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All Chief Executive Officers,
DISCOs.

Subject: SPECIFICATION DDS-110:2012 OF METER DATA COLLECTION (MDC) SERVER TO BE USED IN ADVANCED METERING INFRASTRUCTURE (AMI)

Please find enclosed herewith specification No. DDS-110:2012 for Meter Data Collection (MDC) Server to be used in AMI for perusal and information please.

DA/Draft Specification


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11. Master file.

NATIONAL TRANSMISSION AND DESPATCH COMPANY
(NTDC)

SPECIFICATION DDS-110:2012



METER DATA COLLECTION (MDC) SERVER
TO BE USED IN
ADVANCED METERING INFRASTRUCTURE (AMI)

(D&S) Department

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SPECIFICATION FOR METER DATA COLLECTION (MDC) SERVER TO BE USED IN ADVANCED METERING INFRASTRUCTURE (AMI)

1. Foreword:

- 1.1. This standard specification has been prepared by the Engineering Directorate of Chief Engineer (D&S).
- 1.2. This specification is intended for procurement of material and not for contract.
- 1.3. This specification is subject to revision as and when required.

2. Scope:

- 2.1. This specification is being prepared for the introduction of a Meter Data Collection (MDC) server to be used with Advanced Metering Infrastructure (AMI).
- 2.2. This specification is intended for the introduction of MDC based Meter Reading System to be used with Meters as per relevant specification DDS-50:2007, DDS-60:2007 and DDS-65:03 having communication as per specification DDS-98:2011.
- 2.3. This specification covers the aspects of Meter Data Collection (MDC) server specification, MDC Software Specification, MDC integration with AMI and multi-vendor protocol.
- 2.4. This specification shall cover the multi-vendor compliance of the existing manufacturers as well as the prospective vendors.

3. Definitions:

3.1. AMI:

Advanced Metering Infrastructure (AMI) are systems that measure, collect and analyze energy usage, and communicate with metering devices such as electricity meters, either on request or on a schedule. These systems include hardware, software, communications and Meter Data Management (MDM) software etc.

3.2. Meter Serial Number:

Meter serial number is printed on meter label and stored in meter memory.

3.3. Manufacturer Identifier:

The unique numeric identification of each meter manufacturer.

3.4. Meter Type:

Meter Type shall correspond to design specification i.e. DDS-50:2007, DDS-60:2007 & DDS-65:03.

3.5. MDC:

Meter Data Collection Server is a system in Advanced Metering Infrastructure (AMI) used to obtain data from the meters and store it into the database.

3.6. Wakeup:

Wakeup is a request sent by Meter Data Collection (MDC) Server to the meter for making a connection.

3.7. Pull:

Pull is a mechanism in which MDC demands for specific information or data from meter and meter sends data in response.

3.8. GPRS:

General Packet Radio Service is a packet oriented communication technology. This technology is specifically used for communication between mobile phone and internet.

3.9. SMS:

Short Message Service is a communication service standardized in the GSM mobile communication system.

3.10. Voice Call:

Voice Call is a GSM service used to interchange speech data between two communication entities.

3.11. TCP:

Transmission Control Protocol is transport layer protocol for Internet Protocol (IP).

3.12. IP:

Internet Protocol is a networking layer protocol and forms the core of Internet all around the world.

3.13. DVD:

DVD is an optical disc storage media format, offering higher storage capacity than Compact Discs while having the same dimensions.

3.14. RAID:

RAID (an acronym for redundant array of independent disks; originally redundant array of inexpensive disks) is a storage technology that combines multiple disk drive components into a logical unit to increase the data storage reliability.

3.15. OBIS:

The OBIS Object Identification System defines identification codes for all data in DLMS/COSEM compliant metering equipment.

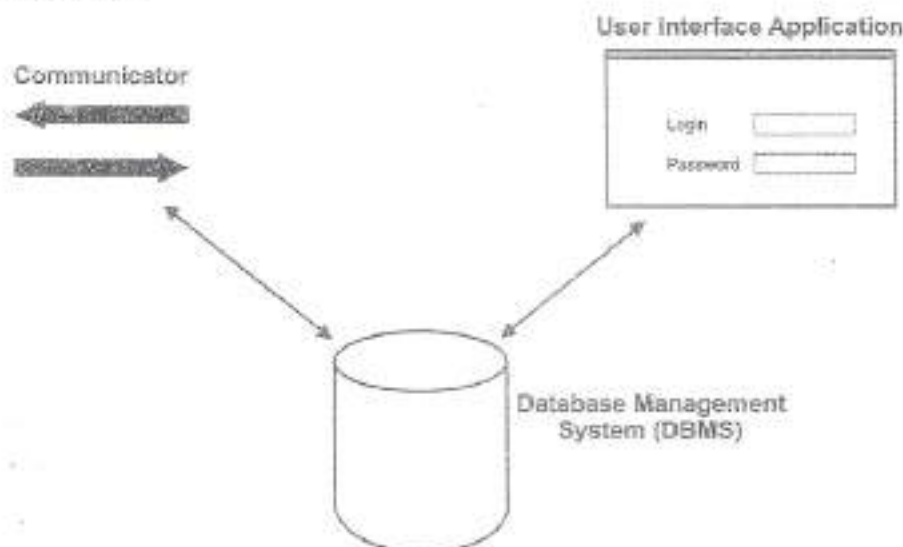
3.16. Mockup:

In manufacturing and design, a mockup is a scaled model of a design or device, used for teaching, demonstration, design evaluation, promotion, and other purposes. A mockup is a prototype if it provides at least part of the functionality of a system and enables testing of a design.

5. Software Architecture:

Meter Data Collection (MDC) Server shall have following:

- 5.1. User Interface Application
- 5.2. Database Management System (DBMS)
- 5.3. Communicator



Software Architecture

6. User Interface Application:

- 6.1. It is responsible for providing a graphical interface to the user to view the data received from the communicator; send meter configuration and other relevant data to the meters.
- 6.2. MDC software shall be capable of displaying all metering data as per relevant meter's specifications (DDS-50:2007, DDS-80:2007 and DDS-85:03).
- 6.3. The interface application shall provide customer hierarchy for at least 3 levels. It shall also provide user management and user rights. User rights shall limit a user to a certain level of customer hierarchy.
- 6.4. The user interface application shall provide a mechanism for meter management functions. For example, adding or deleting a meter, meter configuration etc.
- 6.5. The user interface application shall provide a Graphical User Interface (GUI).

7. Database Management System (DBMS):

- 7.1. The Database Management System (DBMS) is a central repository for all metering data collected through communicator.
- 7.2. The host software shall have capabilities to store and report all metering data in a database management system as required in the relevant meter specifications like billing data, event data, load profiles etc.
- 7.3. It shall provide mechanism for periodic as well as on-demand backup; and also, it shall be able to restore data on request.
- 7.4. The Database server shall have backup interface for DVD.
- 7.5. The database shall be capable to hold the metering data as specified in "Schedule of Technical Data" for a period specified therein (Annex-I)

8. Hardware:

- 8.1. The Database Management Server shall have RAID hard drives.
- 8.2. There shall be at least one backup server (optional).
- 8.3. Server Class machines shall be used.
- 8.4. Online UPS shall be used.
- 8.5. Reliable Internet Connection with at least one static public IP address shall be used.
- 8.6. There shall be arrangement for at least two generators.
- 8.7. Data center room shall be properly air-conditioned.
- 8.8. There shall be at least one GSM Modem for Wakeup SMS/voice call to send one SMS/ make Voice call at a time.
- 8.9. It shall be possible to use more than one server for load sharing when data load is high. The vender will propose system on the basis of requirements given by the customer in Annex-1.

9. GSM Modem:

GSM modem of following specifications shall be used with MDC

9.1. Quad-Band GSM/GPRS 850/900/1800/1900MHz

9.2. Compliant to GSM phase 2/2+

9.2.1. Class 4 (2W @ 850/900MHz)

9.2.2. Class 1 (1W @ 1800/1900MHz)

9.3. The Modem shall have the capability for SMS and voice call communication

9.4. The modem shall have LED indicator visible from the distance.

9.5. The LED shall indicate the operational status of the modem like:

9.5.1. Fast blinking LED indicates absence of SIM card or no network service or insufficient signal strength.

9.5.2. OFF LED indicates modem is not working.

9.5.3. Slow blinking LED indicates healthiness of the modem and is registered to the GSM network

9.6. The SIM card shall be field replaceable

9.7. It shall have RS232 or USB interface for computer

10. Communicator:

It is responsible for handling all communications between meters and MDC and sending data into database for the user interface application.

10.1 Communication Protocols:

10.1.1. MDC shall support DLMS/COSEM communication protocol.

10.1.2. MDC shall also accept output data files as specified in DDS-105:2011 (if applicable).

10.2. Communication Modes:

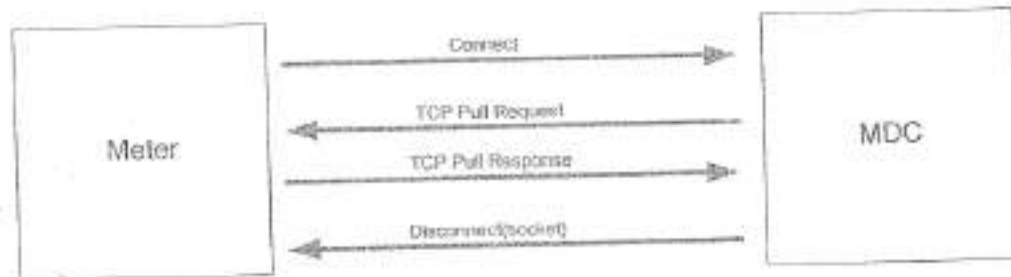
Meters shall be configurable to one of following Mode-I or Mode-II at a time

10.2.1. Mode I (GPRS as Primary Medium and SMS/Voice Call for Wakeup):

10.2.1.1. Pull at Preprogrammed Interval:

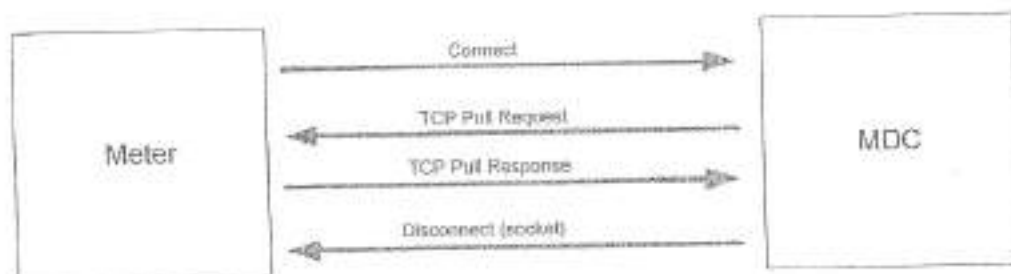
Meter shall establish a TCP connection with the MDC server at a predefined interval via GPRS. Number of retries and retry interval shall be programmable.

The MDC shall pull data from the meter as shown in the figure below:



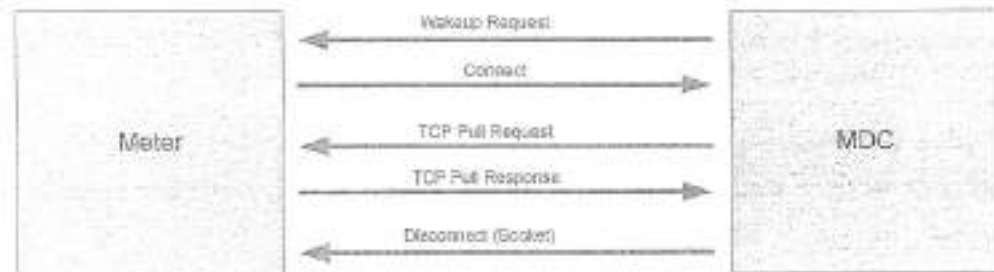
10.2.1.2. Pull at Events & Alarms:

The meter has a number of events/alarms; any of these events/alarms can be configured as a major alarm. If a major alarm/event occurs, meter shall establish a TCP/IP connection with the MDC via GPRS. Number of retries and retry interval shall be programmable. The MDC shall pull data from the meter as shown in the figure below:



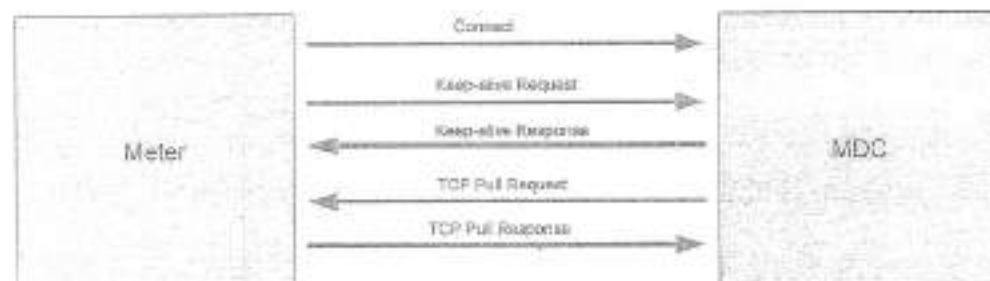
10.2.1.3. Pull on-Demand:

For on-demand data the MDC shall send wakeup SMS or initiate a wakeup voice call for the meter. In response the meter shall establish a TCP/IP connection with the MDC server via GPRS. Number of retries and retry interval shall be programmable. The MDC shall pull data from the meter as shown in the figure below:



10.2.2. Mode-II (GPRS always alive):

Meter shall always maintain a TCP/IP connection with the MDC server via GPRS. In this process the meter shall send periodic heart beat/keep-alive packets to the MDC server. The MDC shall pull data from the meter as and when required as shown in the figure below:



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10.3. Communication Channels:

Meter shall have two programmable IP addresses. For communication via GPRS one of two programmed IP address shall be used as primary address and the other IP address shall be used as secondary address. The meter shall try to establish a TCP/IP connection with the primary IP address if it fails to do so then the meter shall try to establish TCP/IP connection with secondary IP address.

Meter shall have at least three programmable GSM Numbers. In case of Wakeup command via SMS or voice call the meter shall only respond to the wakeup commands originated from the GSM number programmed in it.

10.4. Communication OBIS codes:

10.4.1. Energy and Demand:

Standard OBIS codes for quantities used for billing purposes are shown below.

Cumulative Active energy absolute (Abs KWH)	
Total	1.0.15.8.0.255
Tariff 1	1.0.15.8.1.255
Tariff 2	1.0.15.8.2.255
Tariff 3	1.0.15.8.3.255
Tariff 4	1.0.15.8.4.255

Cumulative Reactive Energy KVarh Q1 + Q3 in single packet (Pakistan Specific)	
Total	1.0.94.92.0.255
Tariff 1	1.0.94.92.1.255
Tariff 2	1.0.94.92.2.255
Tariff 3	1.0.94.92.3.255
Tariff 4	1.0.94.92.4.255

Maximum Demand Active absolute (MDI-KW abs)	
Total	1.0.15.6.0.255
Tariff 1	1.0.15.6.1.255
Tariff 2	1.0.15.6.2.255
Tariff 3	1.0.15.6.3.255
Tariff 4	1.0.15.6.4.255

Cumulative Maximum Demand Active absolute (Cum-MDI-KW abs)	
Total	1.0.15.2.0.255
Tariff 1	1.0.15.2.1.255
Tariff 2	1.0.15.2.2.255
Tariff 3	1.0.15.2.3.255
Tariff 4	1.0.15.2.4.255

Associated data	
MDI Reset Date and Time	1.0.0.1.2.255
MDI Reset Count	1.0.0.1.0.255

10.4.2. Instantaneous:

Standard OBIS codes instantaneous data elements are shown below:

Quantity	OBIS code
Aggregate Active power Import (KW+)	1.0.1.7.0.255
Aggregate Active Power Export (KW-)	1.0.2.7.0.255
Aggregate Reactive power Import	1.0.3.7.0.255
Aggregate Reactive power export	1.0.4.7.0.255
Voltage Phase A	1.0.32.7.0.255
Voltage Phase B	1.0.52.7.0.255
Voltage Phase C	1.0.72.7.0.255
Current Phase A	1.0.31.7.0.255
Current Phase B	1.0.51.7.0.255
Current Phase C	1.0.71.7.0.255
Average Power Factor	1.0.13.7.0.255
Frequency	1.0.14.7.0.255
Time	1.0.0.9.1.255
Date	1.0.0.9.2.255
Current Tariff	0.0.96.14.0.255
CT ratio Numerator	1.0.0.4.2.255
CT ratio Denominator	1.0.0.4.5.255
PT ratio Numerator	1.0.0.4.3.255
PT ratio Denominator	1.0.0.4.6.255
Customer Code	0.0.96.1.10.255

10.4.3. Events Codes and Event notification Packet:

For Event notification standard packet of DLMS/COSEM with Tag 0xC2 should be used. Referred to IEC-62056-53 OBIS code to be used in this Packet is 0.0.96.11.0.255. This OBIS code contains the event code of most recent event occurred. Event code list is implementation specific. List of Event codes for all necessary quantities is given below.

List of event Codes					
Quantity	Event Code	DDS-50	DDS-60	DDS-65 Multi Tariff	DDS-65 Single Tariff
MDI reset	101	Y	Y	Y	N
Parameterization	102	Y	Y	Y	N
Power fail start (will be reported when power is restored)	111	Y	Y	Y	N
Power fail end	112	Y	Y	Y	N
Phase failure	113	Y	Y	N	N
Over Volt	114	Y	N	N	N
Under Volt	115	Y	N	N	N
Demand Over Load	116	Y	N	N	N
Reverse Energy (Active energy)	117	Y	Y	N	N
Reverse Polarity	118	Y	Y	N	N
CT Bypass	121	Y	N	N	N

10.4.4. Keep-alive Packet Format:

The Transport Layer payload of Keep-alive request is defined in the table as follows:

Tag	Length of Meter Number	Meter Number
1 byte (0xDD)	1 byte	As Specified in Section 10.5

The Transport Layer payload of Keep-alive response is defined in the table as follows:

Tag
1 byte (0xDA)

The above request and response packets of Keep-alive commands are payload of Transport Layer. The reasons behind choosing it as Transport Layer payload are given below:

- To keep GPRS data traffic low.
- The purpose served by this packet is beyond the DLMS protocol specification.
- Tags used for Keep-alive request and response packets are utilized by DLMS specification for some other purpose.

Communication network layers stack, showing the generation of Keep-alive request and response, is shown below.

		Keep-alive Request/Response
Transport Layer Header		Transport Layer payload
IP Header	IP payload	

10.5. Meter Identifier:

The MDC shall communicate with meter using a unique 4-Byte Meter Identifier. The office of the Chief Engineer Design and Standards shall allocate prefix to each manufacturer a 4 byte meter identifier as mentioned below:

Meter Serial Number Format		
00-40	00-99	000001-999999
Manufacturer	Meter Type	Meter Serial Number
40 SBL	99 DDS-50	Start =000001 , End = 999999
39 PEL	98 DDS-60	
38 Escorts	97 DDS-65	
37 KBK	Etc.	
36 MicroTech		
35 CTI		
34 TIP		
33 Ace Indigo		
32 Creative Electronics		
Etc.		

11. Data Export Formats:

11.1 Billing_Data.csv

Sr #	Item Name	Type (ASCII Text)	Description
1	Reading Date	YY/MM/DD	
2	Reading Time	HH:MM:SS	
3	Reference Number	XXXXXXXXXXXXXXXX	
4	Meter Serial Number	NNNNNNNNNNNN	
5	T1 Active kWh	XXXXXX.XX	kWh
6	T2 Active kWh	XXXXXX.XX	kWh
7	T3 Active kWh	XXXXXX.XX	kWh
8	T4 Active kWh	XXXXXX.XX	kWh
9	TL Active kWh	XXXXXX.XX	kWh
10	T1 Reactive kVarh	XXXXXX.XX	kVarh
11	T2 Reactive kVarh	XXXXXX.XX	kVarh
12	T3 Reactive kVarh	XXXXXX.XX	kVarh
13	T4 Reactive kVarh	XXXXXX.XX	kVarh
14	TL Reactive kVarh	XXXXXX.XX	kVarh
15	T1 Active MDI	XXX.XXX	kW
16	T2 Active MDI	XXX.XXX	kW
17	T3 Active MDI	XXX.XXX	kW
18	T4 Active MDI	XXX.XXX	kW
19	TL Active MDI	XXX.XXX	kW
20	T1 Cumulative Active MDI	XXXXXX.XX	kW
21	T2 Cumulative Active MDI	XXXXXX.XX	kW
22	T3 Cumulative Active MDI	XXXXXX.XX	kW
23	T4 Cumulative Active MDI	XXXXXX.XX	kW
24	TL Cumulative Active MDI	XXXXXX.XX	kW
25	MDI Reset Date	YY/MM/DD	
26	MDI Reset Time	HH:MM:SS	
27	MDI Reset Count Number	XXXX	

Note: Unavailable quantities shall be appended by blank spaces

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11.2 Instantaneous_Data.csv

Sr #	Item Name	Type (ASCII Text)	Description
1	Reading Date	YY/MM/DD	
2	Reading Time	HH:MM:SS	
3	Reference Number	XXXXXXXXXXXXXXXX	
4	Meter Serial Number	NNNNNNNNNNNN	
5	Aggregate Active power Import (KW+)	XXXXXXXX.XXX	kW
6	Aggregate Active Power Export (KW-)	XXXXXXXX.XXX	kW
7	Aggregate Reactive power Import	XXXXXXXX.XXX	kW
8	Aggregate Reactive power export	XXXXXXXX.XXX	kW
9	Voltage Phase A	XXXXXXXX.XXX	Volts
10	Voltage Phase B	XXXXXXXX.XXX	Volts
11	Voltage Phase C	XXXXXXXX.XXX	Volts
12	Current Phase A	XXXXXXXX.XXX	Amperes
13	Current Phase B	XXXXXXXX.XXX	Amperes
14	Current Phase C	XXXXXXXX.XXX	Amperes
15	Average Power Factor	X.XX	
16	Frequency	XX.XX	Hz
17	Time	YY/MM/DD	
18	Date	HH:MM:SS	
19	Current Tariff	X	Number

Note: Unavailable quantities shall be appended by blank spaces

12. User Acceptance Criteria:

Following tests shall only to be performed when MDC is fully installed at utility designated location.

For energy meter prototype testing as per DDS-98 required communication verification as per Annex-II shall be performed using MDC software mockup.

12.1 Software Architecture

Criteria	Pass	Fail
Provision of User Interface Application		
Provision of Database Management System		
Provision of Communicator Application		

12.2 User Interface Application

Criteria	Pass	Fail
Capable of displaying all metering data as per relevant WAPDA/PEPCO meter's specifications i.e. DDS-50, DDS-60 and DDS-65		
Provides customer hierarchy for at least 3 levels		
Provides user management and user rights		
User rights limit a user to a certain level of customer hierarchy		
Provides a GUI		

12.3 Database Management System

Criteria	Pass	Fail
Stores and reports all metering data in DBMS		
Provides mechanism for periodic as well as on-demand backup; and also restores data on request		
Database server has a backup interface for DVD		
Capable to hold the metering data as specified in "Schedule of Technical Data"		

12.4 Hardware:

Criteria	Pass	Fail
RAID Hard Drives(if applicable)		
At least one backup server(if applicable)		
Server Class machines(if applicable)		
Online UPS(if applicable)		
Arrangement for at least two generators(if applicable)		
At least one GSM Modem.		
More than one server for load sharing(if applicable)		

12.5 Server side GSM Modem:

Criteria	Pass	Fail
Quad Band (verification through datasheet)		
SMS Capability(if applicable)		
Voice Call Capability(if applicable)		
LED Indicator		
Field Replaceable SIM		
RS232 or USB Interface		

12.6 Communicator

Criteria	Pass	Fail
Supports DLMS/COSEM communication protocol		
Supports output data files as specified in DDS-105:2011(if applicable)		

12.7 Communication Modes

Criteria	Pass	Fail
Mode I (Pull at preprogrammed Interval)		
Mode I (Pull at Events & Alarms)		
Mode I (Pull on Demand)		
Mode II(GPRS always alive)		

12.8 Communication Channels

Criteria	Pass	Fail
Provision of two Programmable IP addresses		
Provision of primary and secondary IP addresses		
Provision of three Programmable GSM Numbers		

12.9 Meter Identifier

Criteria	Pass	Fail
Supports Meter Identifier		

12.10 Data Export Format

Criteria	Pass	Fail
Billing Data Export Format as per relevant specifications		
Instantaneous Data Export Format as per relevant specifications		

 ASHFAQ AHMED DY MANAGER (DE) ✓	 DR.RANA ABDUL JABBAR KHAN MANAGER (DE) ✓	 ZUBAIR MALIK CHIEF ENGINEER (D&S) ✓
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13. Annex-I: Schedule of Technical Data:

Following data is to be filled by the customer as per their requirement.

13.1. Billing Data to be transferred from meter to MDC to be filled for each meter/customer type.

S.No.	Item	Type	Required (mark Yes/No)
1	TL kWh	Billing	
2	T1 kWh	Billing	
3	T2 kWh	Billing	
4	T3 kWh	Billing	
5	T4 kWh	Billing	
6	TL kVArh	Billing	
7	T1 kVArh	Billing	
8	T2 kVArh	Billing	
9	T3 kVArh	Billing	
10	T4 kVArh	Billing	
11	TL MDI kW	Billing	
12	T1 MDI kW	Billing	
13	T2 MDI kW	Billing	
14	T3 MDI kW	Billing	
15	T4 MDI kW	Billing	
16	TL CUM MDI kW	Billing	
17	T1 CUM MDI kW	Billing	
18	T2 CUM MDI kW	Billing	
19	T3 CUM MDI kW	Billing	
20	T4 CUM MDI kW	Billing	

13.2. Instantaneous Data to be transferred from meter to MDC to be filled for each meter/customer type

S.No.	Item	Type	Required (mark Yes/No)
1	Aggregate Active power Import (KW+)	Instantaneous	
2	Aggregate Active Power Export (KW-)	Instantaneous	
3	Aggregate Reactive power Import	Instantaneous	
4	Aggregate Reactive power export	Instantaneous	
5	Voltage Phase A	Instantaneous	
6	Voltage Phase B	Instantaneous	
7	Voltage Phase C	Instantaneous	
8	Current Phase A	Instantaneous	
9	Current Phase B	Instantaneous	
10	Current Phase C	Instantaneous	
11	Average Power Factor	Instantaneous	
12	Frequency	Instantaneous	
13	Time	Instantaneous	
14	Date	Instantaneous	
15	Current Tariff	Instantaneous	
16	CT ratio Numerator	Instantaneous	
17	CT ratio Denominator	Instantaneous	
18	PT ratio Numerator	Instantaneous	
19	PT ratio Denominator	Instantaneous	
20	Customer Code	Instantaneous	

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13.3. Frequency and Duration of Data to be filled for each meter/customer type used.

S.No.	Item	Count/Frequency/Duration
1	Billing Data Interval	
2	Instantaneous Data interval	
3	Number of meters/customers in this category	
4	Data to be stored inside server for how many number of months	

13.4. IT Infrastructure requirement.

S.No.	IT Infrastructure	Required from bidder (Yes/No)
1	Servers	
2	Switched Router	
3	Online UPS	
4	Reliable internet Connection	
5	Generators	
6	Data Center Room	
7	GSM Modems	
8	Tower	
9	Others(to be specified)	

13.5. Optional Features:

S.No.	Feature Names	Required from bidder (Yes/No)
1	Wake up on SMS	
2	Wake on voice call	
3	Backup server	
4	DDS-105:2011 integration required	

13.6. Service Level Agreement (SLA):

S.No.	Feature Names	
1	Meters to be integrated (specify make and model)	
2	After sales support duration	
3	Quantity to be integrated for each type and make of meters	
4		

14. Annex-II Parameters list for communication verification:

S.No.	Quantity Name
1	Meter Serial Number
2	Total kWh
3	Total kvarh