Section -7

The Technical Specification

Of

The Pre-Paid Metering System
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List of Abbreviations

ATP  Acceptance Test Procedure
BPDB  Bangladesh Power Development Board
BS  British Standard
CDU  Credit Dispensing Unit
ED  Electricity Dispenser or Prepayment Meter
EBSST  Electricity Basic Services Support Tariff
HHU  Hand Held Unit
HMI  Human - Machine Interface.
ID  Identification
IEC  International Electrotechnical Commission
ISO  International Standards Organization
Km  Kilometer
kV  Kilovolt
kW  Kilowatt
kWh  Kilowatt-hour
LAN  Local Area Network
LCD  Liquid Crystal Display
LED  Light Emitting Diode
LV  Low Voltage
PC  Personal Computer (IBM Compatible).
P-o-S  Point of Sale
PR  Public Relations
SGC  Supply Group Code
SMS  System Master Station
TI  Tariff Index
UPS  Uninterruptible Power Supply
VS  Vending System
MCU  Measurement and Control Unit
UIU  User Interface Unit
<table>
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<th><strong>Glossary</strong></th>
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<td><strong>Active unit</strong></td>
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<td><strong>Agent</strong></td>
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<td><strong>Algorithm</strong></td>
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<td><strong>Base Plate</strong></td>
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<td><strong>Central Computer</strong></td>
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<td><strong>Meter</strong></td>
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<td><strong>Point of Sale</strong></td>
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<td><strong>Power limiting</strong></td>
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<td><strong>Prepayment meter</strong></td>
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<tr>
<td><strong>Security Module</strong></td>
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<td><strong>Supply Group Code</strong></td>
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<td><strong>Vending station</strong></td>
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1. Subject of Specification

The Project covers the design, manufacture, testing, supply, insurance, packing for export, shipment, delivery to site, unloading, provision of access roads, complete erection, testing on completion, commissioning and separate 8 (Eight) years operational support as per tender of Prepayment Metering System in the area of Chittagong, Bangladesh.

In particular the project comprises:

- Installation of a Prepayment Metering System with all hardware and software and all equipment and works necessary fully and completely satisfying the STS Association specifications as enumerated in IEC62055-41 (STS) specifications.
- 8 (Eight) years Operational support of Prepayment Metering system including all necessary works.

2. BPDB’s INTENT

BPDB intends to switch all existing and planned electricity connections in the Southern Zone network to prepaid technology. The design of the system is based on total number of consumers to be migrated to prepayment Metering System under the Southern zone’s responsibility. Approximately 1,39,000 existing customers (400/230V users only) will be migrated from the existing conventional meters and billing system to the prepaid system under this project. A further more than 8,00,000 new customers will be migrated with said prepaid metering system.

BPDB’s strategic intent encompasses the following:

a) Standard designs for vending, communications and metering components will be used and where the current standards are not appropriate new standards and specifications will be developed with a view to incorporating these as future standards.

b) The system shall operate in the online mode. This implies that system availability must be extremely high and that communications between the Clients and the main server may be duplicated to ensure continued operation in case of a communications failure.

c) Correct data is the cornerstone of a world-class vending system. As far as possible techniques to ensure data integrity will be used. Disaster recovery processes and dual redundant hardware and software will be some of the techniques used. As far as possible GIS and GPS technology to be utilized to ensure data integrity.

d) The mission critical nature of the system means that the backup and support is critical to the success of the system. In addition, significant ongoing system maintenance is required on a daily basis. A strategy of employing highly skilled external experts to maintain and support the hardware, operating systems and communications systems is considered most appropriate. Software application and database management should be under BPDB’s direct control. Necessary maintenance support for the Software shall be taken from The Software Provider for initial 8 (eight) years after completion of the project.

e) The server shall be hosted and maintained by the Contractor. Remote access to the server from the Contractor’s premises is essential.

3. Climate conditions

The climate of Bangladesh is mild and temperate. The average temperature recorded for the colder months December - February is between 17 °C and 19.4 °C; for the warmer months April-September between 27.2 °C and 30 °C.
The annual rainfall is around 1500 mm rising in many regions to 2800 mm and in certain areas up to 5000 mm. Approximately 75% of the rainfall occurs in the monsoon months between June and October.

The relative humidity is quite high throughout the year varying between 72% and 82% in the winter months, respectively 84% and 100% in the monsoon months.

Hurricanes ranging in speed from 50 to 60 km/hour or more may occur between April and November. In addition between March and May thunderstorms accompanied by heavy lightnings occur having a speed of 30 to 90 km/hour. Their duration is normally between 1 and 2 hours only.

Tornados can also hit the country at any time of the year but generally occur in the months February and May. A maximum speed of 225 km/h was once measured. The duration of heavy tornados however, usually last only a few minutes.

The main meteorological data to be considered for design of the Project are as follows:

- maximum ambient temperature: 50 °C
- minimum ambient temperature: 5 °C
- maximum daily average temperature: 35 °C
- maximum annual average temperature: 30 °C
- mean annual rainfall: 2500 mm
- minimum annual rainfall: 1461 mm
- maximum annual rainfall: 4127 mm
- relative humidity, maximum: 100%
- relative humidity, average: 80%
- maximum wind velocity: 180 km/h

4. Supply and Services

The scope of this specification covers all supplies and services required for meeting the purpose of the Project, even if these are not expressively mentioned in the Specifications.

The works include three main components. The detailed scope of supply is to be seen in the corresponding sections listed below:

- Section B1: Vending Equipment Specification
- Section B2: Prepayment Meters Specification
- Section B3: Software Suit Specifications

All works not directly mentioned in this Specification, but necessary for the complete and proper instatement and provide operational support of the Prepayment Metering System at the discretion of the Employer's representative shall be performed and provided by the Contractor at no additional cost to the Employer.

The requirements detailed in the following sections shall be read in conjunction with the detailed technical specifications, data sheets and Bill of Quantities.

The relevant costs of supplies and services of each individual item indicated in the price schedules of the above enumerated sections B1, B2, B3 and Operational Support shall include all common supplies and services as described in the following paragraphs.
4.1 Common supplies and services

In order to complete the supplies and services described under the Technical Specifications Part B1, B2, B3 and Operational Support the Bidder's prices shall include but be not limited to common supplies and services which are enumerated below as well as any other supplies and services which he considers to be necessary like various accessories, auxiliaries, fastenings, supporting structures, etc. for the completion of the Project.

The Contractor shall execute

- all preparatory work like data collection, site investigation, etc.
- the complete engineering/design services for the complete specified plant, including interface coordination.
- all required licensing applications
- all other required advanced services to meet the agreed project time schedule of the project
- The scope of work of the Contractor shall furthermore include but be not limited the following as a minimum:

General

- All necessary surveying works, investigations and studies;
- Preparation of site, demolition works, etc.;
- Quality control plan and safety plan;
- All necessary factory acceptance tests, inspections including the associated certificates and reports of these;
- Supply of a system and equipment compliant with the technical specifications referenced in section B1, B2, B3 and Operational Support;
- The supply of all peripheral hardware and software support tools;

Packing and transportation

- Suitable packing and shipping of the entire scope of supplies;
- Handling at seaport
- Inspection on arrival, local transportation to site and temporary storage
- Transport insurance;
- Disposal of packing and transportation material;
- Custom clearance;
- Unloading and handling at site.

Erection, commissioning and testing

- All necessary civil works for furnishing vending stations, SMS, DRS and Meter installation.
- Erection of the scope of supply up to operational readiness including mobilization and provision of the required erection and supervisory staff, skilled and unskilled personnel, as well as of installation of scaffolding, cranes, hoists, equipment and material, personnel accommodation, prescribed site tests and inspections;
- Commissioning, adjustment and optimization of all plant components including the necessary site test measurements and settings
- Supervision of erection, commissioning and Reliability Test Run of complete supplied equipment;
- Delivery of all as-built documents (on data carriers; data formats as requested by the Employer);
- Delivery of detailed Operation and Maintenance Instructions;
- Comprehensive training manuals and material and training courses.
• Delivery of a maintenance program for all equipment of the Plant;

5. **RESPONSIBILITY UNDER OPERATIONAL SUPPORT CONTRACT**

In addition to the requirements of the technical specifications B1, B2 and B3 the following shall be the responsibilities of the Contractor to provide the operational support for the duration of the 8 (Eight) years after completion of the Turnkey Work.

5.1 For LOT -1

5.1.1 **CUSTOMER MANAGEMENT**

**Software Upgrades & customization**

a) The vending software and other related software should be upgraded and customized (like tariff customization, reporting, new STS meter manufacturer interfacing etc.) within the contract period if required without cost. The contractor shall provide online support service to BPDB within the contract period.

b) For other manufacturer's meter which is compatible with the system, the tenderer should provide all types of support for interfacing those meters with free of cost. If BPDB intends to incorporate 3 rd party services in system, the contractor should incorporate the service-free of cost within the contract period.
Database Management

The Operational Support shall be responsible for the database management on the SMS and shall include such activities as follows:

- Registration of customer details and all applications for new prepayment customers within the Operational Support's operational area directly
- Changes to customer details
- Editing of customer records
- Management of customer arrears
- Multi tariff changes as required by Utility during the contract period
- Customer reports detailing the number of prepayment customers at the start of each month to BPDB
- Visiting each consumer to perform a system audit at least once every 6 months

Public Relations and Marketing Program

The Operational Support shall provide a comprehensive public relations and marketing program that concentrates on customer awareness, education and training.

The program shall include radio, television and newspaper advertisements, in English and Bangla, the design, production and distribution of pamphlets and the establishment of a customer care centre. Customers must be politely told that the system is mandatory for customers within the designated areas. The areas that are for conversion must be clearly communicated. The Operational Support shall initiate a PR and Marketing campaign to create awareness, emphasize the benefits of prepayment and provide details of those areas which are about to be converted and general news as well as advice on prepayment metering. The material shall be subject to BPDB's approval prior to publishing or airing.

Customers will be notified of their imminent conversion by both a visit of the Operational Support representative and the delivery of a notice telling when they will be converted and providing an invitation to visit the customer care centre for a further explanation of prepayment metering.

Pamphlets shall be handed to the customer when the meter is installed. The pamphlet shall be in colour in both English and Bangla and shall contain the following:

- a contact telephone number for the customer care centre
- describe benefits/advantages of prepayment
- explanation of how the system works
- a detailed explanation of the tariff
- a STATEMENT THAT NO INSTALLATION CHARGE IS LEVIED. (A charge will be levied for new installations but not for retrofit installations)
- explanation of what happens to the old meter and security deposit
- highlight amount of initial credit programmed into meter
- detailed explanation of the arrears recovery functionality of the system
- explanation of the receipt details
- details of where tokens can be purchased
- a picture of the meter and explanations of how to operate the meter and read the display
- an explanation of all error messages
• a simple definition of a kWh unit of electricity and an indication of what typical household appliances consume
• an explanation of what happens if a token is lost.

The campaign shall focus on but not be limited to creating customer awareness of the benefits of prepayment and informing customers of the details of the changeover to prepayment.

At least one walk in customer information/ fault reporting centre shall be provided and manned by the Operational Support. The centre shall be open at least 12 hours per day 6 days per week. The centre shall provide demonstration meters for customers to use and shall provide technical assistance as well as general education regarding usage of electricity and understanding tariffs and receipts. The arrears recovery mechanism shall also be explained to customers. The customer care centre shall provide a continuously running video, which demonstrates the concept of prepayment and the functionality of the meter. Programs for school children should also be run which will tell them about prepayment metering and the careful and economical use of electricity.

An important aspect of the PR program will be the training of the installation teams in customer relations the correct and polite handling of customers, the part they play in the larger company and provision of technical material for the installation teams.

The following material shall be provided:
• customer relations training booklet
• notification of survey form
• notification of installation form
• promotional and training material to facilitate on site customer training at the time of installation

5.1.2 Delinquent customers

Prepayment customers who bypass or vandalize meters shall have the meter and service line removed from the premises by the Operational Support personnel.

BPDB shall be notified of the meter removal and BPDB shall authorize the Operational Support to take the necessary actions to fine the customer or to take legal action.

Where meters have been vandalized or tampered by customers, the cost of the repairs shall be borne by the customer. The Operational Support shall recover these costs from the customer at rates agreed to by BPDB. Reconnection shall be made only after customers have paid for the energy stolen and for the labour and material costs of the replacement.

5.1.3 COLLECTION OF ARREARS

Arrears shall be collected as a fixed percentage of each token purchase (for example 25%) or as a separate transaction if the customer so wishes.

At each CDU site, signs shall be displayed warning customers to get receipts for cash token purchases AND arrears payments.

The arrears shall be calculated by BPDB and provided to the Operational Support with the following information:
• Customer name
• Account number
• Outstanding balance
BPDB shall use the final reading from the works order to calculate the final outstanding amount. The initial credit is added to this amount and the security deposit is subtracted from it to arrive at the outstanding arrears for the customer. This figure together with the intermediate calculations shall be reported by BPDB to the Operational Support.

The Contractor shall provide reports that indicate the total outstanding arrears on a monthly basis.

Any disputes regarding the initial arrears amount calculated for a particular customer shall be the responsibility of BPDB but the Operational Support shall resolve ongoing queries.

Arrears shall be paid to BPDB at end of each month, together with a report confirming the amount paid by the various customers.

5.1.4 METER READING, AUDITING AND REPORTING

On a monthly basis the following audits and related reports shall be produced by the Operational Support and copied to BPDB:

a) Report of installed base to date.

b) Report actual sales per tariff level.

c) Read all check meters on one day. The tools to read/access all the AMR check meters will be provided by the Employer. The actual operation of the meter reading is a task of the contractor. (Month end)

d) Produce energy accounting report. (% Losses)

e) Report exceptions. (Tamper/fault/low consumption)

f) Update credit limits for CDUs and produce bank reconciliation report for each point of sale individually and for the whole system.

g) Report total outstanding arrears.

h) Report cumulative meter change outs since project inception.

i) Report number and location of all decommissioned meters. Reasons for decommissioning shall also be provided.

5.1.5 PREPAYMENT METER MAINTENANCE

The Operational Support shall maintain the meters including meters supplied under Lot -2 and Lot- 3 during contract period.

Faulty meters shall be repaired on an exchange basis whether under warranty or otherwise at the cost of the Operational Support. The Operational Support shall be entitled to recover repair costs of vandalized meters from the customer responsible for the vandalism.

The Contractor shall provide a system to track meters that have been changed out. The system shall provide a full history of each meter purchased.

This system shall include warranty and service history details and shall track faults per meter.

The Operational Support includes the storage of faulty meters, shipping of batches to the supplier for repair and the receipt and stores management of returned meters.

The Operational Support shall be in a position to verify the accuracy and functionality of the meter at the customer’s premises.

Faulty devices and peripherals shall be repaired on exchange basis whether warranty or otherwise at the cost of the operational support. All sorts of repairing and maintenance tasks for software, hardware, meter and network has to be performed by the contractor.
On a monthly basis meter data collection, auditing and related all sorts of reports shall be prepared by the operational support contractor and copied to respective utility.

Utility shall impose penalty @Taka 500 per hour of delay after 16 hours of lodging complaint with the tenderer under warranty period.

The tenderer shall have to report time to time like 2 times in a month and shall have to report the progress.
5.1.6 VENDING SYSTEM OPERATION AND MAINTENANCE

Contractor should provide technical manual and operational manual of the system within 15 (fifteen) days from before commercial operation start.

The maintenance services shall be valid for 08 (eight) years from the date of commissioning including warranty period.

Maintenance service includes preventive maintenance services on Monthly basis, based on the specific needs of individual equipment or as determined by Contractor/Employer and on-call remedial maintenance under warranty period. Maintenance work should be at BPDB offices. In case it is not possible the maintenance work at BPDB premises, then tenderer will provide the maintenance work by their own arrangement.

Maintenance Services includes the replacement of non-working parts of hardware without incurring any cost to the employer under warranty period.

To provide all necessary labor and technical know-how, and replacement of mechanical, electrical or electronic parts, as required for the maintenance work of equipment under warranty period.

To maintain necessary stock of spare parts which may have the chances of damage for immediate support/ replacement under warranty period.

The maintenance, servicing & replacement works as necessary must start within 02 (Two) hours sharp after lodging complaints under warranty period.

The tenderer shall have to report time to time like 2 times in a month and shall have to report the progress.

Defect or any sort of damage in hardware shall have to be identified, repaired/replaced and put into normal working condition within 08 (eight) hours after lodging complaint with the contractor. The Contractor will be responsible for repair, correction, and replacement of the defective goods or parts without incurring any cost to the employer under warranty period.

BPDB shall impose penalty @Taka 500 per hour of delay after 16 hours of lodging complaint with the contractor under warranty period.

If it is not possible to resolve the problem within 16 (sixteen) hours, the contractor may provide required support/equipments/item/parts on temporary basis without incurring any cost to the employer so that Server, Computer, Line Matrix Printer & UPS shall work properly. But this type of arrangement must not exceed more than two weeks. In that case, penalty will not be imposed for this maximum two weeks under warranty period.

For any further up gradation, if utility procures any part/ product /devices, then the contractor should install, commission the parts/ products /devices without incurring any service charge to the employer under warranty period.

The vending equipment shall be maintained and operated by the Operational Support for the duration of the Operational Support.

Vending stations shall be open for at least 8 hours a day, 6 days per week. The Operational Support shall supply all consumables.
5.1.7 CASH MANAGEMENT

All cash collected at vending points shall be banked directly into a BPDB's bank account on a daily basis. It is of utmost importance that the cash is accounted for correctly and that regular reconciliations take place.

The procedures for cash management at each CDU are as follows:

a) The end of shift reports for the day is collated and a banking report detailing the amount of cash to be banked is generated by the CDU.

b) The risk of the loss or theft of the money lies with the Contractor.

c) The deposit slips and a copy of the banking report shall be forwarded to BPDB on a daily basis.

d) CDU credit limits shall normally be replenished as required. The replenishment shall only take place once the SMS has received proof that the money has been deposited into the BPDB's bank account.

5.1.8 MANAGEMENT OF DELINQUENT CUSTOMERS & FAULTY EQUIPMENT

The Operational Support shall monitor customer behavior on a monthly basis by analysis of the system reports. Customers who have bypassed meters shall be disconnected and fined according to BPDB’s standard procedures.

All meter and CDU faults as shall be actioned by the Operational Support and a monthly follow up report shall be submitted to BPDB.

The Operational Support shall manage all repairs and warranties at own cost for the duration of the contract.

5.1.9 EXPENDITURE INVOLVED

The expenditure involved for the Contractor not limited to the followings:

- Rent of Dedicated Line FOR 1 SMS, 1 DRS, 4 Vending Stations.
- Back Up line OF THE ABOVE
- Cost of Computer RIBON
- Cost of printing paper
- Maintenance of Computer and cartridges.
- Cost of Cleaning of Premises
- Salary of Manpower
- Pick up for deposition of sales
- Fuel and maintenances cost of Pickup
- Daily, Weekly and Monthly SALE REPORT TO BPDB (Stationery /Computer cartridges)
- REPORT STATIONERY
- Dedicated line to 4 Division with Computer set-up AND PARALEL LINE TO CDU’S & CU’s.
- Hardware & Software Engineer for SMS/CDU
- HARDWARE Engineer for back-up recovery
- Maintenance of main SMS, backup/DRP SMA and CDU’s
- Recovery of Arrear, Notice, Supplementary Bill for Consumers and collection
5.1.10 ENERGY BALANCE REPORT

Vending system shall have a comprehensive energy balancing module. A feeder wise report shall be generated for indicating total system loss for the selected feeder. These losses shall be calculated on the basis of calculating the difference of total energy dispatched by the feeders and total energy consumed by all the customers (Pre-paid, LT Consumer and HT Consumers). Energy auditing shall be performed for any individual feeder or for all feeders with respect to the total energy consumed by meters.

5.1.11 MANPOWER

For 8 years operation & maintenance support the tenderer shall supply the following manpower:

1. SMS Manager (EE+IT Background) – 1 No.
2. System & Database Administrator - 2 nos.
3. Hardware & Network Engineer - 1 no.
4. Maintenance Engineer for Meter – 4 nos. having experience in Prepayment metering
5. Supervisors for the CDU Operators – 4 Nos.
6. SMS operators (customer data capture clerks at SMS) – 1 No.
7. CDU Operator - 56 nos.
8. Security Guard - 10 Nos.

6. Training

6.1 Introduction

It is essential that the Employer has an end to end understanding of the system and is able to operate and maintain the system.

This section describes the approach to be taken by the Contractor in implementation of the training of BPDB staff. The specification will describe main activities to be carried out by the Contractor in the provision of the training and the main content of the Bid on training.

6.2 Training organization/administration

Engineers and technicians nominated by the Employer shall be trained at site.

The Bid shall include a description of the Bidder's proposed organization and administration for implementation of the training program, indicating the responsibility for training within the Bidder's proposed site organization, and indicating the staff responsible for the various components of the training.

The training is intended for management and engineering staff of BPDB so as to enable them to understand in detail the function of the prepayment meters and to operate and expand/adapt the Prepayment Metering System.

The Contractor shall train following number of engineers/technicians of BPDB

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<th>LOT</th>
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<th>Training Period</th>
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<tr>
<td>LOT -1</td>
<td>24</td>
<td>4 (Four ) Weeks</td>
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<tr>
<td>LOT -2</td>
<td>12</td>
<td>1 (One ) Week</td>
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<tr>
<td>LOT -3</td>
<td>12</td>
<td>1 (One ) Week</td>
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All cost including traveling, lodging, food and pocket expenses shall have to be borne by the Contractor.
6.3 Training plan
The Bidder must propose a plan for implementation of the Training Program. The plan must describe the sequencing, time, duration and resources involved in implementation of each of the Bidder's proposed training activities.

The plan must be illustrated by a bar chart or diagram with the Work Plan and Staffing Schedule for the Training Program, indicating timing and staff responsible for the various training components. To demonstrate the relation between the overall plans for training, the Bidder may present the training activities in a bar chart, where the other project activities are also presented.

6.4 Training program
The Training Program shall contain full course descriptions for all courses to be carried out. The course description shall present course objectives, reflecting optimal performance of the center system and the work to be carried out to achieve this.

The Contractor (supplier) shall be responsible for training all employees. A system of accreditation shall be implemented and employees shall be trained and accredited prior to performing a specific task.

Accreditation shall apply in particular to:
- Vending operators or cashiers, supervisors and the system manager for CDUs.
- Operators and the system manager for the SMS.
- Meter installation staff.
- Customer care and PR employees.

Bidders are to provide the following detail with the bid:

1. Designation of course
2. Course Outline
3. Duration of Course
4. Cost of additional courses exclusively for the benefit of BPDB employees.

All courses shall be in English medium and shall incorporate written training manuals for each delegate as well as demonstrations and hands on tuition. Training shall take place in Chittagong.
7. General Technical Requirements

This section covers the general technical requirements of all sections of this specification and shall be complied with in every respect unless otherwise stated or agreed with the Employer’s representative.

7.1 Standards and codes of practice

All material and equipment supplied and all works carried out shall comply in every respect with the technical codes of the International Organization for Standardization (ISO) and with the recommendations of the International Electrotechnical Commission (IEC), which apply to the electrical equipment.

Goods and special guarantees beyond the scope of ISO and IEC shall conform at least to one of the following standards and codes in the following priority:

1. VDE and DIN standards
2. BS or ASTM
3. Other internationally accepted standards which ensure a quality equal to or higher than the standards mentioned above, but only if these are submitted in the English language edition.

The Bidder shall clearly state his proposal concerning the standards and codes he intends to apply.

Immediately following the Letter of Acceptance the contractor shall supply 3 copies of his indexed list (in English), of all standards, codes and their referred associated standards, to which the work is to be performed. One (1) copy shall be sent to the Employer’s representative Site Office, one copy to the Employer’s representative head office, and one copy to the Employer, along with the English version of the relevant standard.

7.2 Design, standardization, interchangeability

The works shall be designed to facilitate inspection, cleaning, maintenance and repair. The design shall incorporate every reasonable precaution and provision for the safety of all those concerned in the operation and maintenance of the works.

The equipment shall be designed to operate satisfactorily under all variations of load and temperature, as may be met in normal usage under the variation in climatic conditions given in section A6 ‘Project Information’.

Corresponding parts throughout shall be made to gauge and be interchangeable wherever possible.

All equipment performing similar duties shall be of the same type and manufacture in order to limit the stock of spare parts required and to maintain uniformity.
The following documents shall be read in conjunction with this specification. In case of conflict, however, this document shall take precedence nothing in this specification shall lessen the contractors obligations detailed in any other documents forming part of the contract.

<table>
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<th>Description</th>
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<tr>
<td>IEC 62058-11 &amp; 21</td>
<td>Electricity metering equipment (AC) – Acceptance inspection – part 21: Particular requirements for electromechanical meters for active energy (classes 1 and 2).</td>
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<tr>
<td>IEC 60735</td>
<td>Testing equipment for electrical energy meters.</td>
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<td>IEC 62051</td>
<td>Electricity Metering – Glossary of terms</td>
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<td>IEC 62052-11</td>
<td>Electricity metering equipment (AC)- General requirements, tests and test Conditions- Part 11: Metering equipment</td>
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| IEC 62055 | Part 21: Framework for standardization  
Part 31: Particular requirements- Static payment meters for active energy (classes 1).  
Part 41: Standard transfer specification- Application layer protocol for one way token carrier systems  
Part 51: Standard transfer specification- Physical layer protocol for one way numeric and magnetic card token carrier  
Part 52: Standard transfer specification- Physical layer protocol for two way virtual token carrier for direct local connection |
| IEC 62056 - 21 | Electricity metering – Data exchange for meter reading, tariff and load control – Part 21:Direct local data exchange |
| IEC 61000-4-2 | Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test |
| IEC 61000-4-3 | Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test |
| IEC 61000-4-4 | Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test |
| IEC 61000-4-5 | Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test |
| IEC 60950-1 | Information technology equipment - Safety - Part 1: General requirements |
| IEC 62052-11, 62053-21 & 62053-23 | Alternating current static watt-hour meters (classes 1) |
| IEC 61038 | Time switches for tariff and load control |
| ISO 9001 | Code of practice for quality systems part 1: Model for quality assurance in design/development, production, installation and servicing. |
| ETSI EN300220-1 | Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range |
7.3 Plant and equipment identification

The Contractor shall prepare an "equipment classification system", based on an alpha-numeric system and is subject to the approval of the Employer's representative. Preferably the DIN Regulation 40719 harmonized with IEC-Publication 750 shall be applied.

The classification numbers shall appear in all drawings, lists, documents prepared by the Contractor for the project from the initial stage of the contract execution.

The Contractor shall supply all labels, nameplates, instruction and warning plates necessary for the identification and safe operation of the individual equipment and the plant and all inscriptions shall be in the English language.

7.4 Labeling

Before being packed for shipment to the site, all items of equipment shall be carefully numbered and marked so that they can be readily assembled and erected in the correct relative positions at the site. Wherever applicable, these numbers and markings shall be punched or painted so that they shall be clearly visible.

All individual pieces shall be marked with the plant identification number and the correct designation shown on the Contractor's detailed drawings and other documents (packing lists, spare parts lists in Operating and Maintenance Instructions, etc.).

Marking shall be done identically on labels and by stamping the marks into the metal before painting, galvanizing, etc., and shall be clearly readable after painting, galvanizing, etc.
7.5 Packing

The Contractor shall prepare all equipment and materials for shipment in such a manner as to protect them from damage in transit, and shall be responsible for and make good any and all damage due to improper preparation or loading for shipment.

Packing shall be done for convenient sections, so that the weight and size of sections are suitable for the transport conditions to the site and for handling at the site under the special conditions applicable there.

All parts of the Plant shall be packed at the place of manufacture. The packing shall be suitable for shipment by sea and for all special requirements of the transportation to the site. Where necessary, double packing shall be used in order to prevent damage and corrosion during transportation, unloading, reloading and intermediate storage.

All identical members shall be packed together, if reasonably possible, in a form convenient for shipment and handling.

Small items shall be packed in boxes and large items shall be protected, where necessary, by timber, straw and sacking.

All parts shall be suitably protected against corrosion, water, sand, heat atmospheric conditions, shocks, impact, vibrations, etc. for later transport and storage.

Tube ends and other similar open ends shall be protected against external damage and ingress of dirt and moisture during transit and while awaiting erection at site. Flanged pipes shall have their open ends protected by adhesive tape or jointing and then be covered with a wooden blind flange.

Precautions shall be taken to protect shafts and journals where they rest on wooden or other supports like to contain moisture. At such points wrapping impregnated with anti-rust composition or vapor phase inhibitors shall be used of sufficient strength to resist chaffing and indentation due to movement which is likely to occur in transit.

Lids and internal cross battens of all packing cases shall be fixed by screws and not nails.

The contents of the cases shall be bolted securely to the case or fastened in position with struts or cross battens, and not wedged in place with wooded shocks, unless these are fastened firmly in place. All struts or cross battens are preferably to be supported by cleats fixed to the case above and below to form ledges on which the batten may rest. Cases shall be up-ended after packing to prove that there is no movement of contents.

Where parts are required to be bolted to the sides of the case, large washers shall be strengthened by means of a pad. Wood wool shall be avoided as far as possible for packing purposes.

Where practicable, all indoor items, such as electrical machines, switch and control gear, instruments and panels, matching components etc. shall be “cocooned” or covered in polythene sheeting, sealed at the joints and the enclosures provided internally with an approved desiccant.

Spare parts shall be packed for long duration storage. Items such as gaskets and seals have to be vacuum-sealed packed.

Each crate or package shall contain a packing list in a waterproof envelope. All items of material shall be clearly marked for easy identification against the packing list.

All cases, packages, etc. shall be clearly marked on the outside to indicate the total weight, the position of the center of gravity and the correct position of the slings and shall bear an identification mark relating them to the appropriate shipping documents.

All stencil marks on the outside of cases shall be either of a water-proof material or protected by shellac or varnish.
All packing costs shall be included in the scope of delivery. The packing materials remain the property of the Employer.

7.6 Transport and storage

The Contractor shall arrange suitable transport facilities for any kind of transport up to his storage area/warehouse on Site under his direction and responsibility.

All parts of the plant shall be delivered sufficiently in advance of demand to the Site and shall be brought to the warehouse/storage area of the Contractor, or, if possible and approved by the Employer's representative, to the ultimate place of installation.
## 7.7 Measurement

In all correspondence, technical schedules, drawings and instrument scales, the following units shall be used:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Name of Unit</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Metre</td>
<td>m</td>
</tr>
<tr>
<td>Mass</td>
<td>Kilogram</td>
<td>kg</td>
</tr>
<tr>
<td>Time</td>
<td>Second</td>
<td>s</td>
</tr>
<tr>
<td>Temperature</td>
<td>Degree Celsius</td>
<td>°C</td>
</tr>
<tr>
<td>Temperature Difference</td>
<td>Kelvin</td>
<td>K</td>
</tr>
<tr>
<td>Electric Current</td>
<td>Ampere</td>
<td>A</td>
</tr>
<tr>
<td>Luminous Intensity</td>
<td>Candela</td>
<td>cd</td>
</tr>
<tr>
<td>Area</td>
<td>Square meter</td>
<td>m²</td>
</tr>
<tr>
<td>Volume</td>
<td>Cubic meter Litre</td>
<td>m³</td>
</tr>
<tr>
<td>Force</td>
<td>Newton</td>
<td>N</td>
</tr>
<tr>
<td>Pressure (gauge)</td>
<td>Bar</td>
<td>bar g</td>
</tr>
<tr>
<td>Pressure (absolute)</td>
<td>Bar</td>
<td>bar</td>
</tr>
<tr>
<td>Stress</td>
<td>Newton per square millimeter</td>
<td>N/mm²</td>
</tr>
<tr>
<td>Velocity</td>
<td>Meter per second</td>
<td>m/s</td>
</tr>
<tr>
<td>Rotational Speed</td>
<td>Revolutions per minute</td>
<td>rpm</td>
</tr>
<tr>
<td>Flow</td>
<td>Cubic meter per day-hour</td>
<td>m³/d-m³/h</td>
</tr>
<tr>
<td></td>
<td>Kilogram per second-hour</td>
<td>kg/s-m³/h</td>
</tr>
<tr>
<td></td>
<td>Litre per second</td>
<td>l/s</td>
</tr>
<tr>
<td>Density</td>
<td>Kilogram per cubic meter</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Torque, Moment of Force</td>
<td>Newton meter</td>
<td>Nm</td>
</tr>
<tr>
<td>Work, Energy or Heat</td>
<td>Joule</td>
<td>J</td>
</tr>
<tr>
<td>Heat Capacity, Entropy</td>
<td>Joule per Kelvin</td>
<td>J/K</td>
</tr>
<tr>
<td>Calorific Value</td>
<td>Joule per cubic meter</td>
<td>J/m³</td>
</tr>
<tr>
<td></td>
<td>Joule per gram</td>
<td>J/g</td>
</tr>
<tr>
<td>Power, Radiant Flux</td>
<td>Watt</td>
<td>W</td>
</tr>
<tr>
<td>Heat release rate</td>
<td>Watt per square meter</td>
<td>W/m²</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>Watt per meter Kelvin</td>
<td>W/mK</td>
</tr>
<tr>
<td>Dynamic Viscosity</td>
<td>Newton second per square meter</td>
<td>Ns/m²</td>
</tr>
<tr>
<td>Kinematic Viscosity</td>
<td>Meter squared per sec.</td>
<td>m²/s</td>
</tr>
<tr>
<td>Surface Tension</td>
<td>Newton per meter</td>
<td>N/m</td>
</tr>
<tr>
<td>Concentration</td>
<td>Parts per million</td>
<td>ppm</td>
</tr>
<tr>
<td>Electrical Conductivity</td>
<td>Microsiemens per meter at 25 °C</td>
<td>ns/m</td>
</tr>
<tr>
<td>Frequency</td>
<td>Hertz</td>
<td>Hz</td>
</tr>
<tr>
<td>Electric Charge</td>
<td>Coulomb</td>
<td>C</td>
</tr>
<tr>
<td>Electric Potential</td>
<td>Volt</td>
<td>V</td>
</tr>
<tr>
<td>Electric Field Strength</td>
<td>Volt per meter</td>
<td>V/m</td>
</tr>
<tr>
<td>Electric Capacitance</td>
<td>Farad</td>
<td>F</td>
</tr>
<tr>
<td>Electric Resistance</td>
<td>Ohm</td>
<td>Ω</td>
</tr>
<tr>
<td>Conductance</td>
<td>Siemens</td>
<td>S</td>
</tr>
<tr>
<td>Magnetic Flux</td>
<td>Weber</td>
<td>Wb</td>
</tr>
<tr>
<td>Magnetic Flux Density</td>
<td>Tesla</td>
<td>T</td>
</tr>
<tr>
<td>Magnetic Field Strength</td>
<td>Ampere per meter</td>
<td>A/m</td>
</tr>
<tr>
<td>Inductance</td>
<td>Henry</td>
<td>H</td>
</tr>
<tr>
<td>Luminous Flux</td>
<td>Lumen</td>
<td>lm</td>
</tr>
<tr>
<td>Illuminance</td>
<td>Lux</td>
<td>lx</td>
</tr>
<tr>
<td>Thermal Resistivity</td>
<td>Kelvin meter per watt</td>
<td>Km/W</td>
</tr>
</tbody>
</table>
B1 Vending System Specification

(Applicable for Lot-1 only)
1. General

This Section covers the technical requirements of the Vending Equipment (Credit Dispensing Unit and System Master Station) component of the Prepayment Metering System. The on-line CDU and SMS to be supplied under this contract shall be based on the STS specification.

In addition, the following referenced documents provide the necessary detail to supplement this specification, and should be read in conjunction with this document. In cases of conflict however, this specification takes precedence.

<p>| | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
</table>

1.1 System Overview

The system is hierarchical in nature with the utility billing, customer management and/or financial accounting system at the top of the hierarchy.

The mainstay of bidder’s offer is a field-proven Vending System (VS).

The architecture should be a Windows based management system that should manage both financial and meter related information, thereby addressing both the commercial and technical needs of the BPDB. It should run on a Microsoft SQL or Oracle Server platform and should be capable of handling hundreds of thousands of customers.

The Vending System should be set up in a Client/Server configuration. The database will be kept in SMS on one Server, and will be accessible from that Server or from any number of client computers on the same network (local or wide area). The software shall have an intuitive user interface, with international language capability.

The VS should allow vending by directly controlling CDUs by SMS. The VS should be able to download parameters and data to, and retrieve data from the CDUs via LAN (Local Area Network), WAN (Wide Area Network), or Modem. The CDU’s, which will sell on behalf of BPDB, will be managed on the VS. Account payments and arrears recovery should be supported.

The VS should maintain a complete history of the associations between customers, accounts, meters and locations and the activities and statistics of these can be tracked with reporting.

**Client-Server System**

The VS should allow a Client-Server system with multiple client computers being able to be registered at the SMS, capable of managing various types of POS’s and or CDUs.

The system should be fully scalable, with the only dependence being on hardware used and the number of Client-Server seats licensed.

There should be no limitation to the number of POS’s and or Vending Clients, Customers registered on a system, or the number of transactions managed, as long as the hardware can fulfill the processing requirement.
Management System with Client Computers

The VS should allow a multiple client computer management system being able to be linked up to a single database situated on the Server. This means various people can be doing different tasks on the management system all at the same time and this will be controlled by their login permissions as set-up by the System Administrator.

Vending Server with Client CDUs

The bidder should propose, on the vending side, only one Vending Server with multiple CDUs and the Vending Server can be situated on the Server that contains the Management System databases. There should be either a Local Area Network (LAN) or a Wide Area Network (WAN) connecting the CDUs to this server. This network should ensure that when a transaction is made on the CDU, it will automatically be transferred to the Management System Database via the Vending Server. Additions or modifications made on the Management System should be transferred to the Vending Server via a transfer application hence will be available at the CDU. If the link is down between the CDU and the Vending Server that particular CDU will be off line and no transaction will be able to be made on that Vending Client.

Major Functions of SMS

The SMS provides consolidated energy accounting report to the utility energy management system and receives customer data from the customer management system. The SMS is the prime prepayment system management tool, where customers are registered on the system; tariffs are set and management control and reporting takes place. The SMS is responsible for the following key functions:

Registration of customers.
Initialization, management and control of CDUs.
Management reporting for operational control.
System Accounting and interfacing to BPDB management systems.
Other functionalities as stated in Technical Specifications.

All CDUs shall be connected with SMS on line. Each CDU, at the initial stage, shall be capable of catering for vending to about 3000 customers.

The Credit Dispensing Unit is the second layer of the system. Each Vending Station shall have at least one CDU. If required a vending station may have number of CDUs. Vending Stations consisting of appropriate number of CDUs will be distributed across the geographical area in which the meters are installed. It is the point of sale and dispenses tokens to the customers in exchange for money.

The key requirements of the CDU are to provide maximum security, with the lowest operating and maintenance complexity. The key functions that it is responsible for are:

1. It accepts CDU information from the SMS.
2. It issues information on the token.
3. It dispenses credits and issues receipts to the customer.
4. It accounts for money received for tokens, fixed charges and other amounts owed the customer.

The various components to be proposed for the prepayment system will be as under:

- Main Database Server at System Master station (SMS) which typically includes SMS database, VS database, Application & transaction server
- Customization Unit (CU)
- Vending stations / Credit dispensing units (CDU)

The VS shall allow 3rd party system software to be integrated to the proposed system so that vending shall be compatibly interfaced to support vending methods like mobile SMS, scratch card, internet etc, so that BPDB can adopt to any payment/vending means as the situation warrants with complete security.

The Vending System should be designed as per scope of work. Provision should be there to enhance the number of vending stations as and when necessary.

In general, the CDU will be operated by the contractor’s personnel or by third party vendors on behalf of BPDB. In many cases a combination of the above might operate various CDUs within a system.

The bidder must be capable to supply, install & commission a vending system operating with prepayment meters implementing BPDB’s tariff. The bidder also will operate and maintain the vending system simultaneously for a period of 8(eight) years under full control of BPDB/ RDC(Regional Distribution Company). In case of successful operation & maintenance the composite/universal vending system, that support agreement may be extended for next 2(two) years.

2. Scope of Supply

The Bidder shall supply the following minimum equipment but not limited to and unless otherwise stated shall carry an unconditional 3 (Three) Years warranty (from date of commissioning): The equipment shall be in good working order on handover at the end of the contract period. All equipment paid for by BPDB shall remain BPDB’s property.

The Bidder shall supply all vending equipment and associated peripheral equipment. Prices for the procurement of additional units at a later stage are to be supplied by the Bidder.

The following additional equipment will be required at EACH vending stations:

1 (one) set of security system to safeguard staff and equipment.

Network and Customer Survey

The Contractor shall survey the site to confirm the bill of materials and to collect all information required to rehabilitate the network and install the meters.

a) The information collected shall include:

1. Customer Name.
2. Customer Address.
3. Existing account number/s or illegal consumer.
4. Existing tariff.
5. Transformer number.
6. Single or three-phase connection.
7. Type of reticulation.
8. Length and condition of service line.
9. Whether a circuit breaker is installed.

Preliminary customer information will be provided to the Contractor by BPDB on mobilization. This will, however, need to be verified and supplemented by the contractor as appropriate.

b) The information will be verified by the Project Engineer and Project Director and will be used as a basis for payment of installation services. Work shall proceed until the Project Engineer and Project Director has approved the survey document after conducting spot checks.

c) The survey shall include identification of sites for the location of point of sale terminals and the System Master Station.

d) Customers shall be notified by mass media and pamphlet drops that the survey will take place.

e) Illegal consumers shall be noted by the survey teams and reported to BPDB. BPDB shall disconnect the consumer and take further action.

2.1 Vending Equipment (CDU)

a) The Contractor shall be responsible for the installation and commissioning of vending equipment (which is capable to vend for meter of other manufacturer under STS association) at the designated points of sale and at the System Master Station location.

b) Customer details obtained from the survey shall be captured at the SMS as described in the system overview document.

c) The Contractor shall produce works orders and encode tokens for the installation crews to install meters and to allow the installation supervisor to commission the meters. These shall be available for scrutiny by BPDB at any time.

d) The Vending equipment (CDUs) and associated peripherals as specified in the price schedules shall be supplied by the contractor and shall remain the property of BPDB at the end of the contract.

2.2 System Master Station (SMS)

a) The SMS shall be installed at the BPDB's designated point.

b) The Bidder shall refurbish the office and Bidder personnel shall operate the SMS under full control of BPDB/RDC.

c) All customer details shall be captured on-line and exported to the SMS or alternatively captured directly at the SMS or a client of the SMS on line.
d) The SMS shall be commissioned and programmed with BPDB’s tariffs.
e) SMS and CDU shall be connected online through Local Area Network (LAN) and or Wide Area Network (WAN).

2.3 Sales Points

a) The Contractor shall establish sales points for the duration of the contract.
b) The contractor shall provide all refurbishment work including false ceiling, petty civil works, replace floor with glazed tiles, painting etc. as required.
c) The point of sale offices shall be air conditioned and repainted.
d) Each point of sale office shall have a safe to secure cash takings.
e) CDU operators shall be protected behind security glass or steel bars.
f) The offices shall have reliable telecommunications equipment and lockable safes.
g) The contractor shall purchase all office fittings.
h) The contractor shall provide uninterrupted power supply by UPS.

Cost of the above should be included in their bid proposal.

3. Special Technical Requirements

3.1 Vending System Architecture

As the proposed system is STS, tariffs shall be stored and managed at the SMS and distributed by the SMS to the CDUs.

Data transfer between the SMS and CDUs will take place automatically via remote communications (on-line).

The CDU should consist of at least the following hardware components:

a) A personal computer based host with a keyboard and monitor. An integrated point of sale terminal may serve as the CDU. Personal computers shall be current state of the art equipment. Full specifications of proposed equipment are required in the bidder’s response.
b) A printer for receipts. This may be integrated in the point of sale terminal. A separate audit and report printer is also required.
c) A hand held unit to extract data from meters.
d) An uninterruptible power supply with at least 1000 VA capacity and line conditioning capability. Notwithstanding the capacity requirement the power supply shall provide at least 60 minutes operation after a mains power failure. A facility to allow the system to perform an orderly shut before the uninterruptible power supply shuts down shall be incorporated into the system. A secure, high capacity and quick transfer mechanism is required. This mechanism shall be portable and robust.
e) An on line reliable vending network shall be established through internet/intranet/optical fiber network.
f) The bidder should describe the proposed system architecture in detail.

3.2 Tariff Management

3.2.1 Tariff Definition

The System Manager shall be able to define tariff objects. Each tariff has a unique tariff ID associated with it. The following information is required to define a tariff.

<table>
<thead>
<tr>
<th>Tariff ID</th>
<th>A unique tariff identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Date</td>
<td>This is the date on which the tariff becomes effective.</td>
</tr>
</tbody>
</table>

The developed Software shall be provisioned for supporting both the following tariff so that anyone can be selected to remain active and properly locked through password.

A. Consumption based Step Tariff

<table>
<thead>
<tr>
<th>Step Structure</th>
<th>Step (Consumption range)</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - kWh1</td>
<td>R1</td>
<td></td>
</tr>
<tr>
<td>kWh1 - kWh2</td>
<td>R2</td>
<td></td>
</tr>
<tr>
<td>kWh2 - kWh3</td>
<td>R3</td>
<td></td>
</tr>
<tr>
<td>kWh3 - kWh4</td>
<td>R4</td>
<td></td>
</tr>
<tr>
<td>kWh4 - kWh5</td>
<td>R5</td>
<td></td>
</tr>
<tr>
<td>kWh5 -</td>
<td>R6</td>
<td></td>
</tr>
</tbody>
</table>

B. Sanction load based Stage Tariff

<table>
<thead>
<tr>
<th>Stage Structure</th>
<th>Stage (Sanction load)</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1 kW</td>
<td>R1</td>
<td></td>
</tr>
<tr>
<td>X2 kW</td>
<td>R2</td>
<td></td>
</tr>
<tr>
<td>X..kW</td>
<td>R...</td>
<td></td>
</tr>
<tr>
<td>X..kW</td>
<td>R...</td>
<td></td>
</tr>
<tr>
<td>X..kW</td>
<td>R...</td>
<td></td>
</tr>
<tr>
<td>X..kW</td>
<td>Rn</td>
<td></td>
</tr>
</tbody>
</table>

1 The rate, service charge, fixed charge and minimum charges include any taxes payable.
### Service Charges SC
Fixed charges are levied per month. These charges are different for single and three phase customers in a particular tariff category.

### Minimum Charges MC
There will be no minimum charges for prepaid customers, but conventional customers pay a minimum charge, which varies per tariff category.

### Sanctioned Demand Charges DC (Fixed Charge)
A fixed charge per kW of the sanctioned demand is levied per month.

### VAT
Value added tax is levied on electricity charges and must be catered for in the system.

---

**a)** The tariff code, effective date, kWhx (in units of kWh), Rx together with a fixed monthly service charge SC and a fixed monthly sanctioned demand shall be used to define all prepaid tariffs used in the system.

**b)** The SMS shall make provision for up to 99 tariff definitions, as prescribed in STS specifications.

**c)** The SMS must verify the tariff data entered and shall not allow discontinuities in the energy levels or negative rates for energy and fixed charges.

**d)** There shall be a facility to copy tariffs to new tariff codes for editing purposes. The edit facility shall include a mechanism to increase the values of any of the variables Rx, SC and DC by a fixed percentage.

**e)** Tables of Supply Group Codes and tariffs shall be securely stored at the SMS.

Refer to BPDB's prepayment tariff document (Volume 2, Part C0) for details of the tariffs for the prepayment pilot.

### 3.2.2 Tariff Algorithm

The prepayment system could be implemented with stepped tariffs. The tariffs will be implemented at the vending equipment. An algorithm to allocate units of electricity based on the stepped tariff must be provided. The algorithm must ensure that:

**a)** The stepped tariff is implemented as accurately as is the case for conventionally billed customers.

**b)** Customers are not restricted to the amount and frequency of electricity token.

**c)** The algorithm must allow for frequent changes in tariff rates and/or structures without costly logistics and/or inaccurate application of the tariffs.

**d)** The algorithm shall operate according to the rates specified in the stepped tariff. The bidder shall provide a detailed description of the step tariff algorithm including:
   
   i) All assumptions made.

   ii) Examples of how the algorithm works.
iii) Examples of how to explain the algorithm to customers.

iv) Examples of how to deal with customer queries.

v) Descriptions of how the algorithm manages tariff rate and tariff structure changes

vi) Descriptions of mechanisms to apply corrections

vii) Descriptions of how to deal with the situation where a customer buys at two different locations between data transfers.

viii) Online data transfer is required so that customer can buy token from any vending system and different locations.

3.3 SMS Management

3.3.1 Operational Parameters

The SMS should provide the means to create, edit and/or delete the following minimum operational parameters.

a) CDU location.
b) CDU ID.
c) CDU installation date.
d) Supply Group Codes.
e) Security and key management parameters.
f) Log on Profiles.
g) Password expiry times.
h) Hardware and software configuration details.
i) Communications parameters.
j) Receipt printing header and format.
k) Maximum value for a token.
l) Minimum value for a token.
m) Quick Vend amounts.
n) Authentication time.
o) Credit limit.
p) Allow Reversals.
q) Allow Refunds.
r) Allow Reissues.
3.4 CDU Management

3.4.1 Authentication
The SMS shall support the following CDU authentication functionality:

a) The SMS must authenticate each uniquely identified CDU under its hierarchy periodically. The maximum time period between authentications shall be configurable between 1 day and 21 days or online system.

b) The authentication shall take place by remote communications or by manual transfer.

c) If a CDU is not authenticated by the SMS in the time period allocated, vending at the CDU must be disabled until it is authenticated.

d) All communication sessions between the SMS and each CDU shall be authenticated.

3.4.2 Credit Limits
Each CDU under the hierarchical control of the SMS shall have a credit limit set by the SMS.

a) The credit limit shall be used to limit the risk of theft and shall be refreshed by a manual entry by the System Manager, normally upon receipt of a bank deposit slip. The amount to be refreshed should match the amount on the deposit slip.

b) The credit refresh shall take place by remote communications or by manual transfer.

c) If a CDU credit limit is reached, the CDU will automatically disable the vending of tokens until the credit is refreshed by the SMS either remotely or via manual transfer.

3.4.3 Cash Reconciliation

a) The SMS shall maintain a record of all cash deposited (using the CDU banking report) for a specific period for each CDU under its hierarchical control and shall compare this value with the cash vended value that is calculated by summing all transactions for the particular CDU.

Cash accounting shall take place on a Supply Group basis as well as on a CDU basis.
3.4.4 Operational Parameters

The following minimum operational parameters for each CDU must be maintained by the SMS. The SMS should provide the means to create, update and delete the following minimum information related to the CDU and profile configuration.

a) Vendor Name.
b) Vendor telephone number.
c) CDU location.
d) CDU ID.
e) CDU installation date.
f) Supply Group Codes.
g) Security and key management parameters.
h) Log on Profiles.
i) Password expiry time and date.
j) Hardware and software configuration details.
k) Communications parameters.
l) Receipt printing header and format.
m) Maximum value for a token.
n) Minimum value for a token.
o) Quick Vend amounts.
p) Authentication interval.
q) CDU Credit limit.
r) Allow CDU Reversals.
s) Allow CDU Refunds.
t) Allow CDU Reissues.

3.4.5 CDU Setup Procedure

Setting up of a CDU therefore requires the following steps at the SMS:

1. Define and configure the CDU security parameters.
2. Define the tariffs (independently of Supply Groups)
3. Enable the CDU from the SMS.
3.5 Security

The SMS and CDU shall be secured in such a manner that unauthorized access shall be prevented and an audit of authorized activities is available at all times. It shall not be possible to operate a CDU without regular authentication from the SMS.

3.5.1 Access Control

For both the SMS and CDUs the following access control functionality is required:

3.5.1.1 Levels of Access

There shall be three default levels of access to the vending equipment:

a) System Manager level

b) Supervisor level

c) Operator level (cashier)

In addition the System Manager shall have the ability to define user specific levels of access. This functionality shall be easy to implement and shall provide maximum flexibility.

The following shall be a minimum subset of items shall comprise the levels of access profile:

1. Set up and Configuration
   - Configure hardware
   - Set operational profiles
   - Set time and Date
   - Set-up communications and transfer mechanisms
   - Load cashier details and passwords

2. Security
   - Security Devices
   - Supply Groups
   - Tariffs
   - Credit limits
   - Authentication time period

3. Customer Management
   - Customer registration
   - Edit customer details
4. Token Issue
   - Sales tokens
   - Test tokens
   - Display Information tokens
   - Set current/power limit tokens
   - Tamper reset tokens
   - Tariff change tokens

5. Reports
   - Transaction listing (sales reports)
   - Customer report
   - CDU Sales Totals
   - Total Sales to date

6. Housekeeping
   - Perform Backup/Restore
   - Perform Archive
   - Repair Databases

7. Allow Reversals

8. Allow reissues

3.5.1.2 Log On

   a) The system should make provision for a cashier to enter a personal password before being granted access to the vending application. The password should be based on a minimum of 6 alphanumeric characters, and should be encrypted.

   b) Failed log on attempts must be written to the transaction database. And be stored in an audit trail log file (this can be a field in the database or a specific file). The logs should be retrievable and it shall be possible to generate report for all logs for printing of electronic distribution.

   c) Passwords should expire after some configurable time. The default expiration period must be 3 months.

   d) A CDU should make provision for up to five cashiers, and should maintain separate sales totals for each cashier.

   e) The log-on operation must be logged in the transaction database with the date, time, and cashier ID.

   f) A cashier log on shall prompt the printing of a log on report as specified in the Reports section of this document.
g) The log on event must be stored in the audit log together with the accumulated totals report for that cashier. This report must consist of at least the cashier ID, Time and Date, the total cash collected, refunds, reversed transactions and the cash float amount for the shift.

### 3.5.1.3 Log Off

a) A log off operation must be confirmed before it is executed.

b) The operation must be logged in the transaction database with the date, time and cashier ID.

c) The system shall be capture end of shift and a log off shall be captured in the audit log. It shall be possible to generate an end of shift report from the Point of Sales printer which must be kept. This report should contain at least the following:

- Cashier ID,
- Time and date,
- Monetary totals received, cash and list of cheques (if cheques are accepted)
- Reversed transactions,
- Refunds.

d) The end of shift report as specified in the reports section of this document must also be printed.

e) The cashier must be logged out automatically after recovery from a sudden exit (i.e. power failure, system crash etc.). The event shall be logged in the transaction database/log along with the date, time and cashier ID. The database/log shall store every log on/off and maintain this for later printing or reporting purpose.

### 3.5.1.4 Change Password

This function allows allocation of a new password for the operators should the original password not be known.

a) The Supervisor must select the cashier from a list of registered cashiers.

b) The new password for the cashier must be entered twice.

c) The password shall be changed to the new password if the two new passwords are the same, and a message shall be displayed that the password was successfully changed. Failing that, the operation must be aborted with an appropriate message.

d) The operation shall be logged as “change password” event in the engineering log together with the cashier ID.
3.5.1.5 Access to Software and Databases

No unauthorized access to the software files or databases of the vending equipment will be allowed. It shall not be possible to copy the application software and use it on another computer without the installation of a suitably authorized security device. The bidder shall indicate how the data is to be secured by encryption or other means.

3.5.1.6 Access to System Components and Operating System

a) It shall not be possible to load other application software on the CDU.

b) In the case of the SMS, it shall be possible to load additional software applications.

c) Access to the operating system should not be possible under any conditions, not limited to but including the following conditions: Any system error that causes the program execution to halt; any keyboard entry, touch screen or other human related entry and booting the system from a system disk.

d) Hard drives shall be authenticated by the application and the software shall not permit unauthorized swapping of hard drives.

5.3.2 Audit Trails

a) All transactions on the Vending equipment must be recorded as they are performed using an audit trail printer. The transaction must include the identity of the person making the transaction. If the system is not equipped with an audit trail printer, the events should be logged to a secure non-volatile memory for printing at some future date.

b) All the actions must be logged and it shall not be possible to delete the audit log.

c) All hardware and software faults and errors must be logged.

d) Refer to the transaction management section for details related to specifying the end of a shift, and for banking batch procedures.

e) The total cash amount of all tokens sold from the CDU shall be automatically stored in the secure module. Access to this value shall be controlled by the levels of access profile.

3.5.3 CDU Authentication

The CDU/SMS should support the following authentication functionality:

a) The SMS must authenticate each uniquely identified CDU under its hierarchy at least once per week or each login for online system.

b) The authentication shall take place by remote communications or by encrypted manual transfer. Each authentication message shall be unique to a particular CDU and shall be used only once.

c) If a CDU is not authenticated by the SMS in the time period allocated, the secure module and hence vending at the CDU must be disabled until it is authenticated.
3.5.4 CDU Credit Limit Allocation

The CDU/SMS should support the following authentication functionality:

a) Each CDU is allocated a credit limit (transferred to the CDU from the SMS). As credit is vended to customers, the CDU credit must be decremented until it reaches zero, at which point further vending is suspended. The credit shall be a monetary value, not a kWh value.

b) Only after the CDU operator or supervisor banks the money, and proof of the transaction is furnished to the System Manager at the SMS, will the credit limit be updated by the SMS.

c) The credit limit shall be increased by the amount of money banked.

3.5.5 Supply Group Codes

The valid customers of BPDB are free to purchase electricity from any Vending Station and CDU therein. However, there shall be provision in the VS, should BPDB desire, to restrict some customers to purchase electricity from particular Vending Station / CDU. For such exceptional case, appropriate mechanism/code shall be applied.

3.6 Transaction Management

The transaction types that shall be supported by the CDU are:

a) Cash sales

b) Cash sales reversal

c) Account payment

d) Account payment reversal

3.6.1 Cash Sales

3.6.1.1 Cash Sale Payment

a) The customer data shall be obtained from the CDU database. This data will include:

- Meter serial number (meter ID)
- Supply Group Code (as applicable)
- Tariff ID

b) The token value includes taxes and other charges that are calculated as part of the tariff. The CDU shall, for accounting and reporting purposes, split the taxes from the sales figures.

c) The information shall be displayed and acknowledged by the cashier before the token is generated and written to the token.

d) The operation shall be logged along with the meter serial number on the audit printer.

e) The secure module shall be decremented to manage the credit limits.
3.6.1.2 Cash Sale Reversal

Reversals shall be allowed only if set up in the CDU configuration table.

If enabled by the SMS this function allows the cashier to reverse a token that was issued. The intention of this function is to immediately reverse a token whose value was erroneously entered by the cashier or in the case where a customer cannot pay for the token that was requested.

a) The cashier must retrieve the token and select the reverse transaction option.

b) The token shall be invalidated.

c) The transaction must not be deleted but shall be marked as reversed in the transaction database.

d) The transaction should then be displayed and confirmed before the reversal is accepted.

e) The old receipt must be retained and the word “Reversed” shall also be printed on the new receipt. The cashier must retain both receipts.

f) The operation shall be logged with the meter serial number on the audit trail log/database.

3.6.2 Account Payments

3.6.2.1 Pay Account

This facility makes provision for repayment of outstanding debts by the customer. Debts can be incurred by non-payment of previous bills and by settlement of the outstanding balance when the induction meter is replaced.

a) There are two mechanisms for the repayment of the debt. The first is the allocation of a default percentage of each token purchased is allocated to the loan repayment, and the second is a token for a customer specified amount, being made using this Pay Account facility.

b) The CDU shall first check the outstanding balance of the account by checking the outstanding balance due as at the time of the last SMS download. The system should not accept a payment in excess of the balance and should indicate to the customer what the remaining balance is, and deduct this amount.

c) A receipt for the token must be issued to the customer as proof of payment.

d) The CDU must store a successful account payment transaction in the SMS-transaction database. A unique transaction type number must be allocated for this account payment.

3.6.2.2 Reverse Payment

Processing of the reverse payment is done for the same reasons and in the same way that a cash sale reversal is processed.
3.6.3 Refunds

Refunds shall be allowed only if set up in the CDU configuration table. Bidders are to certify that allowing refunds shall not compromise the security of the system. In addition the following requirements must be met:

a) Only tokens, which have not been inserted into a meter, may be refunded.

b) The original transaction must be available at the point of sale for a refund to occur and shall only be possible at a POS allowed to make refunds. Each refund shall be track and the log on details of the POS operator making the refunds shall be stored in the audit trail/log.

c) If the original transaction is not available at the point of sale the customer must be directed to the SMS to collect the refund.

d) Tokens that can be duplicated by customers or have been issued as duplicate tokens at a vending point shall not be refunded. The bidder is to provide details of how to prevent unauthorized duplication of tokens if refunds are to be allowed.

e) A token shall not be refunded without the presentation of a valid receipt for the token. The receipt number must therefore be entered into the CDU before the refund can be made.

f) The cashier must retrieve the token, verify that it has not been used and then select the refund transaction option.

g) The token shall be invalidated.

h) The original transaction must not be deleted but shall be marked as being a refund in the transaction database.

i) The customer's average consumption and forward allocations must be corrected to reflect the refund.

j) The cashier must retain the old receipt and a new receipt marked "Refund" shall be printed.

k) The operation shall be logged with the meter serial number on the audit trail/log.

3.6.4 Reissue Duplicate of Tokens

The reissue of tokens shall be allowed only if set up in the CDU configuration table. Bidders are to certify that allowing duplicate tokens to be reissued shall not compromise the security of the system. In addition the following requirements must be met:

a) If tokens are reissued they must be identical to the token lost. Under no circumstances shall a new token be encrypted to replace a lost token.

b) The original transaction must be available at the point of sale for a duplicate to be issued.

c) If the original transaction is not available at the point of sale the customer must be directed to the SMS to collect a duplicate token.

d) All duplicate tokens generated shall be logged in the transaction database with original transaction data and the ID of the operator who issued the duplicate token.

e) No refunds shall be possible for tokens that have been reissued.
3.6.5 Receipt Details

A receipt shall be issued for each transaction. The following information shall be printed on the receipt:

- CDU ID number
- The utility/operator Tax registration number
- Date and time
- A unique transaction and receipt numbers
- Transaction type (Cash sale, Account payment, Reversal, Refund etc.)
- The meter serial number
- Supply Group Code (as applicable)
- The monetary value of the token value with the following sub-total indicators that are computed. The purpose of this information is to provide clarity to the customer as to how the token total is allocated.
  - Amount to be credited for electricity consumption.
  - Amount to be credited to the outstanding account, if any.
  - New balances on outstanding account calculate from date of latest SMS download.

Any refunds due to overpayment must be also indicated. Refunds are to be collected at a nominated CDU, the name and address of which shall be printed on the receipt.

3.7 Customer Management

The customer management functionality is used to capture new customers on the system, edit customer details and export customer databases to other systems. Various query facilities are also required.

3.7.1 Customer Data Definition

The minimum data fields required for each customer (meter installation) are:

a) Customer Name.
b) Customer Address.
c) Customer telephone number.
d) Old Account number.
e) Customer ID.
f) Historical average monthly consumption in kWh.
g) Sanctioned Load in kW
h) Transformer Name/Number.

i) Feeder Name/Number.

j) Supply Phase.

k) Meter ID.

l) Meter type. (single phase or three phase)

m) Supply Group Code. (as applicable)

n) Total arrears due.

o) Outstanding arrears amount.

p) Credit Purchased to Date.

q) Date of commissioning the meter.

r) Average kWh Consumption per billing period.

s) Tamper events.

The data can be captured manually at the SMS (if allowed in the access profile) or imported from another system at the SMS. The data resides at the SMS and under normal circumstances will not be captured at the CDU. The Contractor shall develop an import/export facility to transfer data between BPDB’s billing and customer management system and the SMS.

At time of registration the meter details and network details may not be known. These are left for after installation and commissioning of the meter.

### 3.7.2 Edit Customer Data

a) A supervisor with the relevant access rights shall modify customer records. The SMS should therefore support the facility to assign access rights to supervisors using suitable security mechanisms.

b) All modifications shall be written to the audit log.

c) A customer shall not be deleted from the system until the customer’s meter has been decommissioned and transaction uploads from all CDUs with the Supply Group allocated to the customer have been received and processed.
3.7.3 Customer Queries and Reports

Customer queries shall be accessed via the system database. There shall be a facility to generate user-defined reports. The report writer facility shall be intuitive and easy to use.

The reports must be printed at the option of the operator.

3.7.3.1 Customer Information

Customer information refers to that information pertaining to the customer's personal details, physical address and electrical address. The following fields are mandatory for this group:

a) Customer Name
b) Customer Address
c) Customer telephone number
d) Old Account number
e) Customer ID
f) Supply Group Code
g) Tariff
h) Feeder Name/Number
i) Transformer Name/Number
j) Meter type (single phase or three phase)
k) Supply Phase.

3.7.3.2 Meter Information

This group contains information related to the meter, with the following fields being mandatory in this category:

a) Meter Type
b) Meter ID
c) Date of meter commissioning
d) Power Limit value
e) Connected Load
3.7.3.3 Account and Consumption Information

The account information group includes details regarding the old account as well as details regarding outstanding debt. Minimum information required for accounts is

(i) Account names
(ii) Account numbers
(iii) Opening balance
(iv) Interest rate applicable
(v) Payment taxable or not
(vi) Allowable repayment mechanisms
   a) % of money tendered for token
   b) Fixed monthly charges
   c) Voluntary payment amount

Minimum Information required for accounts is: For fixed monthly charges, if a payment has not been made for a number of months, then the accumulated outstanding amount must be paid prior to allocating funds to token purchases.

3.7.3.4 Transaction Information

The fourth group, the customer transaction history must be available at the SMS and a display or printout of this information shall be provided if required. The start and end date of transactions to be included will be entered by the operator.

Transactions shall be split into the following categories:

a) Token sales.
b) Account Payments
c) Reversals.
d) Refunds.

The date of transaction, transaction amount and CDU ID shall be displayed for each transaction.
3.7.4 Customer Queries at the CDU/SMS

The CDU shall not retain historical customer data. Essential customer details shall be maintained in the customer database. The following queries shall be available for all customers belonging to one of the Supply Groups allocated to the CDU:

3.7.4.1 Display Meter Status

The full meter status shall be available at the SMS. The minimum details to be displayed here are:

a) Meter make and Model
b) Meter ID
c) Supply Group (as applicable)
d) Tariff Index
e) Active tariff
f) Current/power limit setting

The details as specified shall be displayed and printed on request.

3.7.4.2 Display Customer Details

Customer details shall be available for query. The following minimum details shall be displayed.

a) Customer Name
b) Customer Address
c) Supply Group Code (as applicable)
d) Active Tariff (Rate, Sanctioned load)
e) Balance on Account

3.8 Communication between SMS and CDU (on line)

The communications protocol shall provide secure transfer of data between the CDU and SMS including node authentication and automatic error correction. Two methods of communication must be available. In both cases it shall be possible to transfer data in the background and to continue operation of the CDU.

a) Scheduled Communication where data is automatically transferred on programmable schedule.
b) Unscheduled Communication where data is transferred on demand by operator initiation.
3.9 Reports at the CDU Level

The following reporting functions are described below:

3.9.1 Cashier End Of Shift Report

The end of shift report is a report of all transactions for a particular operator. The report is opened when the cashier logs on and is closed at log off. This report is automatically printed at every log off operation. The report is used to track transactions performed by a specific operator.

a) The end of shift report shall contain the following:
   - CDU ID
   - Cashier ID and end of shift number
   - Log on time and date
   - Log off time and date
   - Monetary totals for the duration of the shift:
     - Cash sales
     - Reversals
     - Account payments
     - Account reversals
     - Refunds
     - Total amount of cash that the cashier should have collected during the shift: Cash sales + Account repayments - refunds

b) A facility to disable auto printing of the end of shift report and allow printing on demand shall be provided. If auto printing is disabled or the printer is out of order the report must be displayed and written to a file for printing at a later date.

c) The maximum duration of a shift (as configured for the CDU) is exceeded then the cashier is forced to log off.

3.9.2 Transaction Listing Report

Reports shall be sorted by transaction type, date or transaction number. The report must be displayed or printed for a range of dates, operators or transaction types.

Fields to be displayed and optionally printed are:

   a) Transaction type
   b) Date
   c) Cashier number
   d) Serial number
   e) KWhtAmount
   f) Cash Amount

3.9.3 CDU Audit Log

The CDU audit log, which captures all relevant events, shall be displayed or printed on supervisor request. BPDB shall have the facility to access the Audit logs. Audit logs shall not be deleted unless archived. A BPDB held password is entered to allow that facility.
3.10 Reports at the SMS Level

In addition to the reports specified in this document there shall be a facility to generate user-defined reports using a report writer. The bidder shall provide full details of how to generate user-defined reports.

The following reports are also required:

3.10.1 Tariff Definitions

This report allows the operator to view all of the tariffs defined for the Supply groups defined for the System.

a) This report must display the Supply Groups and Tariffs defined for each CDU under the control of the SMS.
b) Existing tariffs and future tariffs shall be stored at the SMS and both shall be displayed in this report.

3.10.2 CDU Status

a) The report shall display all the operational parameters for a particular CDU together with the current level of credit used and the CDU deposit history details.
b) The audit log shall also be displayed in this report.
c) The sales per Supply Group shall also be displayed in this report.

3.10.3 Sales Reports

Sales reports with totals broken down per transaction type shall be displayed and sorted by Customer, by CDU, by Tariff or by Supply Group.

A date range shall be entered to limit the size of the report. The report should contain at least the following (although it must be possible to use the Report Writer to modify or define new sales reports):

1. Date,
2. CDU ID,
3. Customer ID,
4. Tariff,
5. Supply Group,
6. Transaction type,
7. Transaction value with totals for each transaction type and a grand total.

3.10.4 Exception Reports

A suite of exception reports shall be generated on request from the operator. The minimum requirement for the exception reports are as defined below, although it shall be possible to define additional exception reports using the "Report Writer" facility.

3.10.4.1 Low Consumption Report

a) This report lists the customers whose average monthly consumption has dropped below an operator-selected threshold of either kWh usage or monetary expenditure.
b) An option to select the previous month average, a three-month moving average or a 6-month moving average shall be provided.
3.10.4.2 No Consumption Reading

a) The no consumption readings report lists the customers whose historical billing period consumption readings have not reached the SMS.
b) The option to specify the reading for a range of billing periods shall be provided.
c) For each customer or meter in the No Consumption Readings report there must be a facility to retrieve the date and value of the last consumption reading. The meter status (i.e. commissioned, decommissioned or pending commissioning) must also be provided.
d) The meter ID, customer ID, customer telephone number and address shall be provided in the report.

3.10.4.3 Tampered Meters

A list of all tampered meters with date of tamper, meter ID, customer ID and customer address shall be provided.

3.10.4.4 Meter Failures/Alarms

The meter ID, customer ID, date of commissioning, customer telephone and address shall be provided for all meters where the fault or state message indicates an alarm or failure.

All reports must be generated from system and generated reports do not need any change and generated reports could not be changed.

3.11 Testing and Approval

BPDB intends to fully test all the functionalities offered by the bidders as asked for in the tender specifications, prior to award the contract. In order to ascertain the offered system functionalities meet the requirements of BPDB, the verification process will be done by site visit and demonstration as follows. Bidders are to provide the details as required below:

3.11.1. SITE VISIT

Objective of the Site Visit:

The objective of the site visit is to evaluate the general products and services offered by the bidder.

1. Requirements for the Site Visit

- Introduction and background of the client utility: Utility name, location, total customer base, number of prepaid customers, tariffs in use.
- Contact details for bid evaluation team to make follow up enquiries: Contact for System Management issues, Contact for Support and Maintenance issues. (Name, position, telephone and email)
- Details of prepaid system currently in use: Meter type and models, vending architecture, vending functionality, number of vending channels, number of vending outlets,
- Summary of System Management processes: Daily operation, Vending support and maintenance. Details of any hosting arrangements and maintenance and support processes. What is the supplier’s responsibility with regard to support and maintenance? Please describe and summarize Service Level Agreement, if appropriate. What are typical response times?
- Details of Communication systems in use
- Details of reports in use, supply a few sample reports
- Details of historical development of vending at the site including planned and available options for future upgrades
- The supplier must compare the system installed at site visit and to the system proposed.
- Details of typical day to day operational problems with the system: Describe problem and provide frequency of occurrence.
- Adaptability & integration of meters from different vendors
- Description of problem with the system or limitations of the system: What are the issues, how has supplier responded to system issues, what would utility like to change?
- Description of critical implementation issues.
- Comment on documentation provided by the supplier.
- General Assessment of Product provided by supplier
- General assessment of Services supplied by supplier
- Visit to the Central Server and at least one vending point.

3.11.2. DEMONSTRATION

Objective of the Demonstration

The objective of the demonstration is for the supplier to show the BPDB team that the system meets all the requirements of the technical specifications and to explain any deviations and/or alternative functionality.

Requirements for Demonstration

- Set up Client Server architecture as proposed for the prepayment system. Explain any deviations and compromises that are due to the test environment
- Provide populated dummy database to show system operation, maintenance activities and third party vending.
- Walk through technical specifications illustrating compliance to required functionality. This includes generating reports on demand and interfacing to third party vending systems.
- Explain any deviations to the technical specification and additional functionality that may be appropriate.
- Clarify any issues arising from bid submission that are raised by the Bid Evaluation team. These may be technical, commercial or project management related issues.

3.12 Quality Assurance

Bidders shall comply with and be certified to the following ISO levels:

ISO 9001 Quality Systems

Part I: Model for quality assurance in design/development, production, installation and servicing

ISO 9002 Quality Systems

Part II: Model for quality assurance in production and installation

ISO 9003 Quality Systems

Part III: Model for quality assurance in final inspection and test

Bidders shall submit copies of certification with their proposal to this effect.
B2: i. SPECIFICATIONS OF
STS APPROVED SPLIT & NON-SPLIT TYPE SINGLE PHASE METER
1. GENERAL

This section describes the design, manufacture, testing and supply for STS approved split & Non-Split type single phase directly connected Prepayment energy meters of accuracy class 1 for BANGLADESH POWER DEVELOPMENT BOARD (BPDB). Split-type single phase prepayment meter consists of the following two parts:

   a) Measurement & Control Unit (MCU)
   b) User Interface Unit (UIU)

2. SCOPE OF SUPPLY

The tenderer shall be responsible for supply, installation and related services (including supply necessary accessories except cable) packing, loading, shipment, custom clearance if necessary, and transportation, insurance and unloading at site.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Name of Goods or Related Services</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Supply and installation of Split &amp; Non-Split type Pre-payment Energy Meter including necessary accessories packing, loading, shipment, custom clearance if necessary, and transportation, insurance and unloading at site</td>
<td>Single phase, 230 Voltage (phase to neutral), 10(60)A (min.)</td>
<td>Nos.</td>
<td>Lot-1: 40,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lot-2: 67,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lot-3: 27,000</td>
</tr>
</tbody>
</table>

Single phase prepayment meters shall be installed and commissioned according to the minimum guidelines as set out in technical specification. Prior to installation of meters customers shall be forewarned by delivery of a notice explaining what will happen. Public relations will be responsibility of the utility companies.

The installation team shall have a work order sheet instructing them what to do. The following information shall be printed on the works order from:

Customer Name : Supplied by the BPDB and verified by Survey
Customer address : Supplied by the BPDB and verified by Survey
Old Account Number : Supplied by the BPDB
Old Meter Number & Reading : Supplied by the BPDB
Tariff Code : The specific tariff to be allocated to the customer must be identified by the tariff code

There are different categories of installations that will be required:

1. Removal of induction & conventional digital meter and direct installation of prepayment meter with additional wiring or service line work required.

2. Removal of induction & conventional digital meter, re-routing of wiring with replacement of service connection and installation of pre-payment meter. Potential joints shall not be allowed in service drop cable.
3. Removal of service line and meter. Replacement of service connection and installation of meter.

4. New customer installation including service connection and installation of pre-payment meter.

The following guidelines must be followed by the contractor during installation of the meters:

1. The meters shall be sealed with Ferrule Type/Twist type seals compatible with the meters that uniquely identify the utility person who sealed the meters.

2. Meters shall be tested and commissioned by the installation supervisor using the data from the works order form to program the tariff details.

3. At the time of meter installation the customer’s induction & conventional digital meter reading shall be captured on the order by the installation supervisor and the data returned to the SMS. The date of commissioning is also entered onto the work order form.

4. Customers shall be registered at the SMS using the returned work order form within 24 hours of commissioning.

5. The service connections shall not be replaced unless the survey indicates service line with joints or inadequately rated service lines or bad in selected line.

6. All meters shall be installed indoors at a location convenient to the customer as well as service personnel away from sources of heat and moisture.

7. The installation shall be symmetrical, vertical and parallel to respective walls and floors. From the points where the service enters customers building, it shall be enclosed in a 25 mm² PVC pipe until it enters the metering house.

8. The piping shall be clamped or saddled at a maximum of 250 mm intervals.

9. At the time of installation on site training and instruction shall be given to the customer.

10. All other necessary accessories will be supplied by the Contractor. The service cable will be supplied by BPDB.

3. MODE OF OPERATION:

Prepayment consumers who will purchase energy from the nearest vending station / Credit Dispensing Unit (CDU) using Numeric Token. All CDU will be connected to System Master Station (SMS) for monitoring financial activity data and other data will be transferred to SMS and backup server of BPDB regularly.

System voltage: Nominal service voltage 230V, single phase solidly ground neutral at source, maximum system voltage 280V line to Neutral but sometimes voltage is lowers up to 150V.

4. TARIFF

For operating Prepayment Metering System GOB approved updated tariff rate for different categories will be applied.

5. SYSTEM VOLTAGE:

- Nominal 230 volt, single phase,
- Minimum 150 volt, single phase,
- Maximum 280 volt, single phase,
6. **Standards and codes of practice**

All material and equipment supplied and all works carried out shall comply in every respect with the technical codes of the International Organization for Standardization (ISO) and with the recommendations of the International Electrotechnical Commission (IEC), which apply to the electrical equipment.

Goods and special guarantees beyond the scope of ISO and IEC shall conform at least to one of the following standards and codes in the following priority:

1. VDE and DIN standards
2. BS or ASTM
3. Other internationally accepted standards which ensure a quality equal to or higher than the standards mentioned above, but only if these are submitted in the English language edition.

The following documents shall be read in conjunction with this specification. In case of conflict, however, this document shall take precedence. Nothing in this specification shall lessen the contractors obligations detailed in any other documents forming part of the contract.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 62058-11 &amp; 21</td>
<td>Electricity metering equipment (AC) – Acceptance inspection – part 21: Particular requirements for electromechanical meters for active energy (classes 1 and 2).</td>
</tr>
<tr>
<td>IEC 60735</td>
<td>Testing equipment for electrical energy meters.</td>
</tr>
<tr>
<td>IEC 62052-11</td>
<td>Electricity metering equipment (AC)- General requirements, tests and test Conditions- Part 11: Metering equipment</td>
</tr>
<tr>
<td>IEC 62055</td>
<td>Part 21: Framework for standardization</td>
</tr>
<tr>
<td></td>
<td>Part 31: Particular requirements- Static payment meters for active energy (classes 1).</td>
</tr>
<tr>
<td>IEC 62052-11, 62053-21 &amp; 62053-23</td>
<td>Alternating current static watt-hour meters (classes-1)</td>
</tr>
<tr>
<td>IEC 61038</td>
<td>Time switches for tariff and load control</td>
</tr>
<tr>
<td>IEC 62056-21</td>
<td>Electricity Metering - Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange.</td>
</tr>
<tr>
<td>ISO 9001</td>
<td>Code of practice for quality systems part 1: Model for quality assurance in design/development, production, installation and servicing.</td>
</tr>
<tr>
<td>Others</td>
<td>All other relevant IEC specifications for metering equipment</td>
</tr>
</tbody>
</table>
7. GENERAL TECHNICAL REQUIREMENTS

7.1 Service conditions

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Condition</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maximum ambient temperature (°C)</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Minimum ambient temperature (°C)</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Maximum daily average temperature (°C)</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>Maximum annual average temperature (°C)</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Mean annual rainfall (mm)</td>
<td>2500</td>
</tr>
<tr>
<td>6</td>
<td>Minimum annual rainfall (mm)</td>
<td>1461</td>
</tr>
<tr>
<td>7</td>
<td>Maximum annual rainfall (mm)</td>
<td>4127</td>
</tr>
<tr>
<td>8</td>
<td>Maximum relative humidity (%)</td>
<td>100</td>
</tr>
<tr>
<td>9</td>
<td>Average relative humidity (%)</td>
<td>80</td>
</tr>
<tr>
<td>10</td>
<td>Maximum wind velocity (km/h)</td>
<td>180</td>
</tr>
<tr>
<td>11</td>
<td>Maximum altitude above mean sea level (meters)</td>
<td>200</td>
</tr>
</tbody>
</table>

7.2 Environmental Requirements

The meter shall conform to the environmental capability requirements as documented in IEC 62052-11. In addition to that, the following minimum requirements shall be met.

i) The meter shall be protected against malfunction due to the ingress of vermin, by conformal coating of the printed circuit boards in the meter.

ii) Any openings shall be as small as practically possible to prevent the ingress of dirt and vermin and to limit the potential for vandalism or tamper following IP 51 (minimum).
8. SPECIFIC TECHNICAL REQUIREMENTS

The meters to be supplied against this specification shall meet the requirements specified in this clause.

8.1 Specification of Split-type Single phase Pre-payment Meter

<table>
<thead>
<tr>
<th>Measurement and Control Unit (MCU)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>Split-type &amp; Numeric Token STS Keypad Compatible</td>
</tr>
<tr>
<td><strong>Connection</strong></td>
</tr>
<tr>
<td>1-phase, 2-wire, direct connected (unidirectional). Solidly grounded neutral side.</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
</tr>
<tr>
<td>The pre-payment meter shall be designed, constructed and tested in accordance with IEC standard 62055-31, SANS 1524-1, ISO 9001 and ESKOM</td>
</tr>
</tbody>
</table>

### Electrical ratings

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td>Class 1</td>
</tr>
<tr>
<td><strong>Rated voltage</strong></td>
<td>230V phase to neutral</td>
</tr>
<tr>
<td><strong>Variation in voltage</strong></td>
<td>+25% to –30%;</td>
</tr>
<tr>
<td><strong>Minimum Biasing Voltage</strong></td>
<td>150 V</td>
</tr>
<tr>
<td><strong>Number of element</strong></td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Base current, (I_b)</strong></td>
<td>(\leq 10) A</td>
</tr>
<tr>
<td><strong>Maximum continuous current, (I_{max})</strong></td>
<td>(\geq 60) A</td>
</tr>
<tr>
<td><strong>Starting current</strong></td>
<td>0.4% of the Base current</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>45Hz to 65 Hz</td>
</tr>
<tr>
<td><strong>Power factor</strong></td>
<td>0.5 lag to 0.8 lead</td>
</tr>
<tr>
<td><strong>Voltage circuit burden</strong></td>
<td>(\leq 2.5) Watts and 10 VA</td>
</tr>
<tr>
<td><strong>Protective class</strong></td>
<td>Class II double insulated</td>
</tr>
<tr>
<td><strong>Active energy</strong></td>
<td>Meter shall record total active energy</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>Non volatile memory that retain information up to 10 years in the absence of power</td>
</tr>
<tr>
<td><strong>Power limiting</strong></td>
<td>Meter shall disconnect the load when a pre-programmed threshold power limit (in Watts) is reached. The threshold shall be programmable in steps of 500W or less.</td>
</tr>
<tr>
<td><strong>Tamper detection</strong></td>
<td>Sensor to detect that terminal cover have been opened</td>
</tr>
<tr>
<td><strong>Load disconnection</strong></td>
<td>Latching relay</td>
</tr>
<tr>
<td><strong>Credit Transfer System</strong></td>
<td>Standard Transfer Specification (STS).</td>
</tr>
<tr>
<td><strong>Time interval of re-calibration</strong></td>
<td>Shall be minimum 10 (ten) years</td>
</tr>
<tr>
<td><strong>MCU Enclosure</strong></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Meter Case</strong></td>
<td></td>
</tr>
<tr>
<td>The meter shall be constructed by employing flame retardant and high impact strength material. The base, body and frame including terminal block shall be of heat resistive; shock proof and rust proof good quality hard material e.g. unbreakable engineering or stamped metal or molded phenol resin flame retardant as per IEC 60695-2-1 (glow-wire). Installation Standard BS 5685 mounting footprint. The standard wall base configuration is preferred but the Bidder can propose other type of configuration.</td>
<td></td>
</tr>
<tr>
<td>The meter cover shall be of molded black phenol resin or alternatively stamped metal or toughened glass or Poly-Carbonate. The meter cover shall be provided with a window of Poly-Carbonate or toughened glass. For display of LCD display.</td>
<td></td>
</tr>
<tr>
<td>The meter shall be effectively sealed to prevent entrance of moisture, rain and dust into its internal parts.</td>
<td></td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td></td>
</tr>
<tr>
<td>Bidder may propose international standard mounting.</td>
<td></td>
</tr>
<tr>
<td><strong>Protection against penetration of dust and water</strong></td>
<td></td>
</tr>
<tr>
<td>Conform to the degree of protection of IP51 (minimum)</td>
<td></td>
</tr>
<tr>
<td><strong>Connections diagrams and terminal marking</strong></td>
<td></td>
</tr>
<tr>
<td>Every meter shall be indelibly marked with a diagram of connection</td>
<td></td>
</tr>
<tr>
<td>Meter terminals shall be marked, this marking shall appear on the diagram</td>
<td></td>
</tr>
<tr>
<td><strong>Name plate</strong></td>
<td></td>
</tr>
<tr>
<td>Every meter shall have clearly visible, indelibly and distinctly marked name plate containing the following information:</td>
<td></td>
</tr>
<tr>
<td>i) Manufacturer’s name</td>
<td></td>
</tr>
<tr>
<td>ii) Meter type</td>
<td></td>
</tr>
<tr>
<td>iii) Number of phases and number of wire</td>
<td></td>
</tr>
<tr>
<td>iv) Meter serial number and year of manufacture</td>
<td></td>
</tr>
<tr>
<td>v) Rated voltage of the system</td>
<td></td>
</tr>
<tr>
<td>vi) Basic current and maximum current</td>
<td></td>
</tr>
<tr>
<td>vii) Reference frequency in hertz</td>
<td></td>
</tr>
<tr>
<td>viii) Meter constant in imp/kWh</td>
<td></td>
</tr>
<tr>
<td>ix) Class index of the meter</td>
<td></td>
</tr>
<tr>
<td>x) Over-current breaking capacity (in kA)</td>
<td></td>
</tr>
<tr>
<td>xi) BPDB logo</td>
<td></td>
</tr>
<tr>
<td><strong>Terminals</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Terminal</strong></td>
<td></td>
</tr>
<tr>
<td>Symmetrical (BS)/ Asymmetrical (DIN). Bidder can propose other type following international standard.</td>
<td></td>
</tr>
<tr>
<td>Side/bottom entry connection type minimum 4 (four) terminals to accommodate 10 mm² duplex cable.</td>
<td></td>
</tr>
<tr>
<td><strong>Sealing</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Top cover sealing</strong></td>
<td></td>
</tr>
<tr>
<td>Hermetically sealed or ultrasonic welded or lost head screws.</td>
<td></td>
</tr>
<tr>
<td><strong>Security sealing of terminals</strong></td>
<td></td>
</tr>
<tr>
<td>Security seal compatible with pad lock seal</td>
<td></td>
</tr>
</tbody>
</table>

**Operating environment**
<table>
<thead>
<tr>
<th><strong>Area of application</strong></th>
<th>Indoor meter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating temperature range</strong></td>
<td>-10 °C to 55 °C</td>
</tr>
<tr>
<td><strong>Storage temperature range</strong></td>
<td>-25 °C to 70 °C</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td>Maximum 95% non-condensing</td>
</tr>
</tbody>
</table>

**Operation**

<table>
<thead>
<tr>
<th><strong>General</strong></th>
<th>Credit store with decrement-on-use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credit entry mechanism</strong></td>
<td>Keypad; encrypted numeric tokens</td>
</tr>
<tr>
<td><strong>Credit encryption method</strong></td>
<td>20-digit STS</td>
</tr>
<tr>
<td><strong>Delayed Reconnection</strong></td>
<td>Reconnection should be accomplished within a variable period following resumption of the supply voltage</td>
</tr>
<tr>
<td><strong>Operational life</strong></td>
<td>10 (Ten) years minimum</td>
</tr>
</tbody>
</table>

**Metrological performance**

<table>
<thead>
<tr>
<th><strong>Measurement direction</strong></th>
<th>Forward and reverse detection and metering</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consumption indicator</strong></td>
<td>Visible LED</td>
</tr>
<tr>
<td><strong>Status indication</strong></td>
<td>Visible LED</td>
</tr>
<tr>
<td><strong>Communications Link Status</strong></td>
<td>Visible LED</td>
</tr>
</tbody>
</table>

**Disconnection Device**

| **Type** | Latching relay. |

**Insulation; Over voltage and Surge Protection**

<table>
<thead>
<tr>
<th><strong>Insulation system classification</strong></th>
<th>Protective class II</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insulation level</strong></td>
<td>4 kV rms for 1 minute</td>
</tr>
<tr>
<td><strong>Over voltage withstand</strong></td>
<td>Should withstand 420 volts for 48 hours without causing any damage or degrading of its operating life, or causing changes of more than 0.01 kWh in its credit registers (excluding the possible decrement of credit due to power being consumed).</td>
</tr>
</tbody>
</table>

**Surge immunity**

<table>
<thead>
<tr>
<th><strong>Voltage impulse withstand</strong></th>
<th>In excess of 6 kV, 1.2/50 microsecond (IEC 62052-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current impulse withstand</strong></td>
<td>5 kA/20 microsecond</td>
</tr>
</tbody>
</table>

**Electromagnetic impulse compatibility**

<table>
<thead>
<tr>
<th><strong>Electrostatic discharge</strong></th>
<th>15 kV air discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immunity to HF fields</strong></td>
<td>80 MHz to 2 GHz @ 10V/m with load 80 MHz to 2 GHz @ 30V/m no load</td>
</tr>
<tr>
<td><strong>Immunity to FTB</strong></td>
<td>4 kV</td>
</tr>
<tr>
<td><strong>Radio interference</strong></td>
<td>Complies with requirements for CISPR 22</td>
</tr>
<tr>
<td><strong>Specification Compliance</strong></td>
<td>IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4; IEC 61000-4-6 CISPR 22</td>
</tr>
</tbody>
</table>

**Communication Circuitry**

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>Wireless / PLC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission frequency</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Power Output</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Electromagnetic compatibility:</strong></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td></td>
</tr>
<tr>
<td><em>Electrostatic discharge (enclosure)</em></td>
<td></td>
</tr>
<tr>
<td><em>Electrostatic discharge (battery holder)</em></td>
<td></td>
</tr>
</tbody>
</table>

| **Communication Distance (if Applicable)** |

**User Interface Unit (UIU)**

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless / PLC</td>
</tr>
</tbody>
</table>

**Communication Circuitry**

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless / PLC</td>
</tr>
</tbody>
</table>

| **Transmission frequency** |

| **Maximum Power Output** |

**Electromagnetic compatibility:**

| *Electrostatic discharge (enclosure)* |
| *Electrostatic discharge (battery holder)* |

| **Communication Distance (If applicable)** |

**Operating Environment**

| **Operating Temperature Range** |
| -10 °C to 55 °C |

| **Storage Temperature Range** |
| -25 °C to 70 °C |

| **Relative Humidity** |
| Maximum 95% non-condensing |

**UIU Enclosure**

| **Type** |
| Wall mounted |

| **Rating** |
| IP 51 (minimum) |

| **Material** |
| UV stable polycarbonate/ABS blend with flame retardant |

| **Type** |
| Language-independent |

| **Components** |
| Pictographic/Numeric LCD display, keypad, rate of consumption indicator, audio feedback |

| **Liquid Crystal Display (LCD)** |
| At least 5+1 digits; icon information; numeric information display of various meter information such as credit levels, token entry, kWh for the current billing period, Total kWh used since installation, Instantaneous load etc. WxH: 4 mm x 8 mm (minimum) |

| **Minimum character size** |

| **Keypad** |
| 12-key, international standard layout including “information” and “backspace” keys, |

| **Buzzer** |
| Feedback on key press, Token Accept and Reject melodies, low-credit alarms as a factory-programmable option |
Rate enunciation

Pictorial enunciation using a bar graph or equivalent or a flashing icon depicting the rate of consumption

<table>
<thead>
<tr>
<th>Power source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
</tbody>
</table>

Operational life (if applicable)

Sealing

Enclosure

Factory sealed, no user serviceable parts

- Shall have to fill by Contractor.
- Proposed type of UIU shall have smooth operation with MCU through its proper and perfect interfacing. Any disturbance regarding its interfacing with MCU shall not be acceptable and necessary correction along with its replacement (if necessary) shall be made by the contractor without incurring any additional cost.

8.2 Specification of Non-Split-type Single phase Pre-payment Meter

<table>
<thead>
<tr>
<th>Type</th>
<th>Non-Split-type &amp; Numeric Token STS Keypad Compatible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>1-phase, 2-wire, direct connected (unidirectional).</td>
</tr>
<tr>
<td>Standard</td>
<td>The pre-payment meter shall be designed, constructed and tested in accordance with IEC standard 62055-31, SANS 1524-1, ISO 9001 and ESKOM</td>
</tr>
</tbody>
</table>

Electrical ratings

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Class 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>230V phase to Neutral</td>
</tr>
<tr>
<td>Variation in voltage</td>
<td>+25% to –30%;</td>
</tr>
<tr>
<td>Minimum Biasing Voltage</td>
<td>150 V</td>
</tr>
<tr>
<td>Number of element</td>
<td>1.5</td>
</tr>
<tr>
<td>Base current, I_b</td>
<td>≤ 10 A</td>
</tr>
<tr>
<td>Maximum continuous current, I_max</td>
<td>≥ 60 A</td>
</tr>
<tr>
<td>Starting current</td>
<td>0.4% of the Base current</td>
</tr>
<tr>
<td>Frequency</td>
<td>45 Hz to 65 Hz</td>
</tr>
<tr>
<td>Power factor</td>
<td>0.5 lag to 0.8 lead</td>
</tr>
<tr>
<td>Voltage circuit burden</td>
<td>≤ 2.5 Watts and 10 VA</td>
</tr>
<tr>
<td>Protective class</td>
<td>Class II double insulated</td>
</tr>
<tr>
<td>Active energy</td>
<td>Meter shall record total active energy</td>
</tr>
<tr>
<td>Harmonic energy</td>
<td>Meter shall record total energy including harmonic energy</td>
</tr>
<tr>
<td>Memory</td>
<td>Non volatile memory that retain information up to 10 years in the absence of power</td>
</tr>
<tr>
<td>Power limiting</td>
<td>Meter shall disconnect the load when a pre-programmed threshold power limit (in Watts)</td>
</tr>
</tbody>
</table>
is reached. The threshold shall be programmable in steps of 500W or less.

<table>
<thead>
<tr>
<th>Tamper detection</th>
<th>Sensor to detect that terminal cover have been opened</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load disconnection</td>
<td>Latching relay</td>
</tr>
<tr>
<td>Credit Transfer System</td>
<td>Standard Transfer Specification (STS)</td>
</tr>
<tr>
<td>Time interval of recalibration</td>
<td>Shall be minimum 10 (ten) years</td>
</tr>
<tr>
<td>Meter Case</td>
<td>The meter shall be constructed by employing flame retardant and high impact strength material. The base, body and frame including terminal block shall be of heat resistant; shock proof and rust proof good quality hard material e.g. unbreakable engineering or stamped metal or molded phenol resin flame retardant as per IEC 60695-2-1 (glow-wire). Installation Standard BS 5685 mounting footprint. The standard wall base configuration is preferred but the Bidder can propose other type of configuration. The meter cover shall be of molded black phenol resin or alternatively stamped metal or toughened glass or Poly-Carbonate. The meter cover shall be provided with a window of Poly-Carbonate or toughened glass. For display of LCD display. The meter shall be effectively sealed to prevent entrance of moisture, rain and dust into its internal parts.</td>
</tr>
<tr>
<td>Mounting</td>
<td>The base will be provided with 3 (three) screw mounting holes, 1 (one) slotted meter support bracket at the top and 1 (one) round hole on each side in the bottom half of the base for securely mounting the meter to the meter board or as per requirement following international Standard BS 5685 mounting footprint. The standard wall base configuration is preferred but the Bidder can propose other type of base configuration.</td>
</tr>
<tr>
<td>Protection against penetration of dust and water</td>
<td>Conform to the degree of protection of IP51 (minimum)</td>
</tr>
<tr>
<td>Connections diagrams and terminal marking</td>
<td>Every meter shall be indelibly marked with a diagram of connection Meter terminals shall be marked, this marking shall appear on the diagram</td>
</tr>
<tr>
<td>Name plate</td>
<td>Every meter shall have clearly visible, indelibly and distinctly marked name plate containing the following information:</td>
</tr>
<tr>
<td></td>
<td>i) Manufacturer’s name</td>
</tr>
<tr>
<td></td>
<td>ii) Meter type</td>
</tr>
<tr>
<td></td>
<td>iii) Number of phases and number of wire</td>
</tr>
<tr>
<td></td>
<td>iv) Meter serial number and year of manufacture</td>
</tr>
<tr>
<td></td>
<td>v) Rated voltage of the system</td>
</tr>
<tr>
<td></td>
<td>vi) Basic current and maximum current</td>
</tr>
<tr>
<td></td>
<td>vii) Reference frequency in hertz</td>
</tr>
<tr>
<td></td>
<td>viii) Meter constant in imp/kWh</td>
</tr>
<tr>
<td></td>
<td>ix) Class index of the meter</td>
</tr>
<tr>
<td></td>
<td>x) Over-current breaking capacity (in kA)</td>
</tr>
<tr>
<td></td>
<td>xi) BPDB logo</td>
</tr>
<tr>
<td></td>
<td>xii)</td>
</tr>
<tr>
<td>Terminals</td>
<td>Symmetrical (BS)/ Asymmetrical (DIN). Bidder can propose other type following international standard. Side/bottom entry connection type minimum 4 (four) terminals to accommodate 10 mm² duplex cable.</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sealing</td>
<td>Top cover sealing: Hermetically sealed or ultrasonic welded or lost head screw. Security sealing of terminals: Security seal compatible with pad lock seal</td>
</tr>
<tr>
<td>Operating environment</td>
<td>Area of application: Indoor meter</td>
</tr>
<tr>
<td>Operation</td>
<td>General: Credit store with decrement-on-use</td>
</tr>
<tr>
<td>Metrological performance</td>
<td>Measurement direction: Forward and reverse detection and metering</td>
</tr>
<tr>
<td>Disconnection Device</td>
<td>Type: Latching relay.</td>
</tr>
<tr>
<td>Insulation; Over voltage and Surge Protection</td>
<td>Insulation system classification: Protective class II</td>
</tr>
<tr>
<td>Surge immunity</td>
<td>Voltage impulse withstand: In excess of 6 kV, 1.2/50 microsecond (IEC 62052-11)</td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
<td>Electrostatic discharge: 15 kV air discharge</td>
</tr>
</tbody>
</table>
8.3 Latching relay specifications

The latching relay shall be from Gruner, Germany/ Schneider Electric, USA/BLP, UK, compatible with the offered meter. Otherwise bid will be rejected.

8.4 Meter sealing

The terminals shall have to be sealed by pad lock and it will have to be approved by the Engineers.

8.5 Optical Interface

The meter shall have an IEC 62055-52 compliant optical communication port. This should allow the utility to access via front for variety of customer information stored inside the meter and to upload it into a hand held unit (HHU).

8.6 Electromagnetic compatibility

(a) Immunity to electromagnetic disturbance

The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not damage or substantially influence the meter. The disturbances to be considered are:

i. Electrostatic discharges 15 kV air discharge

ii. Electromagnetic HF field 80 MHz to 2 GHz @ 10V/m with load 80 MHz to 2 GHz @ 30V/m no load

iii. Fast transient burst 4kV
(b) Radio interference suppression

The meters shall not generate conducted or radiated noise which could interfere with other equipment. Complies with requirements for CISPR 22

8.6 Accuracy requirements

(a) Limits of error due to variation of the current

The percentage errors shall not exceed the limits for the relevant accuracy class stipulated in IEC standard.

(b) Limits of error due to other influence quantities

The additional percentage error due to the change of influence quantities shall not exceed the limit for the reference accuracy class stipulated in IEC standard.

(c) Limits of error due to ambient temperature variation

The limits of error shall not exceed the limits stipulated in IEC standard.

(d) Starting and running with no-load

Initial start-up of the meter: The meter shall be fully functional within 5 seconds after the voltage is applied to the meter terminals. A random delayed reconnection time within a preset maximum time (eg. 20 seconds) of the load is preferred to reduce the peak inrush current on the distribution network.

Running with no load: When the voltage is applied with no current flowing in the current circuit the test output of the meter shall not produce more than one pulse.

Starting: The meter shall start and continue to register at 0.4Ib% at power factor of 1.

(e) Meter constant

The relation between the test output and the indication in the display shall comply with the marking on the name-plate.

9 FUNCTIONAL REQUIREMENTS

9.1 Security

All credit and meter management tokens shall be meter specifically encrypted to guarantee security of the system. Encrypted tokens shall not be reusable. Tokens to display status and test the meter may be un-encrypted and reusable.

9.2 Token validation

If a token not meant for the meter is applied, the meter should display a message to that effect. Similarly, if a valid token is re-entered into the meter then the meter must display an appropriate message.

9.3 Meter modes
The meter shall be required to support at least two modes of operation, namely the prepayment mode and the post payment mode.

9.4 Prepayment mode

The basis of this mode is that credit is transferred to the meter, and provided the meter remains in credit, the meter provides supply. The credit register is decremented against current consumption with the countdown total being displayed on the meter display.

9.5 Disconnection

a) The disconnection device may be single pole. Internal bi-stable latch versions shall be offered for single-phase meters. Tenderer shall indicate the type of disconnecting device used with single phase meters.

b) The load shall be disconnected under the following conditions:

- The credit in the meter has expired.
- The load power threshold has been exceeded.
- The meter is in a tampered state.
- Neutral missing.

c) The meter shall indicate whether the load is connected or not and shall display the reason for disconnection.

d) The load shall be disconnected by means of a latching contactor. Single pole disconnection is acceptable provided a means of reverse polarity detection is incorporated. The contactor shall be rated at 100 A continuous.

e) The customer shall not have the option to switch the contactor manually. When the maximum power limit has been exceeded, the mechanism to automatically reconnect the load must ensure that the number of switching cycles is limited. The meter shall attempt to reconnect the load up to 5 times at 30-second intervals. If the over-current condition still exists the meter shall wait a period of 30 minutes before attempting to reconnect the load.

f) The short-time over-current test as specified in IEC 62052-11, 62053-21 & 62053-23 clause 4.43 shall be conducted at a value of 2,000 A instead of 30 Imax.

g) The prepayment meter shall have a power limiting function that will automatically disconnect the load when the average power consumed exceeds the maximum allowed. The function is not intended as a system protection feature. The level shall be programmable. The threshold shall be programmable in steps of 500 watt or less.

9.6 Tamper detection

a) Tamper (cover open) shall be detected either in power supply or without power supply.

b) When the meter detects a tamper condition, it should enter a shutdown state, with an appropriate message. The customer should be disconnected immediately. The tamper status shall be reset by using a uniquely coded tamper reset token that may only be used once.

c) Meter should detect reverse flow of power and measure correctly by forward registration.

10 Energy accounting

10.1 Historic consumption

The meter provides the following historical view of consumption.
a) Meter total consumption to date

b) Previous 30 days operation consumption

10.2 Cumulative energy consumption

a) This register records the cumulative consumption since the meter was commissioned.

b) The units of storage are kWh, displayed with a resolution of 100Wh.

11  Human machine interface

11.1 Displays

11.1.1 General requirements

a) The design philosophy of the meter display subsystem should be that a suitable message or indication must be displayed or annunciated for every meter event and alarm without exception.

b) The meter should make provision for the customer or utility personnel to scroll through the displays.

c) The meter should have a default display that displays the following minimum information on entry of the appropriate short code:

- The Remaining Credit.
- The power limit.
- The current Tariff index.

11.1.2 Liquid crystal display

a) A liquid crystal display is required to display status alarm and event information.

b) Minimum lifetime of ten years is required.

c) The size (number of rows and characters per row) should be appropriate for the display and interpretation of the messages and meter information, and should be legible from a distance of at least 500 cm with a viewing angle of no less than 30°

d) The use of graphics and icons is not prescribed provided the meter information can be intuitively displayed and interpreted and provided the minimum display functionality can be met using the vendor specific system.

The language used for displays where necessary shall be in English. A card with Bengali translations of all messages must be provided on installation of the meter.

11.1.3 Fault and status display

a) The meter should have at least one LED to indicate the presence of a meter fault.

b) The meter should provide a visible indication of the status of the incoming supply.

c) The meter should provide a visible indication of the status of the load circuit-switching device

11.1.4 Rate LED

The meter should include a consumption rate indicator LED.
11.1.5 Status/alarm/event displays

In addition to the displays required above the meter must display the following minimum information in an intuitive way such that an inexperienced user can understand and interpret the information intelligibly. Laminated instruction cards are to be provided for each unit.

i) Meter ID.

ii) Out of Credit message

iii) Invalid token entered

iv) Duplicate token entered

v) Meter tamper state

vi) Meter failure and/or fault code

The tenderer must submit a detailed specification of the way in which the display are structured and laid out.

11.2 Buzzer/Audible Alarm

An audible signal is required to acknowledge valid and invalid keystrokes, to warn the customer of select state changes, and to operate as an alarm.

11.2.1 Keystroke Tones

The buzzer shall emit separate tones for valid keystrokes and invalid keystrokes.

11.2.2 Alarm Notification

It is preferred that the meter issue a short audible tone that is louder than the meter status change tone when the meter enters the failed state.
11.3 Keypad

a) It is necessary for the unit transfer meters to have a full Numeric keypad.

11.3.1 General Requirements

Keypad shall either have a tone, a click sound or alternative mechanical feedback to indicate pressing or depressing of a key on the keyboard. The keyboard shall be constructed such that a visually impaired person can physically detect and determine what buttons are where located on the keypad.

11.3.2 Scroll Buttons / Short Codes

The meter shall incorporate buttons or entry of short codes that allow the customer or utility personnel to scroll up or down through the different meter displays.

11.3.3 Enter/Acknowledge Button

A button should be provided for the customer or utility personnel to enter or acknowledge an event or selection on the meter.

12 Technical Features

System requirement:

(1) The meter shall not accept the Token twice. Each transaction results in a different credit transfer number.

(2) There shall be no link between the meter and the vending station. Each meter is a separate stand-alone unit.

(3) The meter shall be designed with provision to warn the customer with a series of LED Icons and optionally also with an audible warning when it is “low” on energy.

(4) The meters are intended for use in Single phase, two wire applications (60A minimum)

(5) The meter shall use numeric token compatible Keypad entry for credit.

(6) The meter and terminal box shall be enclosed and individually sealed in anti tamper housings.

(7) It is preferred that the single-phase STS Key-pad type prepayment meter shall incorporate an internal bi-stable latch to connect the power.

13 Extra Requirements for Prepayment Meters with Internal Latch

1. The prepayment meter shall automatically switch the latch to the “on” state when the supply to the meter is switched on and the following conditions exist:
   - There is credit available
   - The Meter is not in a tampered state
   - The meter is not in a power limiting state

The user shall not have the functionality to switch the latch on or off since it will allow him to switch the latch into the intentional faults in order to weld the contacts.
2. The following procedure shall be employed, to restrict the number of switching cycles when the meter is disconnecting the load, in order to limit the average power consumed.
   (i) reconnect the load up to five times, with 30-second intervals, if the consumption is more that the programmed limit.
   (ii) Wait for 30 minutes if the consumption is still above the limit before repeating the procedure.
3. The meter shall give a clear indication if the load has been disconnected to limit the power.
   (a) The temperature rise for the latch is not specified but the meter shall operate correctly without damage under the following conditions for at least 5 hours:
   (b) A fully operational meter in a chamber at an ambient temperature of 55 deg. C
   (c) At least 120% of the rated voltage of the meter during and after the test the meter shall operate correctly without sustaining any damage and the latch shall successfully connect and disconnect, when tested with not less 40 seconds per switching cycle.
   (d) It shall not be possible to influence the switching operating of the latch by applying a magnet to any externally accessible part of the meter.

16 Other Indicators

1. The prepayment meter shall display the entered credit during the token entry.
2. The prepayment meter shall have a means to remove digits one at a time from the end of a partially entered number (for example, a “Backspace” or “Plus” key).
3. The prepayment meter shall uniquely indicate the following conditions; Acceptance of numeric token, rejection of numeric token, numeric token already used and individual colored icons to indicate at a glance the high to low credit status.
4. A consumption rate indicator light shall be provided.
5. The prepayment meter shall provide continuous power indication when power is supplied to the meter.
6. Audible Alarm

17 Testing and approval

a) It will be the responsibility of the tenderer to submit to the Employers representative for approval a complete Acceptance Test Procedure (ATP) for system verification.

b) Once the Employer’s representatives approve the ATP, the testing and performance validation tests on 2% (random samples) of the supplied meters will commence. The Employer’s representative at the utility’s premises will witness these tests.

18 Quality Assurances

Bidders shall comply with and be certified to the following ISO levels:
ISO 9001 Quality Systems
  Part I: Model for quality assurance in design/development, production, installation and servicing
ISO 9002 Quality Systems
  Part II: Model for quality assurance in production and installation
ISO 9003 Quality Systems
  Part III: Model for quality assurance in final inspection and test
Bidders shall submit copies of certification with their proposal to this effect
B2: ii. SPECIFICATIONS OF
STS APPROVED NON-SPLIT-TYPE THREE PHASE METER
1. GENERAL

This section describes the design, manufacture, testing and supply for STS approved non-Split-type three phase directly connected Prepayment energy meters of accuracy class 1 for BANGLADESH POWER DEVELOPMENT BOARD (BPDB).

2. SCOPE OF SUPPLY

The tenderer shall be responsible for supply, installation and related services (including supply necessary accessories except cable) packing, loading, shipment, custom clearance if necessary, and transportation, insurance and unloading at site.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Name of Goods or Related Services</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Supply and installation of Non-Split-type Pre-payment Energy Meter including necessary accessories</td>
<td>Three phase, 400 Voltage (phase to phase), 10(100)A</td>
<td>Nos.</td>
<td>Lot-1: 1200</td>
</tr>
<tr>
<td></td>
<td>packing, loading, shipment, custom clearance if necessary, and transportation, insurance and</td>
<td></td>
<td></td>
<td>Lot-2: 2000</td>
</tr>
<tr>
<td></td>
<td>unloading at site</td>
<td></td>
<td></td>
<td>Lot-3: 800</td>
</tr>
</tbody>
</table>

Non-Split-type three phase prepayment meters shall be installed and commissioned according to the minimum guidelines as set out in technical specification. Prior to installation of meters customers shall be forewarned by delivery of a notice explaining what will happen. Public relations will be responsibility of the utility companies.

The installation team shall have a work order sheet instructing them what to do. The following information shall be printed on the works order from:

- Customer Name : Supplied by the Utility and verified by Survey
- Customer address : Supplied by the Utility and verified by Survey
- Old Account Number : Supplied by the Utility
- Old Meter Number & Reading : Supplied by the Utility
- Tariff Code : The specific tariff to be allocated to the customer must be identified by the tariff code

There are different categories of installations that will be required:

1. Removal of induction & conventional digital meter and direct installation of prepayment meter with additional wiring or service line work required.

2. Removal of induction & conventional digital meter, re-routing of wiring with replacement of service connection and installation of pre-payment meter. Potential joints shall not be allowed in service drop cable.

3. Removal of service line and meter. Replacement of service connection and installation of meter.

4. New customer installation including service connection and installation of pre-payment meter.
The following guide lines must be followed by the supplier during installation of the meters:

1. The meters shall be sealed with pad lock type seals compatible with the meters that uniquely identify the BPDB person who sealed the meters.

2. Meters shall be tested and commissioned by the installation supervisor using the data from the works order form to program the tariff details.

3. At the time of meter installation the customer’s induction & conventional digital meter reading shall be captured on the order by the installation supervisor and the data returned to the SMS. The date of commissioning is also entered onto the work order form.

4. Customers shall be registered at the SMS using the returned work order form within 24 hours of commissioning.

5. The service connections shall not be replaced unless the survey indicates service line with joints or inadequately rated service lines or bad in selected line.

6. All meters shall be installed indoors at a location convenient to the customer as well as service personnel away from sources of heat and moisture.

7. The installation shall be symmetrical, vertical and parallel to respective walls and floors. From the points where the service enters customers building, it shall be enclosed in a 25 mm² PVC pipe until it enters the metering house.

8. The piping shall be clamped or saddled at a maximum of 250 mm intervals.

9. At the time of installation onsite training and instruction shall be given to the customer.

10. All other necessary accessories will be supplied by the Contractor. The service cable will be supplied by BPDB.

3. Standards and codes of practice

All material and equipment supplied and all works carried out shall comply in every respect with the technical codes of the International Organization for Standardization (ISO) and with the recommendations of the International Electrotechnical Commission (IEC), which apply to the electrical equipment.

Goods and special guarantees beyond the scope of ISO and IEC shall conform at least to one of the following standards and codes in the following priority:

1. VDE and DIN standards

2. BS or ASTM

3. Other internationally accepted standards which ensure a quality equal to or higher than the standards mentioned above, but only if these are submitted in the English language edition.

The following documents shall be read in conjunction with this specification. In case of conflict, however, this document shall take precedence. Nothing in this specification shall lessen the contractors obligations detailed in any other documents forming part of the contract.
<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 62058-11 &amp; 21</td>
<td>Electricity metering equipment (AC) – Acceptance inspection – part 21: Particular requirements for electromechanical meters for active energy (classes 1 and 2).</td>
</tr>
<tr>
<td>IEC 60735</td>
<td>Testing equipment for electrical energy meters.</td>
</tr>
<tr>
<td>IEC 62052-11</td>
<td>Electricity metering equipment (AC)- General requirements, tests and test Conditions- Part 11: Metering equipment</td>
</tr>
<tr>
<td>IEC 62055</td>
<td>Part 21: Framework for standardization</td>
</tr>
<tr>
<td></td>
<td>Part 31: Particular requirements- Static payment meters for active energy (classes 1).</td>
</tr>
<tr>
<td>IEC 62052-11, 62053-21 &amp; 62053-23</td>
<td>Alternating current static watt-hour meters (classes-1)</td>
</tr>
<tr>
<td>IEC 61038</td>
<td>Time switches for tariff and load control</td>
</tr>
<tr>
<td>IEC 62056-21</td>
<td>Electricity Metering - Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange.</td>
</tr>
<tr>
<td>ISO 9001</td>
<td>Code of practice for quality systems part 1: Model for quality assurance in design/development, production, installation and servicing.</td>
</tr>
<tr>
<td>Others</td>
<td>All other relevant IEC specifications for metering equipment</td>
</tr>
</tbody>
</table>
4. GENERAL TECHNICAL REQUIREMENTS

4.1 Service conditions
The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Condition</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maximum ambient temperature (°C)</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Minimum ambient temperature (°C)</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Maximum daily average temperature (°C)</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>Maximum annual average temperature (°C)</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Mean annual rainfall (mm)</td>
<td>2500</td>
</tr>
<tr>
<td>6</td>
<td>Minimum annual rainfall (mm)</td>
<td>1461</td>
</tr>
<tr>
<td>7</td>
<td>Maximum annual rainfall (mm)</td>
<td>4127</td>
</tr>
<tr>
<td>8</td>
<td>Maximum relative humidity (%)</td>
<td>100</td>
</tr>
<tr>
<td>9</td>
<td>Average relative humidity (%)</td>
<td>80</td>
</tr>
<tr>
<td>10</td>
<td>Maximum wind velocity (km/h)</td>
<td>180</td>
</tr>
<tr>
<td>11</td>
<td>Maximum altitude above mean sea level (meters)</td>
<td>200</td>
</tr>
</tbody>
</table>

4.2 Environmental Requirements
The meter shall conform to the environmental capability requirements as documented in IEC 62052-11. In addition to that, the following minimum requirements shall be met.

i) The meter shall be protected against malfunction due to the ingress of vermin, by conformal coating of the printed circuit boards in the meter.

ii) Any openings shall be as small as practically possible to prevent the ingress of dirt and vermin and to limit the potential for vandalism or tamper following IP 51 (minimum).
5. SPECIFIC TECHNICAL REQUIREMENTS

The meters to be supplied against this specification shall meet the requirements specified in this clause.

5.1 Specification of Non-Split-type Three phase Pre-payment Meter

<table>
<thead>
<tr>
<th>Type</th>
<th>Non-Split-type &amp; Numeric Token STS Keypad Compatible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>3-phase, 4-wire, direct connected (unidirectional). Solidly grounded neutral side.</td>
</tr>
<tr>
<td>Standard</td>
<td>The pre-payment meter shall be designed, constructed and tested in accordance with IEC standard 62055-31, SANS 1524-1, ISO 9001 and ESKOM</td>
</tr>
</tbody>
</table>

**Electrical ratings**

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Class 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>400V phase to phase</td>
</tr>
<tr>
<td>Variation in voltage</td>
<td>+25% to –30%</td>
</tr>
<tr>
<td>Minimum Biasing Voltage</td>
<td>150V phase to neutral</td>
</tr>
<tr>
<td>Number of element</td>
<td>3(Three)</td>
</tr>
<tr>
<td>Base current, I_b</td>
<td>( \leq 10 \text{ A} )</td>
</tr>
<tr>
<td>Maximum continuous current, ( I_{\text{max}} )</td>
<td>( \geq 100 \text{ A} )</td>
</tr>
<tr>
<td>Starting current</td>
<td>0.4% of the Base current</td>
</tr>
<tr>
<td>Frequency</td>
<td>45Hz to 65 Hz</td>
</tr>
<tr>
<td>Power factor</td>
<td>0.5 lag to 0.8 lead</td>
</tr>
<tr>
<td>Voltage circuit burden</td>
<td>( \leq 5 \text{ Watts and 10 VA} )</td>
</tr>
<tr>
<td>Protective class</td>
<td>Class II double insulated</td>
</tr>
<tr>
<td>Active energy</td>
<td>Meter shall record total active energy</td>
</tr>
<tr>
<td>Memory</td>
<td>Non volatile memory that retain information up to 10 years in the absence of power</td>
</tr>
<tr>
<td>Power limiting</td>
<td>Meter shall disconnect the load when a pre-programmed threshold power limit (in Watts) is reached. The threshold shall be programmable in steps of 500W or less.</td>
</tr>
<tr>
<td>Tamper detection</td>
<td>Sensor to detect that terminal cover have been opened</td>
</tr>
<tr>
<td>Load disconnection</td>
<td>Latching relay</td>
</tr>
<tr>
<td>Credit Transfer System</td>
<td>Standard Transfer Specification (STS)</td>
</tr>
<tr>
<td>Time interval of re-calibration</td>
<td>Shall be minimum 10 (ten) years</td>
</tr>
<tr>
<td><strong>Meter Case</strong></td>
<td>The meter shall be constructed by employing flame retardant and high impact strength material. The base, body and frame including terminal block shall be of heat resistive; shock proof and rust proof good quality hard material e.g. unbreakable engineering or stamped metal or molded phenol resin flame retardant as per IEC 60695-2-1 (glow-wire). Installation Standard BS 5685 mounting footprint. The standard wall base configuration is preferred but the Bidder can propose other type of configuration. The meter cover shall be of molded black phenol resin or alternatively stamped metal or toughened glass or Poly-Carbonate. The meter cover shall be provided with a window of Poly-Carbonate or toughened glass. For display of LCD display. The meter shall be effectively sealed to prevent entrance of moisture, rain and dust into its internal parts.</td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td>The base will be provided with 3 (three) screw mounting holes, 1 (one) slotted meter support bracket at the top and 1 (one) round hole on each side in the bottom half of the base for securely mounting the meter to the meter board or as per requirement following international Standard BS 5685 mounting footprint. The standard wall base configuration is preferred but the Bidder can propose other type of base configuration.</td>
</tr>
<tr>
<td><strong>Protection against penetration of dust and water</strong></td>
<td>Conform to the degree of protection of IP51 (minimum)</td>
</tr>
<tr>
<td><strong>Connections diagrams and terminal marking</strong></td>
<td>Every meter shall be indelibly marked with a diagram of connection Meter terminals shall be marked, this marking shall appear on the diagram</td>
</tr>
</tbody>
</table>
| **Name plate** | Every meter shall have clearly visible, indelibly and distinctly marked name plate containing the following information:  
   i) Manufacturer’s name  
   ii) Meter type  
   iii) Number of phases and number of wire  
   iv) Meter serial number and year of manufacture  
   v) Rated voltage of the system  
   vi) Basic current and maximum current  
   vii) Reference frequency in hertz  
   viii) Meter constant in imp/kWh  
   ix) Class index of the meter  
   x) Over-current breaking capacity (in kA)  
   xi) BPDB logo |
<p>| <strong>Terminals</strong> | Symmetrical (BS)/ Asymmetrical (DIN). Bidder can propose other type following international standard. Side/bottom entry connection type minimum 8 (eight) terminals to accommodate 16 mm² cable. |
| <strong>Sealing</strong> | Top cover sealing Hermetically sealed or ultrasonic welded or lost head screw. Security sealing of Security seal compatible with pad lock seal |
| Terminals |<br />
| --- | --- |
| <strong>Operating environment</strong> |<br />
| Area of application | Indoor meter |
| Operating temperature range | -10 °C to 55 °C |
| Storage temperature range | -25 °C to 70 °C |
| Relative humidity | Maximum 95% non-condensing |
| <strong>Operation</strong> |<br />
| General | Credit store with decrement-on-use |
| Credit entry mechanism | Keypad; encrypted numeric tokens |
| Credit encryption method | 20-digit STS |
| <strong>Metrological performance</strong> |<br />
| Measurement direction | Forward and reverse detection and metering |
| Consumption indicator | Visible LED |
| Status indication | Visible LED |
| Communications Link Status | Visible LED |
| <strong>Disconnection Device</strong> |<br />
| Type | Latching relay. |
| <strong>Insulation; Over voltage and Surge Protection</strong> |<br />
| Insulation system classification Insulation level | Protective class II 4 kV rms for 1 minute |
| Over voltage withstand | Should withstand 420 volts for 48 hours without causing any damage or degrading of its operating life, or causing changes of more than 0.01 kWh in its credit registers (excluding the possible decrement of credit due to power being consumed). |
| Surge immunity Voltage impulse withstand Current impulse withstand | In excess of 6 kV, 1.2/50 microsecond (IEC 62052-11) 5kA/20 microsecond |
| Electromagnetic compatibility Electrostatic | 15 kV air discharge 80 MHz to 2 GHz @ 10V/m with load 80 MHz to 2 GHz @ 30V/m no load |</p>
<table>
<thead>
<tr>
<th>discharge</th>
<th>4 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunity to HF fields</td>
<td>Complies with requirements for CISPR 22</td>
</tr>
<tr>
<td>Immunity to FTB Radio interference</td>
<td>IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4; IEC 61000-4-6 CISPR 22</td>
</tr>
<tr>
<td>Specification Compliance</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Components of Display</th>
<th>Pictographic/Numeric LCD display, keypad, rate of consumption indicator, audio feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Crystal Display (LCD)</td>
<td>At least 5+1 digits; icon information; numeric information display of various meter information such as credit levels, token entry, kWh for the current billing period, Total kWh used since installation, Emergency credit level, Instantaneous load etc. WxH: 4 mm x 8 mm (minimum)</td>
</tr>
<tr>
<td>Minimum character size</td>
<td></td>
</tr>
<tr>
<td>Keypad</td>
<td>12-key, international standard layout including “information” and “backspace” keys</td>
</tr>
<tr>
<td>Buzzer</td>
<td>Feedback on key press, Token Accept and Reject melodies, low-credit alarms as a factory-programmable option</td>
</tr>
<tr>
<td>Rate enunciation</td>
<td>Pictorial enunciation using a bar graph or equivalent or a flashing icon depicting the rate of consumption</td>
</tr>
<tr>
<td>Operational life</td>
<td>10 (Ten) years minimum</td>
</tr>
</tbody>
</table>

5.2 Latching relay specifications

The latching relay shall be from Gruner, Germany/ Schneider Electric, USA/BLP, UK, compatible with the offered meter. Otherwise bid will be rejected.

5.3 Meter sealing

The terminals shall have to be sealed by pad lock and it will have to be approved by the Engineers.

5.4 Optical Interface

The meter shall have an IEC 62055-52 compliant optical communication port. This should allow the utility to access via front for variety of customer information stored inside the meter and to upload it into a hand held unit (HHU).

5.5 Electromagnetic compatibility

(a) Immunity to electromagnetic disturbance
The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not damage or substantially influence the meter. The disturbances to be considered are:

i. Electrostatic discharges 15 kV air discharge

ii. Electromagnetic HF field 80 MHz to 2 GHz @ 10V/m with load 80 MHz to 2 GHz @ 30V/m no load

iii. Fast transient burst 4kV

(b) Radio interference suppression

The meters shall not generate conducted or radiated noise which could interfere with other equipment. Complies with requirements for CISPR 22

5.6 Accuracy requirements

(a) Limits of error due to variation of the current

The percentage errors shall not exceed the limits for the relevant accuracy class stipulated in IEC standard.

(b) Limits of error due to other influence quantities

The additional percentage error due to the change of influence quantities shall not exceed the limit for the reference accuracy class stipulated in IEC standard.

(c) Limits of error due to ambient temperature variation

The limits of error shall not exceed the limits stipulated in IEC standard.

(d) Starting and running with no-load

Initial start-up of the meter: The meter shall be fully functional within 5 seconds after the voltage is applied to the meter terminals.

Running with no load: When the voltage is applied with no current flowing in the current circuit the test output of the meter shall not produce more than one pulse.

Starting: The meter shall start and continue to register at 0.4Ib% at power factor of 1.

(e) Meter constant

The relation between the test output and the indication in the display shall comply with the marking on the name-plate.
6 FUNCTIONAL REQUIREMENTS

6.1 Security

All credit and meter management tokens shall be meter specifically encrypted to guarantee security of the system. Encrypted tokens shall not be reusable. Tokens to display status and test the meter may be un-encrypted and reusable.

6.2 Token validation

If a token not meant for the meter is applied, the meter should display a message to that effect. Similarly, if a valid token is re-entered into the meter then the meter must display an appropriate message.

6.3 Meter modes

The meter shall be required to support at least two modes of operation, namely the prepayment mode and the post payment mode.

6.4 Prepayment mode

The basis of this mode is that credit is transferred to the meter, and provided the meter remains in credit, the meter provides supply. The credit register is decremented against current consumption with the countdown total being displayed on the meter display.

6.5 Disconnection

a) The disconnection device may be single pole. Internal bi-stable latch versions shall be offered for Three-phase meters. Tenderer shall indicate the type of disconnecting device used with three phase meters.

b) The load shall be disconnected under the following conditions:

- The credit in the meter has expired.
- The load power threshold has been exceeded.
- The meter is in a tampered state.
- Neutral missing.

c) The meter shall indicate whether the load is connected or not and shall display the reason for disconnection.

d) The load shall be disconnected by means of a latching contactor. Single pole disconnection is acceptable provided a means of reverse polarity detection is incorporated. The contactor shall be rated at 100 A continuous.

e) The customer shall not have the option to switch the contactor manually. When the maximum power limit has been exceeded the mechanism to automatically reconnect the load must ensure that the number of switching cycles is limited. The meter shall attempt to reconnect the load up to 5 times at 30-second intervals. If the over-current condition still exists the meter shall wait a period of 30 minutes before attempting to reconnect the load.

f) The short-time over-current test as specified in IEC 62052-11, 62053-21 & 62053-23 clause 4.43 shall be conducted at a value of 2,000 A instead of 30 Imax.

g) The prepayment meter shall have a power limiting function that will automatically disconnect the load when the average power consumed exceeds the maximum allowed. The function is not intended as a system protection feature. The level shall be programmable. The threshold shall be programmable in steps of 500 watt or less.
6.6 Tamper detection

a) Tamper (cover open) shall be detected either in power supply or without power supply.

b) When the meter detects a tamper condition, it should enter a shutdown state, with an appropriate message. The customer should be disconnected immediately. The tamper status shall be reset by using a uniquely coded tamper reset token that may only be used once.

c) Meter should detect reverse flow of power and measure correctly by forward registration.

d) Meter should provide tamper log data and. Tamper shall be detected & recorded in the meter.

e) PHASE SEQUENCE REVERSAL:

The offered meter should work accurately irrespective of phase sequence of the supply.

7 Energy accounting

7.1 Historic consumption
The meter provides the following historical view of consumption.

a) Meter total consumption to date

b) Previous 30 days operation consumption

7.2 Cumulative energy consumption

  c) This register records the cumulative consumption since the meter was commissioned.

  d) The units of storage are kWh, displayed with a resolution of 100Wh.

8 Human machine interface

8.1 Displays

8.1.1 General requirements

a) The design philosophy of the meter display subsystem should be that a suitable message or indication must be displayed or annunciated for every meter event and alarm without exception.

b) The meter should make provision for the customer or utility personnel to scroll through the displays.

c) The meter should have a default display that displays the following minimum information on entry of the appropriate short code:

  - The Remaining Credit.
  - The power limit.
  - The current Tariff index.
8.1.2 Liquid crystal display

a) A liquid crystal display is required to display status alarm and event information.

b) Minimum lifetime of ten years is required.

c) The size (number of rows and characters per row) should be appropriate for the display and interpretation of the messages and meter information, and should be legible from a distance of at least 500 cm with a viewing angle of no less than 30°.

d) The use of graphics and icons is not prescribed provided the meter information can be intuitively displayed and interpreted and provided the minimum display functionality can be met using the vendor specific system. The language used for displays where necessary shall be in English. A card with Bengali translations of all messages must be provided on installation of the meter.

8.1.3 Fault and status display

a) The meter should have at least one LED to indicate the presence of a meter fault.

b) The meter should provide a visible indication of the status of the incoming supply.

c) The meter should provide a visible indication of the status of the load circuit-switching device.

8.1.4 Rate LED

The meter should include a consumption rate indicator LED.

8.1.5 Status/alarm/event displays

In addition to the displays required above the meter must display the following minimum information in an intuitive way such that an inexperienced user can understand and interpret the information intelligibly. Laminated instruction cards are to be provided for each unit.

i) Meter ID.

ii) Out of Credit message

iii) Invalid token entered

iv) Duplicate token entered

v) Meter tamper state

vi) Meter failure and/or fault code

The tenderer must submit a detailed specification of the way in which the display are structured and laid out.

8.2 Buzzer/Audible Alarm

An audible signal is required to acknowledge valid and invalid keystrokes, to warn the customer of select state changes, and to operate as an alarm.

8.2.1 Keystroke Tones

The buzzer shall emit separate tones for valid keystrokes and invalid keystrokes.
8.2.2 Alarm Notification

It is preferred that the meter issue a short audible tone that is louder than the meter status change tone when the meter enters the failed state.

8.3 Keypad

a) It is necessary for the unit transfer meters to have a full Numeric keypad.

8.3.1 General Requirements

Keypad shall either have a tone, a click sound or alternative mechanical feedback to indicate pressing or depressing of a key on the keyboard. The keyboard shall be constructed such that a visually impaired person can physically detect and determine what buttons are where located on the keypad.

8.3.2 Scroll Buttons / Short Codes

The meter shall incorporate buttons or entry of short codes that allow the customer or utility personnel to scroll up or down through the different meter displays.

8.3.3 Enter/Acknowledge Button

A button should be provided for the customer or utility personnel to enter or acknowledge an event or selection on the meter.

9 Technical Features

System requirement:

(1) The meter shall not accept the Token twice. Each transaction results in a different credit transfer number.

(2) There shall be no link between the meter and the vending station. Each meter is a separate stand-alone unit.

(3) The meter shall be designed with provision to warn the customer with a series of LED Icons and optionally also with an audible warning when he/she is “low” on energy.

(4) The meters are intended for use in three phase, Four wire applications (100A)

(5) The meter shall use numeric token compatible Keypad entry for credit.

(6) The meter and terminal box shall be enclosed and individually sealed in anti tamper housings.

(7) It is preferred that the three phase STS Key-pad type prepayment meter shall incorporate an internal bi-stable latch to connect the power.
11 Extra Requirements for Prepayment Meters with Internal Latch

1. The prepayment meter shall automatically switch the latch to the “on” state when the supply to the meter is switched on and the following conditions exist:
   - There is credit available
   - The Meter is not in a tampered state
   - The meter is not in a power limiting state
   The user shall not have the functionality to switch the latch on or off since it will allow him to switch the latch into the intentional faults in order to weld the contacts.

2. The following procedure shall be employed, to restrict the number of switching cycles when the meter is disconnecting the load, in order to limit the average power consumed.
   (i) Reconnect the load up to five times, with 30-second intervals, if the consumption is more that the programmed limit.
   (ii) Wait for 30 minutes if the consumption is still above the limit before repeating the procedure.

3. The meter shall give a clear indication if the load has been disconnected to limit the power.
   (a) The temperature rise for the latch is not specified but the meter shall operate correctly without damage under the following conditions for at least 5 hours:
   (b) A fully operational meter in a chamber at an ambient temperature of 55 deg. C
   (c) At least 120% of the rated voltage of the meter during and after the test the meter shall operate correctly without sustaining any damage and the latch shall successfully connect and disconnect, when tested with not less 40 seconds per switching cycle.
   (d) It shall not be possible to influence the switching operating of the latch by applying a magnet with to any externally accessible part of the meter.

12 Other Indicators

1. The prepayment meter shall display the entered credit during the token entry.
2. The prepayment meter shall have a means to remove digits one at a time from the end of a partially entered number (for example, a “Backspace” or “Plus” key).

3. The prepayment meter shall uniquely indicate the following conditions; Acceptance of numeric token, rejection of numeric token, numeric token already used and individual colored icons to indicate at a glance the high to low credit status.

4. A consumption rate indicator light shall be provided.

5. The-prepayment meter shall provide continuous power indication when power is supplied to the meter.
6. Audible Alarm

13 Testing and approval

a) It will be the responsibility of the tenderer to submit to the Employers representative for approval a complete Acceptance Test Procedure (ATP) for system verification.

b) Once the Employer’s representatives approve the ATP, the testing and performance validation tests on 2% (random samples) of the supplied meters will commence. The Employer’s representative at the utility’s premises will witness these tests.
14 Quality Assurances

Bidders shall comply with and be certified to the following ISO levels:

**ISO 9001 Quality Systems**

Part I: Model for quality assurance in design/development, production, installation and servicing

**ISO 9002 Quality Systems**

Part II: Model for quality assurance in production and installation

**ISO 9003 Quality Systems**

Part III: Model for quality assurance in final inspection and test.

Bidders shall submit copies of certification with their proposal to this effect

15. Documents Submission:

The following Documents to be submitted lot wise with the tender otherwise bid will be rejected:

1. Manufacturer's Authorization if manufacturing is not a Tenderer.
3. Guaranteed technical particulars sealed & signed by the manufacturer & the bidder.
4. Type test report for the offered type meter (Single phase & Three Phase) with photograph of the tested meter as per IEC standard or SANS1524-1.
   
   a. i) Type Test report as per relevant international standard in English along with test results of the offered meter from anyone of the following Independent testing laboratory.
      
      i. KEMA, Holland.
      ii. UL International New Zealand/Parkside Laboratories, New Zealand/USA.
   
   b. The tenderer shall also submit the type test reference number.

5. The manufacturer shall submit the test report on pre-payment mode as per IEC standard or SANS 1524-1.

6. The tenderer / manufacturer shall have experience of following during last 10 (Ten) Calendar years. All supported documents/papers shall have to enclose with the bid.

Lot -1: Execution of offered type pre-payment Metering system along with at least 50,000 offer type Meter Supply & Installation in one contract.

Lot - 2: Supply, Installation, Testing & Commissioning of minimum 50,000 meters in one contract.

Lot - 3: Supply, Installation, Testing & Commissioning of minimum 25,000 meters in one contract.
7. The tenderer / manufacturer shall have to furnish with their offer at least 1 (one) performance certificate for each lot as stipulated bellow to be issued from End User (Must be a Utility) outside the country of the Country of manufacturing.

**Lot wise requirement of end user Certificate**

Lot -1: Offered type pre-payment Metering system along with the supply of at least 50,000 offer type Meter for Supply & Installation, clearly outlining that the system is implemented and licensed to manage more than 5,00,000 meters/consumers.

Lot- 2: Supply, Installation, Testing & Commissioning of minimum 50,000 meters with the system is implemented and licensed to manage more than 1,00,000 meters/consumers.

Lot- 3: Supply, Installation, Testing & Commissioning of minimum 25,000 meters with the system is implemented and licensed to manage more than 1,00,000 meters/consumers.

All end user certificates shall be in English language and in the original end customer letter head where detailed e-mail address, Telephone no., Fax no. will be furnished.

8. Printed Catalogue describing the technical specifications of the offered goods.


16 DEMONSTRATION ON SAMPLES

16.1 SUBMISSION OF SAMPLE

Bidder shall submit Meter (duly programmed) as samples of offered each model/type meter along with their bid at time of bid submission, which will be non-returnable. Late submission of sample is not acceptable. If the bidder fails to submit the samples during bid submission, the bid shall be rejected and will not be considered for further evaluation.

16.2 DEMONSTRATION

The tenderer may be asked to demonstrate the functionality on the sample meters & Pre-payment Metering System of the tenderer as per Technical Specification of Tender requirements. The respective preliminary qualified tenderer will be notified the date of demonstration at least 15 (fifteen) days ahead of the demonstration. For this demonstration BPDB will not bear any expenses. This presentation/demonstration will be a part of the technical evaluation. The Tenderers, who will fail to perform this presentation/demonstration on sample meters & Pre-payment Metering System or whose presentation/demonstration will be unsatisfactory as per technical specification of tender requirements, will be considered technically Non-responsive and as such their tender will be rejected and shall not be considered for further evaluation. In the demonstration BPDB will break the sample for checking the component of the meter.
B2: iii

Technical Specifications of
Service Connection material
TECHNICAL SPECIFICATIONS/REQUIREMENTS OF SERVICE CONNECTION MATERIALS

7.1 GENERAL:

This section of the document includes the design, manufacture, testing & inspection of Service Connection Materials as specified.

7.2 CLIMATE DATA:

Service Connection Materials to be supplied against this tender shall be suitable for satisfactory use under the following climatic conditions:

- **Climate**: Tropical, intense sunshine, heavy rain & humid. Maximum humidity and temperature sometimes occur simultaneously.
- **Maximum Temperature**: 40°C
- **Minimum Temperature**: 0°C
- **Maximum yearly weighted average Temperature**: 30°C
- **Relative humidity**: 50-100%
- **Annual mean relative humidity**: 75%
- **Average annual rain fall**: 3454 mm
- **Maximum wind velocity**: 200 km/hour
- **Average isokeraunic level**: 80 days/ year
- **Maximum altitude above sea level**: 300 meters
- **Atmospheric, Mechanical and Chemical impurities**: Moderately polluted

Service Connection Materials as specified will be installed in tropical locations and in a hot humid environment with presence of the insects and vermin. The information is given as a guide for Tender and no responsibility for its accuracy will be accepted, nor any claim based on the above will be entertained.

7.3 SYSTEM PARTICULARS:

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>SYSTEM CHARACTERISTICS</th>
<th>VOLTAGE LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Normal System Voltage, KV (Voltage Class)</td>
<td>230 132 33 11</td>
</tr>
<tr>
<td>3.</td>
<td>Maximum System Voltage, KV</td>
<td>245 145 36 12</td>
</tr>
<tr>
<td>4.</td>
<td>System Frequency, Hz</td>
<td>50 50 50 50</td>
</tr>
<tr>
<td>5.</td>
<td>Phase Rotation (Anti-Clock wise)</td>
<td>RST RST RST RST</td>
</tr>
<tr>
<td>6.</td>
<td>Type of System Grounding</td>
<td>Solid Solid Solid Solid</td>
</tr>
<tr>
<td>SL. NO.</td>
<td>SYSTEM CHARACTERISTICS</td>
<td>VOLTAGE LEVEL</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>7.</td>
<td>Rated Fault Level (3-Phase Symmetrical), MVA 3 sec.</td>
<td>12550</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>381</td>
</tr>
<tr>
<td>8.</td>
<td>Basic Insulation Level, KV</td>
<td>750</td>
</tr>
<tr>
<td></td>
<td></td>
<td>650</td>
</tr>
<tr>
<td></td>
<td></td>
<td>170</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>

**LOW VOLTAGE 415/ 240V CHARACTERISTICS:**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>SYSTEM CHARACTERISTICS</th>
<th>VOLTAGE LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>Normal System Voltage, V (Voltage Class)</td>
<td>415/ 240</td>
</tr>
<tr>
<td>10.</td>
<td>Type of System Grounding</td>
<td>Solid</td>
</tr>
</tbody>
</table>

### 7.4 SPECIFICATION OF SERVICE CONNECTION MATERIALS & HARDWARE

#### 7.4.1 Specification of Service Bale

**7.4.1.1STANDARDS:**

The Service Bale as specified in this Section shall be conforming to the latest edition of the following standards for operation in overhead lines in air under local ambient conditions. Design, Manufacture, Testing and Performance of the Service Bale shall be in accordance with the BS-6004 or equivalent International standards.

**7.4.1.2 SPECIFICATIONS:**

Service Bales are required for installing them on Low Tension Lines in order to connect service drops from them.

<table>
<thead>
<tr>
<th>Service Bale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Code name</strong></td>
</tr>
<tr>
<td>Service Bale</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
</tr>
<tr>
<td>Overhead lines (Service drop connection)</td>
</tr>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>PVC Insulated</td>
</tr>
<tr>
<td><strong>Thickness of Insulation</strong></td>
</tr>
<tr>
<td>1 (one) mm.</td>
</tr>
<tr>
<td><strong>Material</strong></td>
</tr>
<tr>
<td>Copper &amp; PVC.</td>
</tr>
<tr>
<td><strong>Strand</strong></td>
</tr>
<tr>
<td>Single</td>
</tr>
<tr>
<td><strong>Shape</strong></td>
</tr>
<tr>
<td>U-shaped.</td>
</tr>
<tr>
<td><strong>Size of Bale</strong></td>
</tr>
<tr>
<td>6 SWG.</td>
</tr>
<tr>
<td><strong>Length of Bale</strong></td>
</tr>
<tr>
<td>458 mm.</td>
</tr>
<tr>
<td><strong>Minimum Continuous Current rating at 35°C rise over 40°C ambient temperature (75°C)</strong></td>
</tr>
<tr>
<td>125 Amps</td>
</tr>
</tbody>
</table>
7.4.1.3 INFORMATION REQUIRED:

The Bidder/ Manufacturer as per tender requirements shall provide all information. Besides these, the following information has to be submitted:

a) Manufacturer’s Printed Catalogue describing specification and technical data for offered Accessories.
b) Dimensional drawing of offered Accessories.
c) Detail description of testing facilities at manufacturer’s plant.
d) Manufacturer’s valid ISO 9001 Certificate.

7.4.2. Specification of Split Bolt Line Tap Connector

Non-tension connectors for Copper earth-wire and service lines shall be of the Split Bolt Line Tap suitable for connecting service cables to 25 mm² service bails or Low-tension Lines and Copper cables to Low-tension Lines. These should be made of heavy duty Brass and plated with Cadmium. It shall be of free running threads, easy to grip, wrenching flat, high resistance to seasonal cracking and corrosion.

<table>
<thead>
<tr>
<th>Description</th>
<th>Main</th>
<th>Tap</th>
<th>Minimum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Bail / 4-25 mm² Copper Cable</td>
<td>25</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

7.4.2.1 INFORMATION REQUIRED:

The Bidder/ Manufacturer as per tender requirements shall provide all information. Besides these, the following information has to be submitted:

a) Manufacturer’s Printed Catalogue describing specification and technical data for offered Accessories.
b) Dimensional drawing of offered Accessories.
c) Detail description of testing facilities at manufacturer’s plant.
d) Manufacturer's valid ISO 9001 Certificate.

7.4.3. SPECIFICATION OF COMPRESSION TYPE (CRIMPIT) CONNECTORS

The compression type connectors will be used for connecting the ACSR Conductors to ACSR Conductors, AAC Conductors to AAC Conductors and Copper Conductors to AAC conductors. These should be Uni-metal or Bi-metal type according to the contractions and applications of such connectors.

These should be made from high conductivity Aluminium and pre-filled with oxide inhabiting compound. The design of the compression type connectors should be such that galvanic corrosion is minimized. Conductor rough & tooling shall be clearly joined on the connectors.

The connector must have at least the same conductance as the conductor for which it is intended to be used and shall carry the full continuous current rating of the conductor size they are designed for.

The original quality of contacts shall be maintained throughout the service life of the connectors. Glow discharge and radio interference must be reduced to a minimum level.
All compression type connectors shall be suitable for installation, using either manual or hydraulic compression tools.

The size of the connectors for different Conductors is as follows:

<table>
<thead>
<tr>
<th>Connector Type</th>
<th>120</th>
<th>95</th>
<th>35</th>
<th>16</th>
<th>63.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC WASP / Service Bail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.4.3.1 INFORMATION REQUIRED:

The Bidder/ Manufacturer as per tender requirements shall provide all information. Besides these, the following information has to be submitted:

a) Manufacturer's Printed Catalogue describing specification and technical data for offered Accessories.

b) Dimensional drawing of offered Accessories.

c) Detail description of testing facilities at manufacturer's plant.

d) Manufacturer’s valid ISO 9001 Certificate.

7.4.4. SPECIFICATION OF PIERCING CONNECTOR

Connectors must be designed and manufactured in such a way so that they are reliable in normal use and do not cause danger to the user or to the surroundings.

The cast parts must be tight and contain no pores or slag. They must be made carefully so as to fit each other perfectly and prevent any possibility of fitting in the wrong position.

It is recommended that the parts of the connectors are made of extruded drawn, forged and/or rolled material.

The surfaces of the connectors shall be smooth and clean. The edges of the conductor inlets shall be rounded. Contract and pressure surfaces may be toothed, grooved or grip-jawed provided that this does not weaken the connector.

The connector must have separate spaces for each conductor and be designed so that the conductors remain firmly in space.

As far as possible the connector should be designed so that it is not necessary to detach easily losable parts during installation.

The connectors must be designed so that the conductors will not loosen up during installation.

Construction Features:

The insulated Piercing Connectors shall be designed for insulated Copper cable and/or Aluminium cable to be installed for outdoor use.

a) The connectors shall consist of two high mechanical, di-electrical and climatically resistant PVC cases with inserted toothed straps made of plated hardened copper alloy ensuring a low resistance connection.

b) The conductor channels in each case shall be designed to provide the right penetration of the teeth into the conductor without damaging the core of the cable.
c) The electrical connection shall be protected against corrosion by the presence on the contact teeth of an insulating and lubricating compound.

d) Nut/Bolts shall be galvanized and included a break way torque head providing the proper recommended torque without any help of special tool. If the head is broken, removal is still possible.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Run Diameter of Conductor</th>
<th>Tap Diameter of Conductor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>95-120 mm²</td>
<td>6-25 mm²</td>
</tr>
<tr>
<td>2.</td>
<td>35-70 mm²</td>
<td>4-25 mm²</td>
</tr>
</tbody>
</table>

### 7.4.4.1 INFORMATION REQUIRED:

The Bidder/ Manufacturer as per tender requirements shall provide all information. Besides these, the following information has to be submitted:

a) Manufacturer’s Printed Catalogue describing specification and technical data for offered Accessories.

b) Dimensional drawing of offered Accessories.

c) Detail description of testing facilities at manufacturer's plant.

d) Manufacturer's valid ISO 9001 Certificate.

### 7.4.5. SPECIFICATION OF SHACKLE INSULATOR

#### 7.4.5.1 STANDARDS:

These LT Shackle Insulators specified in this Section shall conform to the latest edition of the following standards for operation in overhead lines in air under local ambient conditions. Design, Manufacture, Testing and Performance shall be in accordance to latest revisions of BS, IEC standards as listed below or other equivalent Internationally acceptable Standards:

- **ANSI C 29.1:** Method of test & requirements.
- **BS-137** : Performance & general requirements and Dimensions.
- **BS-3288** : Insulator Tests.
- **IEC-383** : Insulator Tests
7.4.5.2 SPECIFICATIONS:

These LT Shackle Insulators shall be designed as per above standards for operation in overhead lines in air under local ambient conditions.

1. **Installation**
   Overhead line Pole vertical arrangement.

2. **Nominal System Voltage, kV**
   0.415 (line to line).

3. **Type of System**
   Three phase, Four Wire, Effectively earthed neutral.

4. **System Frequency, Hz**
   50

5. **Atmospheric Condition**
   Moderately polluted.

6. **Altitude, meter**
   0-300 above sea level.

7. **Maximum Ambient Temperature**
   45°C

8. **Insulator Material**
   The Insulator shall be made of good commercial grade wet process porcelain. The porcelain shall be sound, thoroughly vitrified and free from defects and blemishes that might adversely affect the life of the Insulator.

9. **Shape**
   Shall be generally cylindrical form, having an axial hole and circumferential groove for fixing conductor with the tie wire.

10. **Finish**
    The exposed parts of the porcelain shall be smoothly glazed and shall be brown/white in colour and shall bear a symbol identifying the manufacturer and the voltage class.

11. **Markings**
    Each Insulator shall be marked with the name of Trade Mark of the manufacturer, the type of Insulator and the year of manufacture. These markings shall be legible and indelible.

12. **Height maximum, mm**
    76

13. **Diameter Maximum, mm**
    89

14. **Groove Diameter, mm**
    19

15. **Insulator Hole Diameter, mm**
    17.5

16. **Leakage Distance, mm**
    64

17. **Power Frequency Puncture Voltage Minimum, kV**
    70

18. **Flashover Voltage, Minimum**
    - Power Frequency, dry, kV 25
    - Power Frequency, wet, kV 12

20. **Transverse Strength Minimum, Kg**
    1140

7.4.5.3 INFORMATION REQUIRED:

The Bidder/Manufacturer as per tender requirements shall provide all information. Besides these, the following information has to be submitted:

a) Manufacturer’s Printed Catalogue describing specification and technical data for offered LT Shackle Insulator.
b) Detail dimensional drawings of offered LT Shackle Insulator.

c) Detail description of testing facilities (Routine & Type Test) at manufacturer's plant.

d) Manufacturer's valid ISO 9001 Certificate.

7.4.6. SPECIFICATION OF POLE (SERVICE DROP) CLAMP

As per attached drawing.

7.4.6.1 INFORMATION REQUIRED:

The Bidder/Manufacturer as per tender requirements shall provide all information. Besides these, the following information has to be submitted:

a) Manufacturer’s Printed Catalogue describing specification and technical data for offered Accessories.

b) Dimensional drawing of offered Accessories.

c) Detail description of testing facilities at manufacturer's plant.

d) Manufacturer's valid ISO 9001 Certificate.

7.4.7. SPECIFICATION OF SERVICE HOOK

The service hooks must be suitable for the aerial cables and the poles to be used. There must be a wide enough range of fastening devices to enable the fastening of the aerial cable with the poles in both straight and angle lines. It must be suitable to attach the cable to walls of wooden or brick building.

In addition, hook rings for attaching to poles and fastening devices of a dead end clamp to a roof top pipe shall be supplied. The hooks shall be made of steel and galvanization shall be applied by a hot dip process and made as per attached drawing.

7.4.7.1 INFORMATION REQUIRED:

The Bidder/Manufacturer as per tender requirements shall provide all information. Besides these, the following information has to be submitted:

a) Manufacturer’s Printed Catalogue describing specification and technical data for offered Accessories.

b) Dimensional drawing of offered Accessories.

c) Detail description of testing facilities at manufacturer's plant.

d) Manufacturer's valid ISO 9001 Certificate.

7.4.8. SPECIFICATION OF STRAIN CLAMP

As per attached drawing.

7.4.8.1 INFORMATION REQUIRED:

The Bidder/Manufacturer as per tender requirements shall provide all information. Besides these, the following information has to be submitted:
7.5 DOCUMENTATION:

The following documents are to be submitted along with the Tender;

TECHNICAL:

1) Guaranteed Technical Particulars (GTP) shall be properly filled up and signed by both Manufacturer & Tenderer;
2) Letter of authorization from the Manufacturers, in case, the Bidder is not the manufacturer, in prescribed Form;
3) 2 (two) nos. of Manufacturer's Supply record for Service Connection Material or other line hardware materials within the last 5 (five) years from the date of opening in the following format (The supply record covering one fourth of the tendered quantity/offered value in a single contract will be considered only);

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name, Address, Phone No., e-mail &amp; Fax No. of the Purchaser</th>
<th>Contract. no. &amp; Date</th>
<th>Contract Value</th>
<th>Description of Material with Quantity</th>
<th>Date of Completion of Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<tr>
<td>2.</td>
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</tbody>
</table>

4) Satisfactory Performance Certificate from at least 2 (two) Electricity Utility for Service Connection Material or other line hardware materials within the last 5 (five) years from the date of opening;
5) Local manufacturers, who have supplied the same offered item to BPDB within the last 5 (five) years from the date of opening, need not to submit any Manufacturer's Supply Record, Satisfactory Performance Certificate with the tender proposal. In that case, they have to submit one Satisfactory Performance Certificate (within last three years) from Director, Purchase, BPDB, Dhaka, for the same offered item covering 25% of the tendered quantity in a single Contract.

8. APPROVAL OF DRAWING, DESIGN, SPECIFICATION, GUARANTEED TECHNICAL PARTICULARS

The Bidder shall have to take approval of Design, Drawing, Technical Specification, and Guaranteed Technical Particulars from the Directorate of Design & Inspection-II, prior to manufacturing the goods. For approval of Design, Drawing, Technical Specification, Guaranteed Technical Particulars, the Bidder shall have to submit 3 sets of Design, Drawing diagram, Technical Specification, Guaranteed Technical to the Directorate of Design & Inspection-II within 21 days from the date of signing contract.
9. **Quality Acceptance Test**

a. The Engineering Team (nominated by the Purchaser) will participate on the quality acceptance test (QAT) of the following equipment at the manufacturer's plant and confirm their quality as per specification. The Purchaser's nominated "Engineering Team" consists of at least 4 (four) Engineers in each team shall have the witness of the QAT of the goods on the manufacturer's premises.

<table>
<thead>
<tr>
<th>LOT-1:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Team-1 :</td>
<td>Hardware materials.</td>
</tr>
<tr>
<td>Team-2 :</td>
<td>Single Phase &amp; Three Phase Prepayment Meter</td>
</tr>
<tr>
<td>Team-3 :</td>
<td>Single Phase &amp; Three Phase Prepayment Meter</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOT-2:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Team-1 :</td>
<td>Single Phase &amp; Three Phase Prepayment Meter</td>
</tr>
<tr>
<td>Team-2 :</td>
<td>Single Phase &amp; Three Phase Prepayment Meter</td>
</tr>
<tr>
<td>Team-3 :</td>
<td>Single Phase &amp; Three Phase Prepayment Meter</td>
</tr>
</tbody>
</table>

If part of the said Equipment is being manufactured on other's premises, the contractor shall obtain for the Purchaser permission to examine and test as if the said Equipment were being manufactured on the Contractor's premises.

b. The Supplier shall give the Purchaser a 30 (thirty) days' notice in writing of the date and the place at which the test will conduct. Tests shall be performed in accordance with the relevant IEC standards and as per contract shall be complied with offered technical particulars and guarantees. All expenses for such tests shall be borne by the bidder.

c. The Supplier/ Manufacturer shall provide all reasonable facilities and assistance viz. labour, materials, electricity, fuel, stores, apparatus, instruments etc. as may be required and as may be reasonably demanded to carry out such tests efficiently at no charge to the purchaser.

d. All the cost regarding QAT witness by the Purchaser’s ‘Engineering Team’ i.e. the cost of Air Ticket from Dhaka to the place of Inspection & return, internal transportation, Phone, Fax, E-mail, Health insurance, Hotel accommodation, Food etc. and pocket money US$ 100 per day per Engineer for a period of 10 (ten) days excluding journey time shall be borne by the Supplier and the cost shall be included with the equipment quoted price.

e. The manufacturer/ Supplier shall furnish the following to the 'Engineering Team':

   a) Approved specification, Guaranteed technical particulars and Drawings of the goods.

   b) The test schedule showing the standards applied, test methods and other relevant information.

   c) Type test report of the offered goods.

   d) Factory test report of all the goods as per relevant standard.

f. Test shall be performed in accordance with the relevant standards supplemented by the specification requirements and as per contract. Where no specific tests are specified then the equipment shall be tested in accordance with the appropriate standards or alternative standard accepted by the Purchaser. Where no appropriate standard is available,
tests shall be carried out in accordance with the Manufacturer’s standard practice, which shall meet with the approval of the Purchaser.

g. Purchaser’s 'Engineering Team' shall select samples from the goods to be supplied on random basis for testing. The selected samples shall be tested according to the relevant standards at the manufacturer premises in presence of Purchaser’s 'Engineering Team'. In case of absence of requisite testing facilities in the manufacturer premises, the samples shall be tested in the testing laboratory accepted by the Purchaser/ Purchaser 'Engineering Team'.

h. The supplier shall provide 3 (three) sets of all test reports to the purchaser duly countersigned by the witnessing team within 10 (ten) days after completion of QAT. The purchaser will issue written instruction to the supplier to deliver the goods to the purchaser's designated stores against satisfactory test report.

i. No equipment shall be packed, prepared for shipment or dismantled for the purpose of packing unless it has been tested and approved or tests have been waived and written instruction have been received from the Purchaser.

j. If any dissimilarity is observed during post delivery inspection on receive goods in respect to pre-inspected goods, the purchaser has to right, not to receive the goods in the purchaser's store.

10. Post-Delivery Inspection & Testing

Post-delivery inspection shall be done by an inspection team of BPDB in presence of Bidder/ Suppliers representative after the delivery of the goods at the BPDB's designated stores. Any defect or damage have been found at post-delivery inspection the defective or damaged Transformers/ materials/ goods to be repaired/ replaced by the Bidder/ supplier at his own cost as per contract specification.

11. Hand Over of Project Site

The tenderer will supply, install, test, commission, the prepayment meter, train utility personals on installation testing, commissioning, operating troubleshooting, maintain and managing the prepayment meter and handover the feeder to respective utility.
System Software Specifications
(Applicable for lot-1 only)
1.0 Introduction

Bangladesh Power Development Board intends to procure robust Revenue Management System Software for the STS Prepayment Meter System, which should cater for BPDB requirements for present and the future years in the long term. As such BPDB would give preference to the offer which can provide all the functionalities as stated in the specifications with options for all foreseeable futuristic application now prevailing in other parts of the world and among power utilities.

Demonstration of the offered features is a qualification criterion.

1.1 Overview of Software Features

The revenue management software features required are listed below.

**Compliance**
1. Fully Compliant with IEC62055 (STS) specifications and all relevant STS guidelines.
2. Compliance with financial service regulations over the storage of data

**Customer Management**
3. Storage of all historical connections between the meter, point of connection and the customer
4. Full search facilities on any criterion string
5. Creation of linked accounts
6. Auto generation of account information
7. The system should provide for enhanced metering
8. Allows for configuration for multiple regions and zones
9. Input for GPS coordination
10. Automatic creation of key change tokens when customer changes tariffs
11. Ability to allocate a sponsored amount of credit per customer
12. Appropriate hierarchy for Add/Edit Customer
13. Exception method of payment by cheque
14. Tax Exempt customer identification
15. Exception method of payment payment by Credit Card

**Meter Management**
16. Accurately tracking status of a meter
17. Feature for selecting type of meter being installed from among different STS meters
18. Feature for different geographical locations / feeder ID / transformer ID
19. Supports different types of engineering vouchers
20. Provision for the capturing of conventional meter readings
21. Storage of reticulation information

**Integration**
22. Provision for integration with other systems in use at BPDB
23. Able to integrate to other vending mechanisms, such as automatic cash handling machines, self service terminals and other third party options
24. Provision of web integration for management functionality and reporting
**Business Rules & Tariff Management**

25. Use of vending based tariffs  
26. Straight and step tariff support  
27. Capability to provide prepaid services, according to the BPDB’s rules  
28. Provision for rounding values up or down, as well as for actual amounts  
29. Provision for ‘free issues’ (EBSST token) to specific customers like indigents  
30. Allocation of fixed charges based on different calculation types

**Debt recovery**

31. Allows payment of accounts even when a blocking code is active – which does not allow a customer to purchase prepaid electricity tokens  
32. Allowance for the cashier to enter the full amount from which the arrear amount will automatically be deducted; and the remainder of the money will then automatically be allocated towards prepaid electricity sales  
33. Arrears recovering in line with the credit control policy of the BPDB  
34. Provision for users with specific access rights to change the full arrear amount to a specific amount; and then allow a limited electricity sale amount, after which the system must automatically revert back to the original arrear amount taking into consideration the amount paid by the transaction  
35. Capability to enforce payment on a linked account, if a blocking code is attached to the linked account, before allowing prepaid electricity sales  
36. Automatically deducts arrears and current account payments from credit on dispensing unit

**Protection**

37. Blocking of prepaid electricity token generation, if there is a difference between the information on the meter card and the database  
38. Provision for configurable blocking codes  
39. Provision for the automatic removal of the blocking code once the arrears have been paid and then allows the customer to purchase electricity within the same operation  
40. Provision for a per-user defined password authorisation, based on user rights to prevent unauthorised use of reversals and free issues  
41. Allowance for a credit limit amount that can be issued at any specific individual CDU without re-authorisation  
42. Provision for password expiry with early notification of password change requirement  
43. Provision to block log-in attempts by operators already online.  
44. Provision for transactions or actions at end of shifts, and/or pre-defined intervals to be archived and/or restored  
45. Provision of access rights per field  
46. Restriction of access to functions, by setting up timetables  
47. Automatic operator log-off  
48. Automated batch/day closing at predefined time frames  
49. Provides for different payment methods on different linked accounts while deducting the amounts paid from the tendered amount and ensure that the total of all payments balance back to the amount tendered  
50. Caters for the uploading of key management files into the database, to configure and connect encryption devices for STS encryption algorithms
Flexibility

51. Availability of corporate policy requirements regarding system enhancements and site specific requirements
52. System part of a user group where system enhancements and site specific requirements can be discussed and implemented
53. Allows BPDB to change or modify the format of the prepayment voucher that is printed
54. Provision for messages at the bottom of the token voucher, which can be changed by BPDB according to their specific requirements

Administration

55. Administrators can log into the servers directly from their offices
56. Provision that the re-authorisation of a workstation be done by a supervisor, i.e. to open the vending module or change to refresh a workstation’s credit limit, and initiating a data migration process; and not a normal user
57. List of current system users with contact details supplied
58. Extended notes and change control

Security

59. Full audit trail on user activity and movements
60. System provides for user ID disabled or removed to remain in history transaction data
61. Provision of encrypting and decrypting of archived data
62. System caters for tamper monitoring and specific technologies to effect notifications
63. Ability for BPDB to configure access rights

Data storage & Synchronisation

64. Stores all details on a master database,
65. System allows re-authorisation without doing a data migration process
66. System synchronises all transaction data before transferring and clearing, especially for offline transactions
67. System can be configured for automatic synchronisation of data
68. Provision for batch updates
69. Provision of bidirectional polling and the polling intervals can be configured by the Utility

Recovery & Stability

70. Provides for real time, bi-directional and data replication with hot primary and/or standby switch over to a site identified for offsite disaster recovery
71. All servers will be located at the BPDB’s one building except for the Disaster Recovery server
72. Manual archiving/backup
73. Archiving of all system units from the management server

Point of Sale

74. Provision for swipe cards or capturing of meter card number, or account number, as point of entry
75. Provision for the use for debit and credit cards
76. Provision to warn the cashier before finalising any transaction
77. Caters for setting up a set of predefined lists for typical purchase amounts, per workstation
78. Allows vending when a point of connection, meter or tariff is not linked to a customer
79. Allowance for the payment of arrears, current amounts or linked accounts; separate to a prepaid electricity token purchase
80. Provides that the cashier can select to pay current account (if so requested by the customer), after arrear amounts were deducted and then the remainder of the money will automatically be allocated to electricity sales
81. Provides that the cashier can select to pay a linked account (if so requested by the customer), after arrear amounts were deducted and then the remainder of the money will automatically be allocated to electricity sales
82. Allows system to do all three of the above-mentioned transactions in one operation (full amount, current account and linked account) if so required by the customer without having to enter the customer’s details three times, but still generate a transaction for each operation

**Batch Management**
83. Provision of batch numbers to follow sequentially and print denominations of all money received separately

**Third Party Management**
84. The ability to view all Third Party(ies) and their associated vending points
85. Third Party-specific transactions: deposits, reversals, credit allocations, commissions
86. The ability to view the available credit for a third party and transactions that produce this available credit
87. The distinct administration of third party vending points and BPDB vending points

**Reporting**
88. Generation of transaction files that includes all transaction data, including EBSST tokens, arrear payments and current account payments
89. Report preview before printing
90. Provides for simple conversion of all data, including historical data
91. Generation of following reports, but not limited to, by employees of the BPDB

The list below represents the typical reports that are required in a standard prepayment system. Bidders are encouraged to indicate all other reports performed by their Revenue Management System.

<table>
<thead>
<tr>
<th>Division</th>
<th>BPDB Code</th>
<th>Report Type / Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Account</td>
<td></td>
<td>All customer account collection</td>
</tr>
<tr>
<td>Account</td>
<td></td>
<td>Customer account balances</td>
</tr>
<tr>
<td>Account</td>
<td></td>
<td>Total outstanding per account type</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Account</td>
<td>Arrears differences between SMS and VS</td>
<td></td>
</tr>
<tr>
<td>Audit</td>
<td>Report customer changes audit</td>
<td></td>
</tr>
<tr>
<td>Audit</td>
<td>Free Issues</td>
<td></td>
</tr>
<tr>
<td>Audit</td>
<td>Report customer changes audit</td>
<td></td>
</tr>
<tr>
<td>Audit</td>
<td>Cancellations</td>
<td></td>
</tr>
<tr>
<td>Audit</td>
<td>Account balance between managers</td>
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<tr>
<td>Audit</td>
<td>Consumption reports</td>
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</tr>
<tr>
<td>Audit</td>
<td>check account balances on VS &amp; SMS</td>
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</tr>
<tr>
<td>Audit</td>
<td>check accounts on VS &amp; SMS</td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td>Customer snap shot</td>
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</tr>
<tr>
<td>Customer</td>
<td>Active list</td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td>Blocked list</td>
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<tr>
<td>Customer</td>
<td>Daily transaction by operators</td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td>Kwh sales by month</td>
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</tr>
<tr>
<td>Customer</td>
<td>Inactive customer list</td>
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</tr>
<tr>
<td>Customer</td>
<td>Inactive list</td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td>Registered by dates</td>
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</tr>
<tr>
<td>Customer</td>
<td>Location List</td>
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<tr>
<td>Customer</td>
<td>Meter history</td>
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<tr>
<td>Customer</td>
<td>No Transaction in range of days</td>
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<tr>
<td>Cashier</td>
<td>Cashier session summary</td>
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<td>Financial</td>
<td>Transaction Detail</td>
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<td>Financial</td>
<td>Sub account initial balance</td>
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<td>Financial</td>
<td>Account Arrears collection</td>
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<td>-----------------------------------</td>
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</tr>
<tr>
<td>Financial</td>
<td>Arrears recovery rate</td>
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<tr>
<td>Financial</td>
<td>Free Electricity by Vending Unit</td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td>Sub Account Transactions</td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td>Actual for month by tariff steps</td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td>Third Party credit transfer</td>
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<tr>
<td>Third Party</td>
<td>Transaction by Date range</td>
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<tr>
<td>Third Party</td>
<td>Third Party sales report</td>
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<tr>
<td>Third Party</td>
<td>Supervisor Report</td>
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<td>Third Party</td>
<td>Credit remaining</td>
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<td>Third Party</td>
<td>History per customer</td>
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<tr>
<td>Third Party</td>
<td>History per Location</td>
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</tr>
<tr>
<td>Third Party</td>
<td>Total meters inactive</td>
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</tr>
<tr>
<td>Third Party</td>
<td>Active meter list</td>
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</tr>
<tr>
<td>Third Party</td>
<td>Kwh Purchases per month</td>
<td></td>
</tr>
<tr>
<td>Third Party</td>
<td>Total Meters installed</td>
<td></td>
</tr>
<tr>
<td>Third Party</td>
<td>Total meters in repair</td>
<td></td>
</tr>
<tr>
<td>Third Party</td>
<td>Total meters in stock</td>
<td></td>
</tr>
<tr>
<td>Operators</td>
<td>Detail Transaction by Tariff type</td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td>End of session slip printer</td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td>New Connections per month</td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td>Operator list</td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td>System list</td>
<td></td>
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<tr>
<td>Operations</td>
<td>Transactions by tariff type</td>
<td></td>
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<tr>
<td>Operations</td>
<td>End of session slip printer</td>
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</tr>
<tr>
<td><strong>Security</strong></td>
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<td>-----------------------</td>
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</tr>
<tr>
<td>Security</td>
<td>User Privileges Snapshot</td>
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<td>Security</td>
<td>Changes to Privileges</td>
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<tr>
<td>Security</td>
<td>Logon After hours</td>
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<table>
<thead>
<tr>
<th><strong>Transactions</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transactions</td>
<td>All transactions for meter no....</td>
</tr>
<tr>
<td>Transactions</td>
<td>Detail Transaction by Tariff</td>
</tr>
<tr>
<td>Transactions</td>
<td>Free Electricity Tokens</td>
</tr>
<tr>
<td>Transactions</td>
<td>Meter transaction history</td>
</tr>
<tr>
<td>Transactions</td>
<td>Total account revenue details</td>
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<tr>
<td>Transactions</td>
<td>Total Kwh sold</td>
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<tr>
<td>Transactions</td>
<td>Vat Collection</td>
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<tr>
<td>Transactions</td>
<td>Cashier daily summary</td>
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<tr>
<td>Transactions</td>
<td>Detail Meter with kwh steps</td>
</tr>
<tr>
<td>Transactions</td>
<td>Vending Unit Month sales summary</td>
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