

Section 7. Procuring Entity's Requirements

7.1 Scope of Supply of Plant and Installation Services by the Contractor

7.1.1 General Scope

Design, Manufacture, Supply, Installation, Testing & Commissioning of Smart Pre-Payment Meters, Data Concentrator Unit (DCU), Network, Utility Vending Station cum Customer Care Center (VS-CCC) and other related equipment with related services on Turn-key Basis. The scope of plant and services include design, manufacture, quality assurance, inspection & testing, packing for export, insurance & shipment to site, transportation, setting to work site and testing & commissioning of all the equipment necessary for operation of the smart prepayment metering system to be installed. Moreover, the existing meters dismantled from the existing consumer premises shall be handed over and deposited to WZPDCL Store / Project Store without any damage as per directions of Project Director or Engineer in Charge of this project.

The site(s)/ point(s) of delivery and installation are:

S&D-1,2,3,4,5, Khulna, WZPDCL.

S&D- Bagerhat, WZPDCL.

Mongla ESU, WZPDCL.

Fultola ESU, WZPDCL.

Dighaliya ESU, WZPDCL.

Shatkhiria ESU, WZPDCL

Pirojpur ESU, WZPDCL or as directed by the Project Director within WZPDCL area.

The meters & DCU's to be supplied by the contractor shall have to be successfully integrated and interfaced with the Existing Smart Pre-payment Metering System (Unified system as well as HES/MDM system) of WZPDCL as per Technical Specification of Tender requirements. The detail requirement is listed in the technical specification and Guaranteed Technical Particulars (GTP).

The scope also includes imparting training both foreign and local to WZPDCL's Engineers on offered system and operational support service for 3 (Three) years from the date of commissioning and handover of the system

The contractor is responsible for ensuring that all and any items of work required for the safe, efficient and satisfactory completion and functioning of the works are included in the Bid price whether it will be described in the specification or not. In case of implementation of the turnkey contract, if there is no need to supply/ install/ work on any item of the price schedule in terms of reality, the bill for that item will not be paid by the employer or if partial supply/install/ work has to be done, it will be paid proportionately or price breakdown with discussion /negotiation.

7.1.2 The major scopes:

Major scopes are described below:

Sl. No.	Description of Items	Unit of Measurement	Quantity
1	Design, Manufacture, Supply, Installation, Testing & Commissioning of Smart Pre- paid metering Networks	Lot	1
2	Design, Manufacture, Supply, Installation, Testing & Commissioning of Utility Vending Station cum Customer Care Center (VS-CCC)	Nos.	2
3	Design, Manufacture, Supply, Installation, Testing & Commissioning of single phase & three phase Smart pre-paid energy meters with BPLC communication	Nos.	138811

Sl. No.	Description of Items	Unit of Measurement	Quantity
	modules [with replacement of existing meters.]		
4	Supply of External GPRS communication module for offered Single Phase & Three Phase Meter (Plug and Play), 4G, (which will also support all other available bands in Bangladesh)	Nos	6941
5	Design, Manufacture, Supply, Installation, Testing & Commissioning of DCU (Data Concentrator Unit) with Enclosure Box, CT, SIM Cards cables & other materials	Nos.	965
6	Design, Manufacture, Supply, Testing & Commissioning of Hand-Held Unit	Nos.	13
7	Optical communication cable (for downloading data from meter to PC).	Nos.	52
8	Supply, Installation, testing, commissioning of Network (Network 1+ Network 2)	Nos.	983
9	Interfacing of offered meters with the existing smart pre-payment Metering system software of the purchaser	Nos.	138811
10	Manpower Training (Local & Foreign)	Man-Month	4.96
11	Infrastructure Development for 02 Nos. VS-CCC (miscellaneous, as when/Where required)	Lot	1
12	Supply of relative IT hardware (Storage/Fiber cable etc) and Software (miscellaneous, when and where required)	L.S	L.S
13	Three (3) years operation & maintenance support for system	Lot	1

7.1.3 Network requirements

Details of Network requirements are as follows:

The MIC, and the DRC will be assigned with real IP address.

Sl. No.	Description of Items	Description of the Network	Unit of Measurement	Quantity
01	Network 1: MIC to DCU (wireless connection) and DCU to the related Meters (PLC connection).	- GPRS/EDGE/EVDO or other. - Different Locations (in WZPDCL area). - Chosen Data Service Network Provider so every other operated on-air mobile operator will be available for necessary communication amongst them and that has to be ensured. - A secured & separate APN. - A fixed static IP scheme. - Bi-directional (Full Duplex). - PLC Communication (BPLC)	Nos.	965
02	Network 2: MIC to VS-CCC Network. This network includes both physical connection via fibre optical line and wireless connection through GPRS.	- Dedicate leased fibre line (like DDN) @minimum 2mbps - A secured & separate APN - Alive network for 24x7 round the clock - A fixed static IP scheme - Bi-directional (Full Duplex) @minimum 1Gbps twisted pair (RJ45) - Different Locations (in WZPDCL area). - Chosen Data Service Network Provider so every other operated on-air mobile operator will be available for necessary communication amongst them and that has to be ensured.	Nos	18

Sl. No.	Description of Items	Description of the Network	Unit of Measurement	Quantity
		GPRS 4G (which will also support all other available bands in Bangladesh)		

7.1.4 Utility Vending Station cum Customer Care Center (VS-CCC):

The contractor shall supply, install, test and commission 02 Nos. Utility Vending Station cum Customer Care Center (VS-CCC) at designated (by project director) places with the following Hardware items:

Sl. No.	Description of Items	Unit of Measurement	Quantity
1	Workstation with Required Software	Nos.	4
2	GRPS/EDGE/EVDO Modem	Nos.	4
3	SIM Card with Required Software	Nos.	4
4	Laser Printer with Required Software	Nos.	2
5	Slip Printer with Required Software	Nos.	4
6	Laptop with Required Software	Nos.	2
7	Router and Switch with Required Software (both System and application)	Nos.	2
8	Split type square ac 2 ton with related material and services (including installation)	Nos.	2
9	Civil Works: existing infra-structure development for the (VS-CCC) (As and when required)	Lot	1

1.1.5 Training Services

Details of Manpower Training (Local) are as follows:

Sl. No.	Description of Manpower/ Qualification criteria	Quantity	Training Location	Description of training contents/ materials
1	Software Engineer, Network & Hardware Engineer, Electrical Engineer	2.66 Man-Month	To be mentioned by Tenderer	1. Linux operating System, API, DLL, PL/SQL/JAVA, VPN, In depth operations and source code analysis of Unified System, HES, MDM and AMI system with related areas. 2. Every piece of Software supported Hardware that is involved in the system and on interfacing with conventional network and Meters focusing at major on PLC, DCU/ECG, GPRS, VPN with related AMI server. 3. On the electrical parts of the system as well as the customization of the meter.
2	Operator and End user	0.67 Man-Month	To be mentioned by Tenderer	POST operate the vending station, Meter Customization and the related areas as required

Details of Manpower Training (Foreign) are as follows:

Sl. No.	Description of Manpower/ Qualification criteria	Quantity	Training Location	Description of training contents/ materials
1	Software Engineer, Network & Hardware Engineer, Electrical Engineer	1.63 Man-Month	To be mentioned by Tenderer	1. Linux operating System, API Details, DLL, PL/SQL/JAVA, VPN, In depth operations and source code analysis of HES and AMI system. 2. Every piece of Software supported Hardware that is involved in the system and on interfacing with conventional network and Meters focusing at major on PLC, DCU/ECG, GPRS, VPN with related AMI server. 3. On the electrical parts of the system as well as the customization of the meter.

The tenderer will provide required local training as well as foreign training in the manufacturers/ suppliers country(s) or in the above mentioned locations. So that the trainees can operate and maintain the system smoothly after handover of the turnkey project. The training programs will cover Software Engineer, Network & Hardware Engineer, Electrical Engineer and operators.

7.1.6 Three (03) years of operation & maintenance support for system:

RESPNSIBILITY UNDER OPERATIONAL SUPPORT In addition to the requirements of the technical specifications, the following shall be the responsibilities of the Operational Support for the duration of the 3 (three) years Operational Support.
Source Code The Source codes of the system shall be the property of the employer.
Software Use The tenderer shall comply with the requirements for interfacing of offered meter with the employers' softwares.
System Management The registration of customer details on the MIC & CDC management of any changes to customer details, the Operational Support shall perform editing of customer records and management of customer arrears. The Operational Support shall effect up to 5 tariff changes as required by Utility during the contract period. Data shall be uploaded/downloaded to the MIC/CDC from the UVS,POS, Meter & UCCs from the respective to the MIC & CDCS every 24 x7 round the clock. The Operational Support shall provide customer reports detailing the number of prepayment customers at the start of each month to Utility. The Operational Support shall visit each consumer to perform a system audit at least once every 6 months. The Operational Support shall process all applications for new pre-paid customers within the Operational Support's operational area directly. New installations shall be completed by the operator and notified to Utility.
Technical Manual Tenderer 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 03 (three) years from the date of commissioning under warranty period.
• To keep the supplied Software in good working condition under warranty period.
• Maintenance service includes preventive maintenance services on Monthly basis, based on the specific needs of individual equipment or as determined by Tenderer/Employer and on-call remedial maintenance under warranty period. Maintenance work should be at utility offices. Incase it is not possible the maintenance work at utility 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 has to report time to time like 2 times in a month and shall has 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 tenderer. The Tenderer will be responsible for repair, correction, and replacement of the defective goods or parts without incurring any cost to the employer under warranty period.
• Utility shall impose penalty @Taka 500 per hour of delay after 16 hours of lodging complaint with the tenderer under warranty period.
• Pre-Paid Meter Maintenance: 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.
• If it is not possible to resolve the problem within 16 (sixteen) hours, the tenderer may provide required support/equipment/item/parts on temporary basis without incurring any cost to the employer so that Server, Computer & Line Matrix Printer 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 tenderer should install, commission the parts/ products /devices without incurring any service charge to the employer under warranty period.
• For 3 years operation & maintenance support the tenderer shall employ the following personnel: a) Coordinator (min. Bachelor Degree with 15 years Working experience)- 1 no. b) System Administrator- 1 no. c) Network Engineer - 1 no. d) Hardware Engineer - 1 no. e) Programmer - 1 no. f) Database Administrator - 1 no. g) Electrical Supervisor-11 nos. having experience in meter installation h) UCC/ UVS operator- 11 nos. having experience in vending and UCC work. They will provide full time support to utility vending operator/ utility people for vending/ UCC related work.

7.1.7 Hand Over of Project Site

The tenderer will supply, install, intergrate and interface with WZPDCL's existing HES/MDM and existing BPLC DCUs, test, commission, the prepayment meter, train all utilities personals on installation testing, commissioning, operating troubleshooting, maintain and managing the prepayment meter and handover the feeder to respective utility. To hand over the project the tenderer must submit the following:

1. Summary Sheet of Old meter reading (with image) and New meter Reading according to customer pro-forma (which include customer's name, address, account no., Old meter no. Old meter reading, New meter no., etc.).
2. Customer summary data shall be submitted in a well-organized format (provided by Utility) using a software.
3. Tenderer shall submit all the source code at the start of the project work and the last updated source code of the whole system at the time of project handover.
4. Tenderer shall provide the PC software/meter parameterization software for meter and DCU with minimum 12 nos. User ID and Password.

[N.B. Smart card mentioned in any section of the tender document will be considered as null and void.]

7.1.8 Existing Pre-payment metering System

7.1.8.1 The Principle

For a stable and efficient electricity distribution system and an effective and trust worthy revenue collection system a country wide Smart Pre-Paid Metering System is evident. As the technology advancement reaches at its peak for peace to help the utility companies to manage a well-organized electricity distribution system, the utility companies no need to rely on conventional metering system. An adaptation of Smart Pre-Paid Metering System can change the needs and the requirements of better solution for the utility companies that make the whole distribution system more dynamic and digitally enhanced. By introducing the features and advantages of the Smart Pre-Paid Metering System that will not only provide freedom of the consumers but also generate a pace in collection strategy of the utility companies in comfort eliminating all kinds of confusion and havoc of corruption.

Digital Metering System brings a quantum leap in energy calculation in accuracy. But eventually most of the energy meters are analog devices. Conventionally mostly installed the analog meters are not only a less-in-accuracy but also it creates and follows to maintain a human hauled operational system that is a bit costly and rather slow. On the contrary the digital metering systems are quick and free from all the demerits of the running aged old electricity distribution system.

Let's have a quick through of National Unified Smart Pre-Paid Metering System. In prepaid model, an electricity consumer has to buy credit (Unit/Currency) from the utility company and to enjoy the limited bought electricity credit into the meter before he can use the electricity. This amount is slowly credited as the consumer uses electricity. One can refill one's necessary credit at any nearest Point of Sale for electricity. As it is clear that the consumer is solely responsible for the pre-buying energy credit and accommodating the purchased energy for optimal use, the utility company requires no resources and personal for billing purposes and that surely will help to improve customer care services. In a sense it is a direct and practical procedure to help the consumers to be optimal in one's uses to reduce down the system loss and averaging the incremental collection of the revenue. By the National Unified Smart Pre-Paid Meter System. The Load Demand will be aligned as the consumer can meet the facility of monitoring one's installed credit initials.

But this model also introduces a chance of fraud if there is a complete lack of meter usage supervision. This is easily corrected by introducing data exchange mechanism within the energy meters that are able to report usage statistics, load profile, power failures, tamper data and other relevant information. Building this data exchange mechanism within a keycode meter will require additional hardware like power line communication or mobile communication chips. But as more and more manufactures enter the market it will become difficult to maintain the success of the model if they do not follow a single standard. It will be difficult for the utilities to run a successful business if they cannot replace an existing meter from a particular manufacture with another meter from another manufactures. So it is undoubtedly a present time demand to have standardized single uniform platform of distribution system for a nation.

This is only possible when all manufactures follow a single guideline and standards. These standards include meter data and history, data exchange format and software specification for all related software. This document proposes such a system which not only includes practical lessons learned from the field but also introduces new features and components that are necessary for utility companies to manage new generation of prepaid meters with tariff management. A complete breakdown of the overall system is specified first with diagram, then it is described in detail, network architecture is explained next and

the hardware and software specification defined. A complete and exhaustive specification like this can only ensure the success of all future meter requirements of Bangladesh but can also act as a model for other countries to follow.

There are already existing single-phase meters deployed and used in the field. Some of the mode of media of these works with a smartcard and others with keypad. The proposed solution builds on the existing model by providing standardized data exchange mechanism. The data exchange media will be the smartcard or keycode tokens. This will carry both tariff and recharge amount data from utility to meter and carry usage data from meter to utility (i.e. bidirectional data transfer). And for the keypad process a standard key mechanism also been introduced and adopted. A standardized data format for the smartcard has been adopted. Since many manufactures use different encoding and security within their meter, the data exchange mechanism also has provision for manufacturer encoded data that can be only decoded by the meter. The manufacturer will provide API to create this encoded data from raw data to the utility.

In Bangladesh, the electricity is being running on traiff beneficiary approach. So the revenue collection must have been counted and calculated at the meter side for a real time calculation and have to generate a real customer data pattern that will definately enhance the data exchange to reveal the energy generation as well as the load management.

All the Smart Pre-Paid meter that shall be procured shall be followed the discribed system software architecture (attached in part-2 of this STD).

The overall network system of the Smart Pre-Paid metering system:

7.1.8.2 The Technical Specification on the Network and the Software of the Smart Pre-Paid Metering System has mainly two parts.

- **The Master Information Center (MIC):** All the servers, the routers, the switches, the billing software located centrally in the utility premises are defined together as The **Master Information Center**.
- **The Data Network Service Provider** (Mobile Network Companies): The Data Network Service Provider companies are responsible for providing both SIM/ RIM card data circuit for data network service having a stable bandwidth capacity. Short Message Service (PUSH-PULL SMS) also is available and defined for the short text messaging system activated in the mobile network companies.

7.1.8.3 The System

The system as shown in the diagram are containing several continuous areas each performing different particular roles.

7.1.8.3.1 Master Information Center (MIC):

The core area of the system is the Master Information Center (MIC). This is where all the running communication processes and the running business processes are installed and located residing in the utility company premises.

The Master Information Center (MIC)is comprised of

- **The Database Servers (RDBMS):** The Multiple database servers provide reliable data storage and delivery.
- **The Routers and the Firewalls:** The Routers are connected through the system master station to The Data Network Service Provider round the clock. All the network connections have gone through the firewall for maximum security reasons.

- **The Application Server:** This is a request processing side. There should be at least two application servers at this end as to make the system a little flexible. These servers will be responsible for processes of all the requests from the Point of Sales (POS) terminals and vending stations.

The functions of these servers are:

- ✓ To provide a real time and relentless connectivity in between the database and POS/Utility Vending Station,
 - ✓ To provide secure authentication service to POS/ Utility Vending Station,
 - ✓ To process unit charge/bill pay request from POS/ Utility Vending Station,
 - ✓ To ensure required encrypt data quickly,
 - ✓ To transfer results and status of the data to POS/Utility Vending Station for hardcopy receipt to a consumer,
- **The Short Message Server (PUSH-PULL SMS):** This server will process PUSH-PULL SMS requests arriving from the various consumers through The Data Network Service Provider.
 - **The Accounting and Billing Server:** This server will keep and produce the various billing and transaction reports for all the vendors, mobile operators and consumers.

7.1.8.3.2 The Data Network Service Provider (Mobile Operators): The Data Network Service Provider actually it refers to the mobile operators will provide the following services:

- Provide data network service through GPRS/EDGE/EVDO/HSPA network,
- Provide PUSH-PULL SMS service to utility companies and their consumers through mobile phones.

Every Data Network Service Provider will be connected to each utility only one Master Information Centre through a dedicate fiber or leased fiber line.

7.1.8.3.3 Utility Vending Station cum Customer Care Center (VS-CCC) 24x7:

Mostly located at utility premises, this will be managed by the utility companies itself round the clock. It will be established for multi purposes as well. The utility consumers will come here most of the time to recharge their credits. The Consumers will deliver their meter information and pay the operator his preferred and demanded amount. Each VS-CCC will be equipped with a set of laptop or desktop, smartcard reader/writer, laser printer, slip printer, network modem and the VS-CCC software. The operator will enter these consumer details into the software and issue a request to process the transaction. The software will use the data network service to connect to the application server at Master Information Center and initiate a fund transfer request. Before getting the fund transfer, he should have a fund collection from the respective vending station of the respective utilities. The process will first check whether there are enough funds available in the operator's account for this transaction. If 'No' then a message is sent back to the VS-CCC informing regarding the insufficiency fund status. If there is enough fund, then the application server initiates a transfer fund request from the operator's account. If the transfer is successful, then the server checks the database to find the type of meter installed at the consumer premises. If it is a keypad meter then the server will generate the 'n' digit keypad number necessary to recharge the meter. This number or the encrypted message along with a success recharge message is sent back to the VS-CCC software (as it is a two-way communication system). The VS-CCC software then prints the keypad code. The software will print a receipt containing the amount paid instantly. The VS-CCC software will keep the till next vended amount in accordance

with its purchased amount as well as the system master station will also follow the log of transaction for future use.

In case of the three phase meters, the SMS server will send back the success message to the VS-CCC software and the software will print the acknowledgement receipt for the consumer.

The consumer will get necessary services regarding the meters during stipulated office hours and the complains will be attended from here. So, a customization center must integrate here to give the consumer a prompt, better and reliable service to shorten down the power cut. This center will also integrate with the system master station to create new consumer, assign/change meter of consumer and perform all administrative tasks to maintain consumer data integrity in the Master Information Center.. The POS vendors will come here to collect the required energy during the official time table. The vending stations will deposit the collected amount to the Bank. Again, for the consumers the late hour collected amount will be kept and deposited to the bank after certain time maintaining the friendly hours.

Since it will be managed by the utility company. A 'n' digit code can be generated or smart card written directly taking cash from the consumer. The vending stations along with the customization center will be connected to The Master Information Center though a secured dedicated leased line or where possibly through the mobile data network where leased line is not available or not feasible.

7.1.8.3.4 Utility Consumers: Consumers can check their assigned load status and other information by sending PUSH-PULL SMS by a predefined format using their mobile phones. Each utility company will have its own short-code (example: BPAY or 2729) which will be valid for all mobile operators. When a PUSH-PULL SMS is sent, the data network service provider will send it directly to the Master Information Center's PUSH-PULL SMS server through the connected network. The PUSH-PULL SMS server will process the PUSH-PULL SMS request, generate the appropriate response and send the response back to the requesting mobile phone containing the requested information. This will work as PUSH-PULL SMS service.

7.1.8.3.5 On-Line Prepayment meters: Both the Single Phase and Three phase meters will have on-line vending facility. Each meter will support GSM (GPRS 4G which will also support all other available bands in Bangladesh) module through which the information can directly be communicated to and from the meter as well as the meters should communicate with server through BROADBAND PLC/RF using DC/DCU.

7.1.8.3.6 Data Service Network: The backbone of the proposed Smart Pre-Paid Metering System will be established on already erected and developed network by a recognized data service network provider. The only one system master station of each utility company will be connected with their network through a firewall. The data service network provider actually the mobile operators will be connected through this data service network. Similarly, the vending stations of the utility organizations may also be connected through the same data service network as required.

7.1.8.4 The Network Specification of the Smart Pre-Paid Metering System

The Pre-Paid Metering System will require the following basic network connections to work seamlessly that will online 24x7. These networks are defined below:

Network 1: Network 1: MIC to DCU (wireless connection) and DCU to the related Meters (PLC connection):

Network features:

- GPRS/EDGE/EVDO or other.
- Different Locations (in WZPDCL area).
- Chosen Data Service Network Provider so every other operated on-air mobile operator will be available for necessary communication amongst them and that has to be ensured.
- A secured & separate APN.
- A fixed static IP scheme.
- Bi-directional (Full Duplex).
- PLC Communication (BPLC)

Network 2: MIC to VS-CCC Network:

This network includes both physical connection via fibre optical line and wireless connection through GPRS. Prominent features are:

- Dedicate leased fibre line (like DDN)
- @minimum 2mbps
- A secured & separate APN
- Alive network for 24x7 round the clock
- A fixed static IP scheme
- Bi-directional (Full Duplex)
- @minimum 1Gbps twisted pair (RJ45)
- Different Locations (in WZPDCL area).
- Chosen Data Service Network Provider so every other operated on-air mobile operator will be available for necessary communication amongst them and that has to be ensured.
- GPRS 4G (which will also support all other available bands in Bangladesh)

7.1.8.5 System Integration, Installation, Operation and Maintenance

The Tenderer will be responsible for design, manufacture, supply, installation, testing & commissioning smart pre-paid meters & metering system with related service on turn key basis, which will include to the operation of the system and interfacing of offered meters with purchasers existing software. Already developed software API is enclosed in part-2 of the STD. The whole system will be integrated so that all parts run smoothly. These responsibilities include but are not limited to:

- Work with utility to test and finalize all input and output.

- Deploy software at each required location.
- Ensure interoperability of each software module.
- Install a secure software installation method.
- Arrange for SMS message short codes from mobile operators.
- Work with the data service network provider (mobile operators) and with the purchasers' to setup the required network communication for both wireless and physical connections.
- Work with the data service network provider (mobile operators) representation to setup SMS message server and communication.
- Work with utility, pos vendors and all concerned to test software for bugs and if required fix bugs or incorporate improvements and suggestions.
- Work to provide vending service to the smart prepaid metering consumer of the respective utilities through Mobile SMS, mobile Apps, POS, ATM/Bank booth, web service etc.
- Work with meter manufactures to make sure all software and hardware meters communicate properly.
- Work with utility to make sure that all software follows the defined standards, agree on change with all partners if required.
- Interfacing: The system software has been developed and irrected. The prescribed interfacing protocol has been developed in JAVA which is attached in Part -2 of the tender document. The tenderer's meters will follow that protocol and will complete their interfacing API on or before demonstration date. No tender will be technically responsive until and unless the interfacings API works and comply with requirements and also fully satisfy the Engineers authorized by the Employer. Otherwise the tender shall be rejected and will not be considered for further evaluation.
- The offered meter will be manufactured in such a way so that its API can follow the already developed system software's API. The rights & the cCopy rights of the system software and the pattern of the system will be the sole owner of the people's republic of Bangladesh.
- The offered meters shall have to be integrated and interfaced with the WZPDCL's existing HES/MDM and existing BPLC DCUs.

etc. and more as required.

The software parts are described below:

- The online single phase and 3phase meter must be connected directly with the MIC server using the built in GPRS/EDGE/EDVO/HSPA modem.
- The communication data format is XML.
- The XML data exchange format is defined in the XML schema files.

- The communication channel of the 3phase online meter must be encrypted by 256bit SHA and seeded by a true random number generator.
- Each online pre paid meter will have contained a unique key installed
- Each online 3phase meter will have contained a unique key installed.
- Utility must be able to program the following data into the meter before they are used:
 - Meter ID
 - Data Communication Port (default 2100, custom port)
 - Server IP Address
 - Server Port
 - Encryption Key
- The meter will get a fixed IP address from the installed SIM card.
- The meter will always listen to the “Data Communication Port” for incoming data and will always send data to “Server IP Address: Server Port”.
- For incoming request, the reply data will go through the same connection similar to HTTPS.
- Incoming request from server to IP address and port 2100 of meter.
- Server posts encoded XML data.
- Server sends two carriage return to denote that it has send the entire request.
- The meter decodes the data, process the request and generates appropriate response and send it back to server.
- Bidirectional data transfer will use the same connection like HTTPS.
- The contractor shall have to supply at least 12 Nos. PCSOFT with all types of access and lifetime licenses.

etc. and more as required.

7.1.8.6 Vending Software:

This software should have proper installer to install and this software should have a hardware constrained with a unique hardware electronic ID like MAC address or chassis ID or Processor ID or vendor service tag no. ID or etc.

- Sales Module
 - ✓ This module will sale credit or energy as per consumer requirement
 - ✓ To Define type of Pre Payment meter.
 - ✓ To Collect consumer and meter related information from related MIC database like tariff and Slab, holiday, friendly hour, Emergency credit, connection load, and Alert level etc. and related information through established network.
 - ✓ To Send defined information through Smart card or generating token or through SMS/GPRS for remote Meter.
 - ✓ To Collect Meter historical data that will be collected from the meter and operational data from Smart card and update those to MIC database.

etc. and more as required.

- Data Exchange module
 - ✓ This module will collect updated information from MIC and send & insert it to relevant databases.
 - ✓ To Collect information from temporary local database and send all those processed data to MIC through P2P connection by established LAN or Dial Up or through Data network Service.

- ✓ All exchangeable data need to prepare using encryption methodology.

etc. and more as required.

- Report Module:

There will be a several types of reports to be generated. It has to be met the on demand process of the each utility division. here some of it's type are noted below:

- ✓ Daily Sales report,
- ✓ Individual consumer purchase report,
- ✓ Operator related report,
- ✓ Generate log for Data Exchange module,

etc. and more as required.

7.1.8.7 POS Application

This application work **will be operative for 24x7 round the clock online system.**

Sales Module

7.1.8.7.1 For Smart card base Meter

- ✓ To Collect consumer and meter historical Information from Smart card and get Credit demand by key input.
- ✓ Send those information's to the MIC through short Message service (SMS) or by GPRS/EDGE Service through established data network service.
- ✓ To Collect necessary information From the MIC as per request and update smart card by those information's.
- ✓ To Print module for slip print.
- ✓ To Send acknowledgment to the MIC after completion of Operation.
- ✓ To Generate log file for all operations.

etc. and more as required.

7.1.8.7.2 For Keypad base meter

- ✓ To Insert consumers' identification number and credit demand to POS interface and POS will send those to the MIC through short Message service (SMS) or by GPRS/EDGE Service through established data network service.
- ✓ To Collect Token Number for the above request from the MIC and print it to thermal paper.
- ✓ To Send acknowledgment to the MIC after completion of Operation.
- ✓ To Generate log file for all operation.

etc. and more as required.

7.1.8.7.3 For Online single phase and three phase Meter

- ✓ To Insert consumer identification number and credit demand to POS interface and the POS will send those through short Message service (SMS) or by GPRS/EDGE Service through established data network service.
- ✓ To Collect acknowledgement from the MIC after sending information to Meter by the MIC itself through short Message service.
- ✓ then at POS an acknowledgement will be received and print a slip for consumer.
- ✓ To Send acknowledgment to the MIC after completion of Operation.
- ✓ To Generate log file for all operation.

etc. and more as required.

7.1.8.8 The MIC Software

MIC Application

This application will be **the core** of the total Smart Pre-Paid metering system. Any type data modification will be allowed **and accomplished** only by this application. It will have different management Module for processing different type tasks.

7.1.8.8.1 Consumer Information Management

- **Information modification**

- By this module **only** authorized user can modify any kind of data related to consumer.
- Consumer personal information.
- Consumer tariff Class.
- Connection load.
- Issued meter related information.

etc. and more as required.

- **Report module**

- Consumer personal information
- Sales report
- Consumption report
- Historical report

etc. and more as required.

- **Tariff Management**

- Management module
 - Insertion of new tariff
 - Modification of existing tariff
 - Tariff Slab insertion and modification
 - Activation Date issue

etc. and more as required.

- **Report module**

- Individual tariff details
- All active tariff details

- Tariff history log

etc. and more as required.

7.1.8.8.2 Customized Information Management

This Module will use for include/exclude/Modification of common feature for individual or common Consumer.

- Holiday Information
- Friendly Hour
- Weekend
- Emergency Credit Limit
- Credit Alert Information

etc. and more as required.

7.1.8.9 Utility Vending Station Management

• Management module

- Issue new vending Station
- Update vending Station information.
- Deposit Information Update
- Vending Authentication information
- Vending sales Limit

etc. and more as required.

• Report Module

- Individual Vending related information
- Vending sales pattern
- Vending Station Deposit Status.

etc. and more as required.

7.1.8.10 POS Management

• Management module

- Issue new POS
- Update POS information.
- Deposit Information Update
- POS Authentication information
- Issued GSM/GPRS SIM related information.
- Commission related information
- POS sales Limit

etc. and more as required.

• Report Module

- Individual POS related information
- POS sales pattern

- c. POS Deposit Status.
- d. POS Sale Commission and related report

etc. and more as required.

7.1.8.11 Load Control:

This feature is a unique and essential part of the system to regulate the Load Management. This will be included into the meter and obviously the software. The Load control module will work on both for the offline & online meters. This module will reside in the application software. In the meter the request will follow the trigger of load control. so there will be a micro-controller programmed load control feature.

7.1.8.12 DATA Exchange Management Service

This is a self-running and automatic service that has the vital role for the total system. It will be the way by which all vending Station and POS can communicate and exchange information with the MIC.

- To Prepare update or modified data from MIC database Server.
- To Collect and insert new Data from every Vending Station and POS to MIC Database Server.
- To Synchronize all updated data from database Server, Vending Station and POS.
- To Generate log for every task for synchronization.

etc. and more as required.

7.1.8.12.1 Content management Application

- **Short Message Service(SMS) module**
 - **POS management**
 - ✓ To Collect request SMS/GPRS from POS.
 - ✓ To Process and generate information from MIC database as per request.
 - ✓ To Send replied SMS/GPRS for the particular request to the particular request.
 - ✓ To Send Common information to POS.

etc. and more as required.

- **Consumer management**
 - ✓ To Send Meter operational information to online 3 phase Meter as per requirement for instant urgent basis.
 - ✓ To Collect Meter related information from remote meter through SMS.

etc. and more as required.

Token Management

- To Collect requested information from database.
- To Generate Token for individual request.
- To Generate token for common information.

etc. and more as required.

Meter Management

Meter Customization

- To Issue new meter for individual consumer.
- To Update meter related information to database.
- To Collect meter related information from database and send those to Meter.
- To Generate report for related task like day wise meter customization.

etc. and more as required.

Meter/Smart Card Change Application

- To Change new issued meter or card related information to database
- To Send meter related information to new issued Meter.
- To Send changing information with common information to Smartcard as it can be accessible by the particular Meter.

etc. and more as required.

Meter Status Access module

- This module will used for accessing meter Current information Collected from Meter through Common Meter Status Card or RF/IR communicator or through RS485 Serial interface.

etc. and more as required.

7.1.8.12.2 Instant Service Management

It is a portable application by which utility can mentor and monitor meters installed at Field. This application must have been hardware constrained.

- To Interface to collect information from meter through Meter through Common Meter Status Card or RF/IR communication or through RS485 Serial interface.
- To Update information to Meter as per MIC requirement.
- To Interface to Collect information from MIC database as per requirement to update information to meter and stored it to temporary database at the portable device for the time being.
- To Interface to Update MIC database with collected information from occurred situation.

etc. and more as required.

7.1.8.12.3 Authorization Management

- As everyone cannot get permission to access every management module, this module will use for giving permission to individual for accessing specific management module.
- It will also manage permission for user of vending Station and POS by providing user name and password.

etc. and more as required.

7.1.8.12.4 Backup Module

This module is to take backup of the MIC related database.

etc. and more as required.

7.1.8.13 Report Management Console

Sales reports

- Account wise sales reports.
- Daily sales reports.

- Monthly sales reports.
- Tariff wise sales reports.
- POS wise sales reports.

etc. and more as required.

Consumption reports

- Account wises.
- Tariff wises.
- Feeder wises.
- Month wises.

etc. and more as required.

VAT reports

- Date wises
- Month wises
- Year wises

etc. and more as required.

Customer reports

- Account wise
- Meter no wise
- Phase wise
- Tariff wise
- All customer

etc. and more as required.

- **Exception reports**

- Sanction load violation report on No of [n]% violated
- Low/No consumption report

etc. and more as required.

7.1.8.14 Account log info report

- Account wise
- All
- Others
- Holiday report
- Tariff report
- Vending station/POS report
- Credit given report
- Vending station information report
- Sales pattern
- Deposit status
- Vending statistics report

etc. and more as required.

It is notable that the software that will be involved and installed in the CDC, MIC, UVS, UCC & POS will be followed on the basis of a decided convention of the Data Exchange Format that will be responsible for The meter that must be able to read and to write data to the smartcard in specific decided format if it is a smartcard based meter or decode information from decided encoded keys typed through the keypad if it is a keypad based meter.

At the POS or the Utility Vending Station the Token will be generated for the Keypad base meters so the software should have followed the keypad numbering scheme as described below. Here it is should be mentioned that the scheme is perception only it could be changed or modified with respect to the manufacturer that varies.

7.1.8.15 Keypad Numbering Scheme

While the manufacturer is free to use any number scheme they see fit, the number scheme must be secure and use minimum number of digits and must always contain the following fields in encrypted form:

Meter ID

Recharged amount

Sanctioned Load

Sequence Number

The meter must check the validity of these fields before recharging the credit. The sequence number is an auto generated number starting from 1 for each recharge or keypad numbers. A keypad number will only be accepted if the previous number has been keyed in. For example, if a consumer goes to POS to recharge 300Tk and gets keycode xxxyyyzzz (which contains sequence number n). The next month he goes again to recharge 250Tk and gets keycode pppqqrrr (which contains sequence number n+1). Keycode pppqqrrr will only be accepted if xxxyyyzzz has been keyed in previously i.e. meter will only accept a keycode containing sequence number 'n' if at some point keycode containing sequence number 'n-1' has been keyed in. This is to ensure that keycodes are not discarded by a consumer intentionally.

Periodically it may be necessary to generate a keycode that contains more data. The keycode scheme must be able to accommodate the following data if and when required:

Meter ID

Recharged amount

Sanctioned Load

Sequence Number

Load Change

- Sanctioned Load
- Start Time
- Load Control

Rate

- Start Unit
- Peak Rate
- Off peak Rate
- Activation Date

Holiday

- Month

- Day

It is assumed that the keypad number with only the meter id, amount, load and sequence number will be a lot shorter than the key code containing all the rate information.

At the POS or the Utility Vending Station the data transfer will be occurred for the smartcard base meters so the software should have follow the Smart Card Data Format scheme as described below. Here it is should be mentioned that the scheme is a perception only it could be changed or modified with respect to the manufacturer that varies.

7.1.8.16 Encrypted Data Generation SDK/API

It is notable that the software that will be involved and installed in the CDC, MIC, UVS, UCC & POS will be followed on Encrypted Data Generation SDK/API of the related respective meter supplied by the meter manufacturer responsible for. The meter that must be able to read and to write data to the smartcard in specific decided format if it is a smartcard based meter or decode information from decided encoded keys typed through the keypad if it is a keypad based meter through the involved Encrypted Data Generation SDK/API.

At the POS or the Utility Vending Station the data transfer will be occurred for the smartcard base meters or the Token will be generated for the Keypad base meters so the software should have follow and use

Encrypted Data Generation SDK/ API as described in Part B of the Tender Document. Here it is should be mentioned that the Encrypted Data Generation SDK/API is a perception only it could be changed or modified with respect to the manufacturer that varies.

The meter manufacturer must provide SDK/ API to generate encrypted that suitable for the meter to process and understand the API interface that has been developed in JAVA and operating system is on Linux.

The manufacturer must provide:

- Library compiled in GCC Linux that can be integrated in Java Program.
- Sample project and source code illustrating usage of provided java program
- Documentation of each function, input and output.

Work with utility to make sure that all software follows the defined standards, agree on change with all partners if required. Standards are summarized below:

7.1.9.17 POS-SMS Communication Format

The POS will communicate directly with the MIC using a separate & private Data Service Network (mobile network or other secure network where applicable). The data exchange will occur through an encrypted XML data exchange. The communication channel will use a 512bit or 1024bit SSL which the vendor must acquire. A private key will reside on the server and a public key will be available. The XML request and response formats are defined in the attached XML scheme files. Furthermore, the following additional information are required:

Server Address:

Port: 443, standard SSL port

URL: https://server_address/pos_process/

1. Accounting Server-SMS Communication Format
2. Meter Manufacturer API/SDK Format

The Tenderer must collect, integrate and test proper functionality of these SDK from the meter manufacturers:

- Library compiled in GCC Linux that can be integrated in any Linux C program.
- Windows DLL or C library with all required header files.
- .NET managed DLL.
- Sample project illustrating usage provided library/ DLL.
- Documentation.
- Installer.

Function Lists: The following functions and parameters must be implemented:

Function meter_encode:

Related Parameters

Parameter	Data Type
Recharge_amount	Integer
Sanctioned_load	Float
Sequence Number	Integer
Rate	Array
Holiday	Array
Loss	Array
Load Change	Array
Meter_id	String
Expected_output	Unsigned char (1=keycode, 2=binary data)
Meter_id	String
Sanctioned Load, Weekend, Emergency Account, Friendly Hour (start/end), Peak Hour (start/end), Buzzer Volume, Rate, Holiday, Loss, Load Change includes: Rates, Rate starts at unit, Rate at Peak, Rate at Offpeak, Activation Date, Holidays, Month, Day, Load Change, Load Control, Start Time (hour/minute), Sanctioned Load, Etc. and more as required.	Array

Related Response	
Parameter	Data Type
Status	Boolean
Amount	Float

Encoded_Data	Byte array
Keycode	String
Meter_id	String
Etc. and more as required.	

Function meter_decode:	
Parameter	Data Type
Meter_id	String
Encoded_Data	Byte array
Etc. and more as required.	
Related Response	
Parameter	Data Type
Status	Boolean
Tamper Status, RTC Status, LR Status, Usage Data for the last 6 months individually, Month, Year, KWh, Taka Recharged, Taka Used, Average Power, Reactive Power, Maximum Power, Volt Ampere, KWh in Peak, KWh in Off peak, KVarh in Peak, KVarh in Off peak, Total charge in Peak, Total charge in Off peak, Number of power failures, Number of time sanctioned load exceeded, Load control, Tamper, Number of times tampered Date/ Time of Tamper	Array
Etc. and more as required.	

7.1.8.18 Meter Number Scheme

The meter number scheme will be the unique and be followed by a conversion of the utility. The number scheme will not be the scheme described but the description will be the basic of the conversion of the meter number scheme which will be supplied after signing of the contract.

A 11 digit meter number is envisioned. The first digit will be the utility ID. The second and third digit will correspond to meter manufacturer name. The fourth digit will correspond to meter type. The next 7 digits will be a sequence number used to identify each meter and will consist of numbers (0-9).

7.1.8.19 3φ Meter-SMS Data Exchange and Authentication Scheme

The XML data exchange format is defined in the attached XML files. Furthermore, the communication channel must be encrypted by 256bit SHA and seeded by a true random number generator. Each meter should also have a unique key installed.

Server Address:

Port: 2100, custom port

Protocol: Text/Encrypted XML

7.1.8.20 Meter Connection Procedure

The following procedure is envisioned: Configure the meter with server IP, port and any authentication key required. Bring the meter online and send a query test command from the server. The meter should respond with firmware version which will verify connectivity. The send the “conf” command to meter from server.

7.1.8.21 Establishment of Network

The tenderer who will implement will be responsible for establishment of the network for the entire system. These include but are not limited to:

- Network connecting POS to MIC
- Network connecting UVS & UCC and utility POS to MIC if/when required
- Network connecting Data Network Service Provider (mobile operators) to MIC
- Arrange contract with Data Network Service Provider (mobile operators) for a secure private data network and provide data network SIM/RIM to POS operators.
- Ensure security of the network. Setup APN where required
- Ensure uptime of network
- Manage network, test performance, throughput and bottleneck of network
- Maintain automated network failure detection and failover. Develop a failure notification service model
- Follow network address scheme as defined below:

Each utility company will be assigned a unique number starting with 1 (max: 119, total: 119). Each mobile operator will be assigned a unique number starting with 230 (max 254, total: 25). Each financial institution will be assigned a unique number starting with 120 (max 229, total: 110). For our example, we will assume the following numbers to illustrate an example.

Utility company x: 1

Utility company y: 2

Mobile Operator m: 230

Mobile Operator n: 231

Financial Institution p: 120

Financial Institution q: 121

All utility servers will reside in a unique subnet of the 172.16.x.x network.

Example:

Utility company x application server address: 172.16.1.1

Utility company y application server address: 172.16.2.1

Mobile company m application server address: 172.16.230.1

Mobile company n application server address: 172.16.231.1

Financial Institute p payment server address: 172.16.120.1

Financial Institute q payment server address: 172.16.121.1

Other 253 IPs are available for other network servers for later or additional use