.
- 3.14.3 Phase and neutral interchange: The meter shall record forwarded energy.
- 3.14.4 The meter shall operate normally in case the phase and neutral are swapped with neutral connected to earth.
- 3.14.5 The metering system shall be provided with adequate magnetic shielding so that any external magnetic field (AC Electro Magnet or DC Magnet) as per the values specified in standard applied on the metering system shall not affect the proper functioning and recording of energy as per error limits prescribed by standard.
- 3.14.6 Meter Cover Open detection: If case of meter cover/base is opened it shall log the tamper in meter memory with meter time & date.
- 3.14.7 Magnetic Interference: Meter shall record accurate energy in case of external magnetic influencing signals as per the relevant IS Code. Meter shall be immune up to 0.5T permanent magnet.
- 3.14.8 If neutral is disconnected from both supply & load side the meter shall not power up and / or shall disconnect the supply.

3.12 **TESTS**

3.15.1 Type Tests

Meter shall be fully type tested as per IS 13779/1999 (amended up to date) and external AC/DC magnetic influence tests as per CBIP Tech-Report 88. The Type Test Reports shall clearly indicate the constructional features of the type tested meters. All the Type Tests

shall have been carried out from any NABL accredited Laboratories to prove that the meters meet the requirements of the specification.

3.15.2 Meters shall pass the entire acceptance and routine tests as laid down in IS: 13779/1999 (amended up to date) and also additional acceptance tests as prescribed in this specification. Prepaid functionality shall be tested by the utility as per IS: 15884 / 2010.

3.15.3 Other Acceptance tests

- i) The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage/problems,
- ii) Power consumption tests,
- iii) The meter shall withstand impulse voltage at 10kV as per applicable standard.
- iv) The meters shall be tested at (-) 15% and at (-) 30% of reference voltage as well as (+) 10% and (+) 20% of reference voltage and shall record energy within limits of variation as per relevant IS.
- v) For other influence quantities like frequency variation the limits of variation in percentage error will be as per IS: 13779/1999 (amended up to date).
- vi) The meter shall detect the measurement shifting from phase to neutral circuit and neutral to phase circuit in the memory. This shall be done by finding the imbalance between phase and neutral current and comparing with the pre defined threshold and the persistence time. The condition for measurement shift shall be according to below conditions and the meter shall log the forwarded energy in this conditions:

1	Interchanging of phase & neutral terminals.
2	Neutral connected on incoming side but connected to earth via resistor on outgoing side. Load is connected solidly to ground.
3	Phase & neutral interchanged at incoming and load is connected to earth.

- vii) Meter shall record accurate energy in case of external magnetic influencing signals as per the IS13779. Meter shall be immune up to 0.5T permanent magnet and the switch shall not operate in this condition. In case of abnormal magnetic field such as continuous DC magnetic induction of 0.27 Tesla \pm 5% and magnetic induction of 10 milli Tesla.

4. CONSUMER INTERFACE UNIT (CIU):

- The meter shall be supplied with a separate In-home display unit /CIU.
- The display unit shall be powered up from the meter
- The display unit shall have a LCD display.
- The display unit shall have a key pad to enter the code. The keypad should be similar to the keypad available on the meter.
- The display unit shall have an RJ11 connection port to connect to the meter.
- The display unit and energy meter shall be connected using a 4 wire connection cable (Similar to telephone cable).
- The display unit shall have a buzzer to generate alarm signal in case of low credit and overload.

- The display unit shall have provision to connect an electronic device to transfer the token from Vending station.

5. **METER DATA READ THROUGH MRI AND / OR BCS:**

It shall be possible to read the prepaid meters and minimum following information shall be available in meter reading data.

- The transaction history data with date and time.
- Instantaneous data should be available at the time of data downloading.
- All the events history with time based and category based information.
- Tariff details including slab tables and information about the current active rate price.
- Monthly history and consumption data of the energy consumed for last twelve months.
- All the account related information like meter credit, emergency credit details, minimum charge and fixed charges value.
- All the limiting parameters shall also be available in meter reading.

6. **VENDING SYSTEM REQUIREMENTS:**

This section specifies the requirements of the vending system for currency based Prepaid metering solution.

The meter shall work on the latest currency transfer keypad technology supported by an online vending system. Since the keypad technology is future proof, cost effective and in this communication age, enables consumers to buy electricity over the multiple vending options like Customer billing centers, customer website etc. The vending system shall use Triple Data Encryption Standard (Triple DES), i.e. it provides three levels of encryption for the vend code. The code shall be meter specific and can't be used in any other meter.

The vending station shall be placed at the billing stations of the customer for which necessary office space, electricity etc. and furniture for this system shall be provided by the customer. Cash shall be collected by the client staff; upon the advice of the designated staff the vend terminal / personal computer shall generate a token to transfer the credit to the energy meter. The token shall be printed using the printer attached to the personal computer. There should be an additional facility to transfer the credit to Energy meter through CIU using electronic device to avoid human error in entering the token. Adequate back up power in the form of suitable UPS with standard back up shall be provided by the customer at each Vending Station.

The vending system shall be the online vending system from where the vend codes shall be issued.

7. **VENDING PROCESS:**

- 7.1.1 On receipt of the vender request the system shall have a provision to ascertain the identity of the consumer. The keys to identify the consumer shall be the meter serial number or consumer premise number.
- 7.1.2 The vender terminal shall send the request to a central database that shall authenticate the transaction and generate an encrypted code.

7.1.3 The code hence generated shall be printed on paper using the attached printer or transferred to a designated electronic device (STTD).

7.1.4 The vending system shall be used to transfer current values (Rupees) to the meter through STTD.

8. DOMAIN SERVER:

The DMC shall be a part of the vending system which shall have capability to interface with the central database and produce the management reports as detailed in the specification. It shall manage all administrative data, including settings of system accounts, tariffs, meter and Consumer data. It shall also provide reporting system for system analysis.

Various tasks that should be performed from the DMC are outlined below:

8.1.1 Consumer Database Management

- Entry of new consumers and their details
- Existing consumer database
- Meter Registration
- Meter Allotment
- Meter Re Allotment

8.1.2 Tariff Management

- Utility tariff rate & slabs
- Consumer category
- Tax percentage on recharge amount
- Fixed Charge value
- Minimum charge value
- Maintenance charges

8.1.3 Limit Parameters management

- Define Load Limit
- Current Limit value
- Emergency Credit

8.1.4 Reports

- View all tokens
- Individual customer report
- All recharges done by member

8.1.5 Import of data by the vending station from the master station / Export of data by the main station to the vending stations:

- Import of data from Comma separated values(CSV) format files
- Export of data in CSV format

9. SECURITY ASPECT:

The vending system shall be a sophisticated system with reliable security features.

- a) The token created for particular meter with the defined tariff shall not be used for any other meter.
- b) The meter shall accept the valid token only once. The token generated shall be meter specific and shall be used only on the particular meter for which it is intended.
- c) The token shall not be reusable
- d) The token shall be re-issued in case it is lost however the meter shall accept the code generated only once.
- e) Whenever a tariff change takes place no other token shall be accepted by the meter unless the updated tariff token is entered into the meter.
- f) The token generated shall be authenticated as well as encrypted so that no decoding is possible.

10. System requirement for vending (to be provided by the contractor except item no.1 & UPS at Sr. No. 2):

S. No.	Component	Specification	Quantity
1	Desktop PC	Minimum 2GB RAM, minimum 80 GB HDD, Windows XP or Above	04 nos.
2	UPS	1KVA	04 nos.
3	Fire wall		04 nos.
4	Internet Connectivity		To be provided by Railways
5	RJ11 communication cable	4 core cable	As per in home display unit quantity

11. Vending Charges

The supplier shall provide training & support for generation of four vending transaction per month per consumer free of cost for six month. After six months Railways to be allowed to use software for token generation free of cost. However maintenance of Desktop PC & UPS will be on Railways account. The supplier shall ensure to provide uninterrupted services like generating vend token, tariff management, report generation etc. to the customer.

TECHNICAL OFFER FOR PILFER PROOF METER BOX TO HOUSE
THREE PHASE SINGLE SOURCE PREPAID ENERGY METER

1. SCOPE:

The meter box shall be intended to house one number Three Phase whole Prepaid energy meter. The meter box complies with relevant Indian standard IS: 14772:2000/ IS: 13410 / other applicable standard with latest amendment.

2. MATERIAL:

- a. The meter box shall be made of polycarbonate / Engineering Plastic material:
- b. Meter box shall be weather proof, capable to withstanding temperatures of Glow wire test at 650°C as per IS: 11000. HDT of meter box material shall be minimum 85° C.

3. CONSTRUCTION:

The meter box shall have roof tapering down to both the sides for easy flow of rainwater. The thickness of the box shall be minimum 2.0 mm on all sides. The overall dimensions of the box shall be such that a minimum 25 mm clearance from left , right and top, 25 mm from front and 10mm from back side & 70 mm from meter terminals and bottom side shall be maintain in between meter and box surface,.

- a. The box cover shall be fixed with concealed hinge. It would be open by at least 120 degrees.
- b. Soft rubber gasket shall be provided all around the periphery of box for protection against ingress of dust and water inside the box.
- c. Meter Box shall comply IP protection class with IP - 54.
- d. Handle shall be provided on the box door for ease of door opening.
- e. For holding and sealing the door, 2 Nos. U-shaped clamps shall be provide. These clamps/latches would hold the box cover with base.
- f. All metallic parts would be well protected against corrosion.
- g. Colour and Mounting :
Offered Meter box's base and cover shall be of grey/ transparent colour.
Box shall have 4 nos. holes of 6 mm diameter for fixing the meter box on wall / wooden board.
- h. Cable Entry:
Suitable provision shall be provide at the bottom side of the meter box bottom for cable inlet & outlet and the same shall be capable of accommodating cable of 22- 26 mm diameter, engineering plastic cable gland shall be provide.

4. TESTS FOR BOXES:

The following tests are to be conducted on the box at any independent NABL accredited laboratory and test reports shall be carried out as per relevant Indian Standard.

- Test of HDT minimum 85° C

- Test for mechanical strength
- Glow wire test at 650°C as per IS: 11000

5. ACCEPTANCE TEST

- i. Physical verification of dimensions of the box.
- ii. Compatibility of the box for housing the meter, and ensuring ease of connecting and reading the meter.