Advance Metering Technology, AMR, MRI & BCS

INTRODUCTION

Energy Meters are an integral part of electricity revenue generation system. Procurement and installation of energy meters will be the key focus area of all power utilities. Drafting out appropriate technical and functional specifications of the meters is an important first step, requiring sufficient vision to ensure that the new meters do not get obsolete within their desired life-period, and to differentiate their application requirements.

Advanced metering infrastructure/technology

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, consumer energy displays and controllers, customer associated systems, Meter Data Management (MDM) software, and supplier business systems.

IMPORTANCE OF METERING

- *Energy meter is the cash register of the utility.*
- *Energy meters form vital instruments of revenue realization for a utility.*
- *Inaccurate/ defective metering is catastrophe, both for Consumer & the utility*

METERING PLACES/POINTS

- *Metering point at 132/33 kV sub-stations, from where we draw the power (Energy).*
- *Metering points at our 33/11 kV sub-stations. (at 33 kV Incoming, 33 kV & 11 kV sides of Transformers and on 11 kV out going feeders).*
  - *Import / Export points in between two s/s.*
  - *Distribution Transformers.(DTR metering)*
  - *Consumers premises.(LT / HT/ EHT)*

PURPOSE OF METERING

- *Workout line losses between sending end to s/s ,*
- *Workout losses in between DTR and consumers*
- *Workout losses / bus balance in s/s*
- *Recording consumptions in consumers meters (consumed by the users)*
- *Obtain data for analyzing system for load pattern/ power quality/ system strengthening*
- *tampers & Events analysis.*

Type of Meters

- ***Single phase 230 V Static LT kWh meters***

  a. Static meters with mechanical dial (old)
  b. Static meters with optical port (galvenically isolated port).
  c. Static meters with infrared port (wireless port)
  d. Static meters with RF port (wireless port)

- ***Three phase 3X 230 V Static LT kWh meters***

  a. Static meter with mechanical dial (old)
  b. Static meter with optical port . (galvenically isolated port)
  c. Static meter with RF port . (wireless port)

- ***Three phase 3X 230 V Static LT CT tri-vector meters***

  -For High value LT consumers with AMR
  -For DTR Metering (DLMS compliant)

- ***Three phase Static HT tri-vector meters***

  -For HT & EHT consumers with AMR
  -For feeder metering (DLMS compliant)

Note – all the static meter have LCD (liquid crystal Diod) display

With the introduction of Static Energy meter in distribution system; utilities have got a big weapon in their hands i.e. Meter data received from the meter for analysis with the help of AMR/ CMRI and BCS. These meters have ability to record the electrical parameters of the system in its load survey. In addition this meter is also capable of detecting any abnormal electrical conditions with its intelligence. So these meters are also called intelligent and smart meter. The complete data of meter can be retrieved electronically (either by RMR/AMR or by a hand held device called CMRI).

COMMON METER READING INSTRUMENTS (C.M.R.I.)

MRI is an instrument by which we can retrieve meter data of a particular maker's meter for that MRI is suitable.

CMRI is an instrument by which we can retrieve meter data of different maker's meters (having different meter's software) as per our requirement.

MAKE OF CMRI AVAILABLE IN OUR SYSTEM

1. *Analogic make CMRI*
2. *Sands make CMRI*

Before operation of CMRI following should be ensured

1. *Battery of CMRI should be charge up to the mark.*
2. *Sufficient space should be available in CMRI memory.*
3. *Battery charger , connecting leads should be in healthy condition.*

AUTOMATED METER READING

In this process modem is connected with meter through optical or RJ11 port and power up by available 110 V/230V supply from TTB or as the case may be. Another modem need to be connected to computer in which BCS is loaded. Energy meter is having its own protocol or DLMS protocol to which it responds. Schedules for reading are to be prepared in BCS and then they are run on computer. In schedules the GSM No. which is to be dialed is fed. When schedule runs it dials that number and send a hand shaking commend. The meter on the other hand recognizes that these commands and send the data to BCS . The data when received by BCS is saved in a particular file at some pre defined location. (So in this manner the data which was to be collected from site by MRI is collected in computer with the help of BCS and lot of time /man power is saved.)

<u>Equipments required for automated meter reading (AMR)</u>

1. *GSM modem (ECD 200) at meter end.*
2. *GSM modem (ECD 100) at PC end*
3. *Sim cards for PC end as well meter end*
4. *Base computer software*
5. *connecting leads*

<u>Modes of meter readings via AMR</u>

Meter readings of a particular meter can be access on following mode

In GSM Infrastructure:

1. *<u>Store and forward mode</u> : In this mode stored data in GSM modem at meter end is received as per configuration of modem i.e. hourly/daily/weekly/monthly. In this mode baud rate is 9600bps . For receiving all meter data from a meter memory it will takes about 3 to 4 minutes only.*
2. *<u>Transparent mode</u> : In this mode meter reading data directly received from meter. In this mode baud rate is 1200bps. For receiving all meter data from a meter memory it will takes about 30 to 40 minutes .*

In GPRS Infrastructure:

3. *We can view the live data of the programmed intervals.*

INFORMATION RETRIVED BY CMRI/ AMR FROM METER MEMORY

(data may vary as per type and class of meter)

1. ***Instant parameters*** *like voltages. Phases current, power factors, Active power, Apparent power, Reactive Power, system Frequency, Phase sequence etc.*
2. ***Energy Values*** *like Active/apparent/reactive energy & demand , average power factor, mid night data, power on/off position etc. meter CT/PT ratio, meter tarrif program, flag position of meter*
3. ***Load survey data*** *like daily load data of energy & demand for last 30 days at every 15 minutes interval.*
4. ***Events & temper*** *data like PT missing, CT short, CT open, load unbalance, magnet temper, Over load, neutral disturbance conditions etc.*
5. ***Transactions record*** *: Any changes in meter display or programming or temper reset with date & time*

ADVANTAGE OF AMR

1. *No need of man power to take the meter readings data.*
2. *Manual errors eliminates completely*
3. *Time saving in reading & billing process.*
4. *Expenditure saved against vehicles and stationary etc.*

BASE COMPUTER APPLICATION SOFTWARE

A BCS play vital role to read the meter remotely and for efficient and speedy recovery of data read through CMRI/HHU and also to view the downloaded information in different formats & graphs.

The general specifications of the Base Computer Application Software is as below:

The BCS software shall be user friendly. Windows based Base computer software shall be supplied. Base Computer software shall give all details adequate for analysis and load surveys parameters. The software shall have the facility to convert all the consolidated information / data of selectable parameters into ASCII and XML format. EDP department of purchaser can generate its own DBF (data base files) to downloaded all the required information into it.

i. ***Platform*** *: The BCS shall be executable on all WINDOWS system. The BCS shall be suitable to run on IBM compatible PC hardware platform.*

ii. ***Meter Data Display*** *:The software shall show electrical condition existing at the time of reading the meter in tabular forms as well as graphical format (Phase diagram)*

All the information about energy, maximum demand and their respective TOD register reading, billing register readings shall be shown in a manner which user can easily understand.

All the load survey data shall be available in numerical as well as graphical format. It shall be possible to view this data daily, weekly, and monthly format. The load survey graph will show values where the cursor is placed for the selected or for all parameter.

All the information about abnormality events shall be accompanied with date and time stamping along with 'snap-shot' of respective electrical conditions. This information shall be displayed in the sequence in which it happened in cumulative format as well as summary format.

The software shall be capable of preparing CMRI to read the meter information or time setting of the meter.

iii. ***Support Display****: There shall be "user friendly" approach for viewing meter data for the reading collected now or for the reading collected in the past. All information about a particular consumer will be sorted out and available at one place so that locating any consumer 's past data is easy. It shall be possible to retrieve/locate data on the basis of either one of the following particulars:*

a) *Consumer's ID/Numbers.*
b) *Meter Sr. No.*
c) *Date of meter reading.*
d) *Location.*

iv. ***The Data Transfer*** *:It shall be possible to transfer data to and fro from CMRI through serial interface.*

v. ***Remote Meter Reading option****: It should be possible to read remote end meter using* ***GSM/ GPRS*** *infrastructure with configurable auto reading mode and manual mode. The auto dialling and reading mode shall have enough flexibility to define different groups and their priority orders to read the meter etc.*

vi. ***Configurability*** *:It shall be possible to have selective printing of all available data of the meter. Print out shall not include anything and everything available with the BCS. The software shall support "print wizard" whereby user can decide what to print out. The use of the software need not revert back to the supplier of the software for modifying the software just to print what he desires.*

BCS shall have facility to export data to ASCII or spreadsheet format for integrating with the purchaser's billing system. Here again an "Export wizard" or similar utility shall be available whereby user can select file format, what data to export, the field width selection etc.

vii. ***Security:*** *The BCS shall have multilevel password for data protection and security. The first level shall allow the user to enter the system. The different software features shall be protecting by different passwords. The configurable of passwords shall be user definable.*

viii. ***Help:*** *The exhaustive online help shall be available with the software so that user can use all the features of the software by just reading the help contents.*

Objective type question :

Que 1 *: Optical port is*

- ***(a) A galvenically isolated port***
- *(b) A electrical contact port*
- *(c) A wireless port*
- *(d) non of above*

Que 2*: Reading of meter using Infrared communication port is possible*

- *(a) through connecting the cord to meter*
- ***(b) through Wireless port***
- *(c) Through optical port*

Que. 3 : *ECD-200 GSM Modem used at :*

- ***a. Meter end***
- *b. PC end*
- *c. Meter as well as PC end*
- *d. None*

Que. 4: *LCD represent to :*

- *a. Light crystal diode*
- *b. Liquid ceramic crystal diode*
- ***c. Liquid crystal diode***
- *d. Light ceramic crystal diode*

Que. 5: *CMRI is used to :*

- ***a. Retrieve data from meter***
- *b. Reading Change in meter*
- *c. Testing of meter*
- *d. Analyzing data of meter*

Que. 1: *What are the merits of A.M.R.? Explain it in brief?*

Ans.- Automated meter reading*:- In this process modem is connected with meter through optical or RJ11 port and power up by available 110 V supply from TTB .Another modem need to be connected to computer in which BCS is loaded. Energy meter is having its own protocol to which it responds. Schedules for reading are to be prepared in BCS and then they are run on computer. In schedules the GSM No. which is to be dialed is fed. When schedule runs it dials that number and send a hand shaking commend. The meter on the other hand recognizes that these commands and send the data to BCS . The data when received by BCS is saved in a particular file at some pre defined location. (So in this manner the data which was to be collected from site by MRI is collected in computer with the help of BCS and lot of time /man power is saved.)*

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Advantages of AMR

- *No need of man power to take the meter readings data.*
- *Manual errors eliminates completely*
- *Time saving in reading & billing process.*
- *Expenditure saved against vehicles and stationary etc.*

Que. 2: Brief on the information to be retrieved from the meter with the help of CMRI/AMR.

Ans: INFORMATION RETRIVED BY CMRI/ AMR FROM METER MEMORY

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