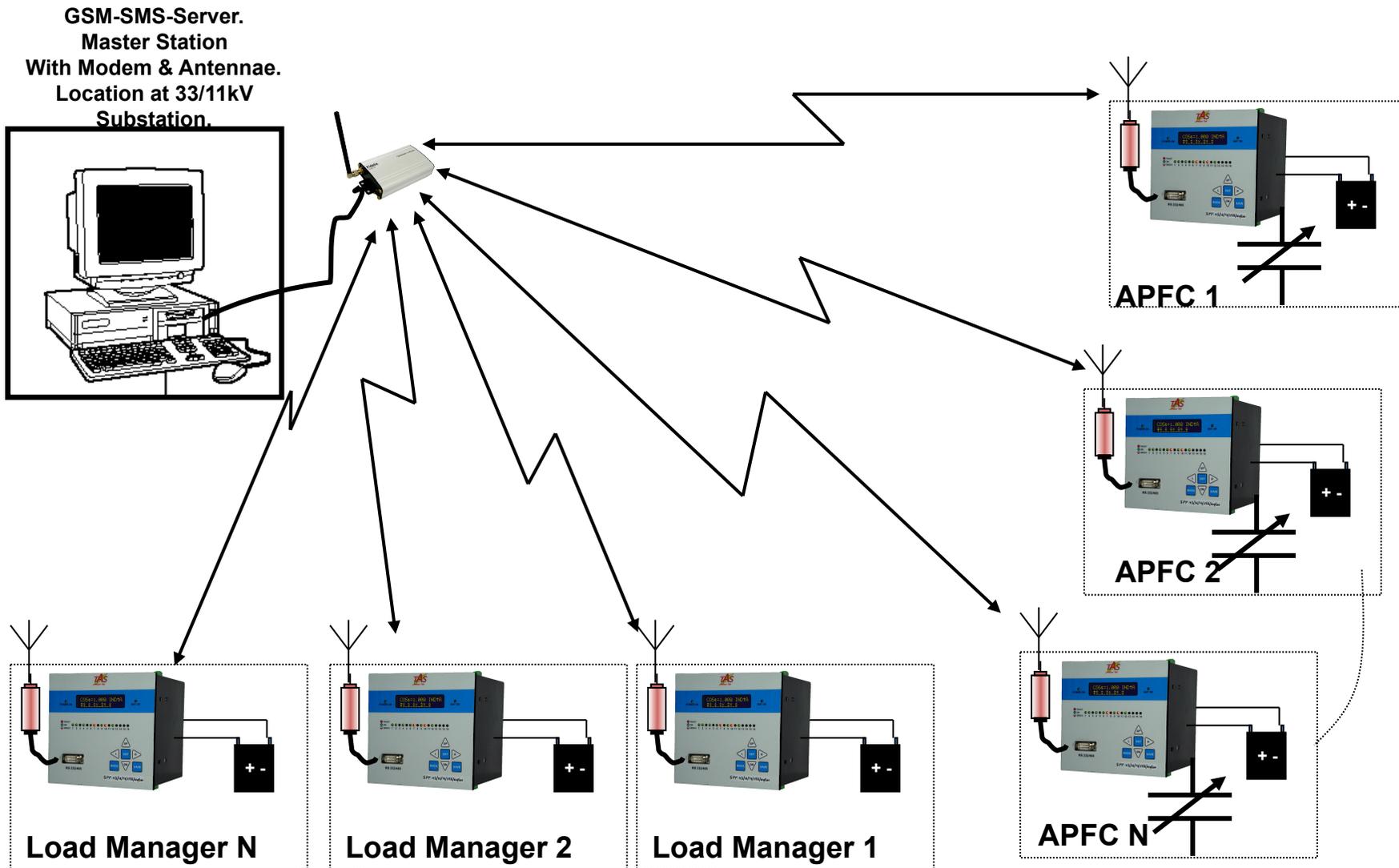# RMS AUTOMATION SYSTEMS LTD.

SMART PRODUCTS DEVELOPMENT THROUGH SMARTER TECHNOLOGY

Load monitoring & APFC monitoring with GSM communication.

GSM-SMS-Server.
Master Station
With Modem & Antennae.
Location at 33/11kV
Substation.

APFC 1

APFC 2

APFC N

Load Manager N

Load Manager 2

Load Manager 1

Why GSM-SMS method of Communication and not other method?
Features Comparison.

Features Description	GSM/CDMA with SMS (SMS)	GPRS/CDMA/PSTN line DATA CALLS (Data Calls)	RF link on VHF or UHF. Half duplex. (RF)	Power Line Data communication. (PLCC)
Mode of communication	Off-line, asynchronous.	Direct line-line. Synchronous.	Direct (node hopping), synchronous.	Direct, point to point, Synchronous.
Method of communication.	Bi-directional. No restriction on any RTU to communicate at any time. Event triggering possible.	Master to Remote on polling basis. RTU cannot initiate communication. Event trigging difficult.	Master to Remote on polling basis. RTU cannot initiate communication. No event triggering	Master to Remote on polling basis. RTU cannot initiate communication. No event triggering.
Data size.	160 ASCII for GSM & 150 ASCII for CDMA.	Almost no limit but restricted by protocol used.	Almost no limit but restricted by protocol used.	Almost no limit but restricted by protocol used.
No of RTU communication per hour for one MCU.	2,500 to 5,000 RTUs for single SIM card modem at MCU.	100 to 240 RTUs for single line modem at MCU. (data size dependent)	150 to 300 RTUs for single RF modem at MCU. (data size dependent)	60 to 300 RTUs for single RF modem at MCU. (data size dependent)
DATA reliability	0.2% chances of data loss.	Good. Less than 0.1% chances.	Dependent on Protocol used. But normally good. Depends on landscaping and line of site.	Only reliable for 33kV and above lines. Lower kV lines reliability is issue. Not proven for 11kV & below.
Communication running rates.	Rs. 50/- per month per RTU.	Depends on data calls. Rs.350/- per month per RTU + Rs.1/- per call.	Rs.150 per **Year.**	Rs.150 per **Year.**
Cost of initial installation.	Rs.3,500/-for GSM and Rs.8,000/- for CDMA per RTU.	Rs.3,500/-for GSM and Rs.8,000/- for CDMA per RTU.	Rs.12,000/- per RTU including land survey + RF Yagi antennae etc.	Rs.17,500/- per RTU.

© RMS Automation/2010-02-26/AB/GSM-SMS Communication with APFC

Why GSM-SMS Method of Communication and not Other Method?

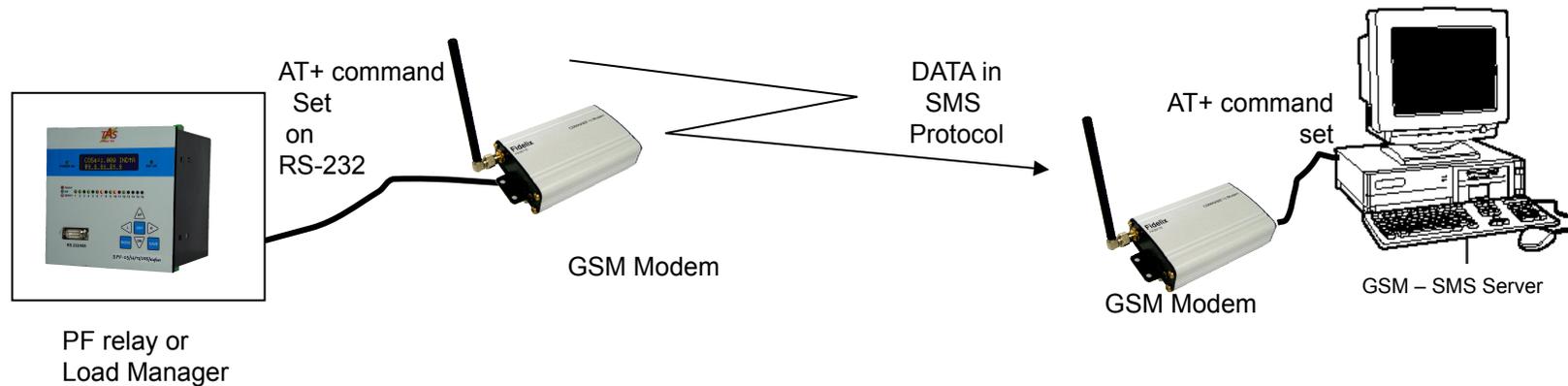## What is our requirement?

Our Requirements:

• Per MCU at least 2500 units should be able to communicate.

• Every RTU should be able to transmit the data at every one hour.

• Every RTU should be able to send the event triggered communication. This is for indicating the faults and Power ups and Power downs.

• The data size to be sent can be fitted within 100 ASCII characters.

• The reliability of communication should be good, but occasional data loss (say one in 200 or 300) would not make a great problem too.

• The communication charges should be as low as possible.

This requirement clearly shows that the most efficient method to be used for this type of application should be GSM-SMS mode of communication.
The other methods are having some major drawbacks.

Communication Methodology
(In consideration to various protocols)

AT+ command Set on RS-232

DATA in SMS Protocol

AT+ command set

GSM Modem

GSM Modem

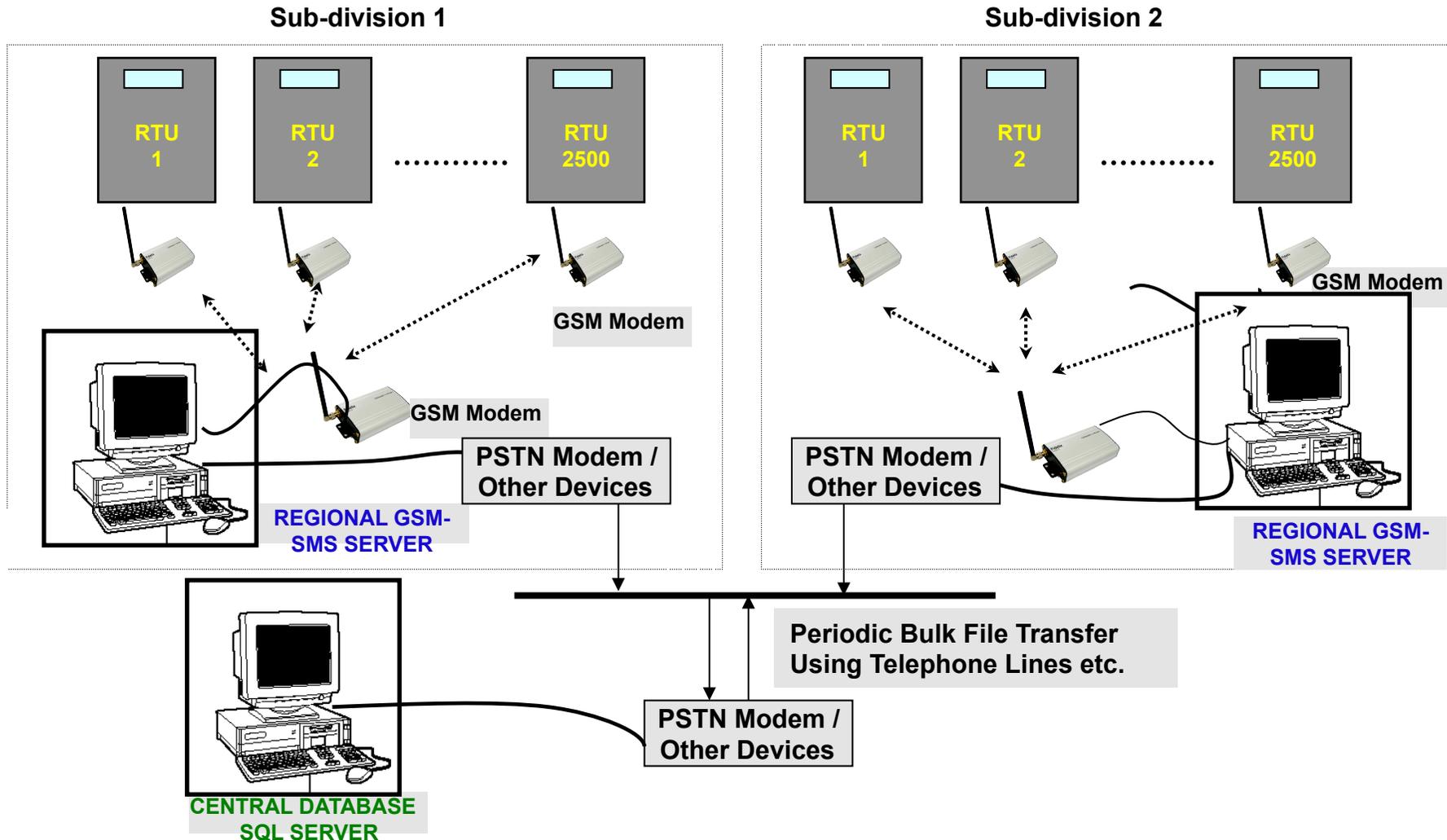GSM – SMS Server

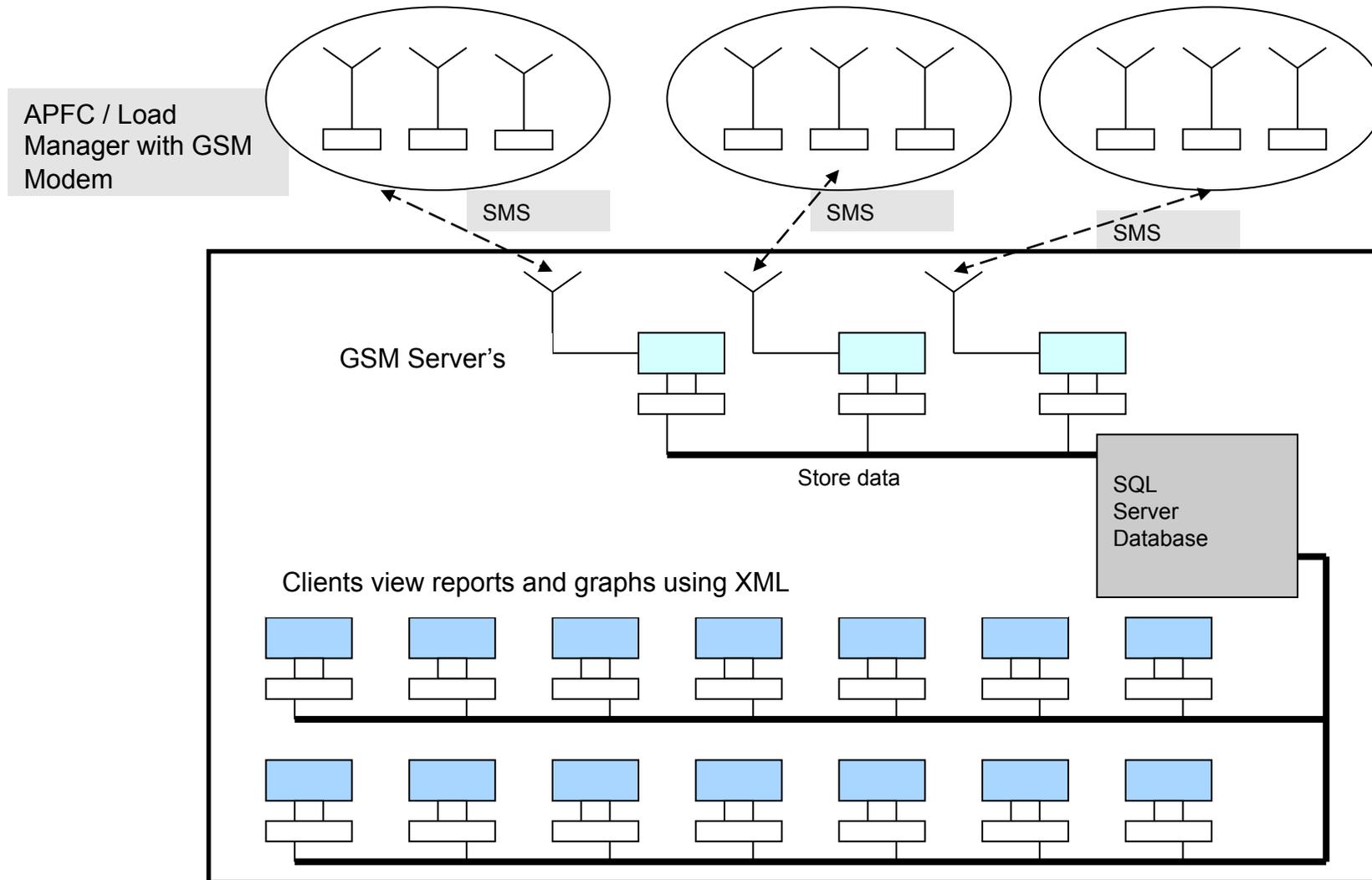PF relay or Load Manager

Various Communications used:

• Between PF relay/ Load manager and GSM Modem: On RS-232 with AT+ Command sets for GSM Modems.

• Between RTU side modem and MCU side GSM modems: Mode of communication is SMS. The protocols used would be HEX coded ASCII character dedicated protocol.

• Between MCU side GSM Modem and MCU (GSM-SMS-Server): On RS-232 with AT+ Command sets.

Scheme can be further extended to communicate With Central SQL Database Server.

Sub-division 1

Sub-division 2

RTU 1   RTU 2   ....   RTU 2500

RTU 1   RTU 2   ....   RTU 2500

GSM Modem

GSM Modem

GSM Modem

REGIONAL GSM-SMS SERVER

REGIONAL GSM-SMS SERVER

PSTN Modem / Other Devices

PSTN Modem / Other Devices

Periodic Bulk File Transfer Using Telephone Lines etc.

PSTN Modem / Other Devices

CENTRAL DATABASE SQL SERVER

Further Networking with GSM-Servers (MCUs)

APFC / Load
Manager with GSM
Modem

SMS

SMS

SMS

GSM Server's

Store data

SQL
Server
Database

Clients view reports and graphs using XML

MCU (GSM-SMS-Server) Data Logging

Here there are four different types of data are logged:

Viz:
1. Interval Records.
2. Event triggered Records.
3. Daily Records.
4. MCU requested Records.

Interval Records: Here the interval of sending the records can be set by user depending on the requirement and the cost consideration from GSM service provider. The interval can be 5min or can be 6 or 8hrs. The data send here is normally the instantaneous data like Voltage, Current, Capacitor current, Power parameters like kW, kVA and kVAr, THD factors of Voltage, Current and Capacitor current, the number of banks on/off and faulty bank status etc.

Event Triggered Records: Here the records are sent by PF controller / Load Manager against any un-usual events happening. These can be like fault detection, Power up/down conditions, Manual bypass etc.The data sent is similar parameters as that of interval records.

Daily Records: Normally these records are sent, once a day. The parameters sent here are normally Energy parameters like kWH, kVAH, kVArH & C-kVArH, the capacitor values in terms of kVAr (or if required in μF) and the faulty banks status etc.

MCU requested Records: There is an option available with MCU where operator can request a data from a specific RTU. On request from MCU, the RTU responds with the data. This data has structure as like Interval records.

Regional GSM-SMS Server: Main Screen: Latest Records

Regional GSM-SMS Server: Main Screen: Stored Data

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Regional GSM-SMS Server: Main Screen: Graphical Analysis
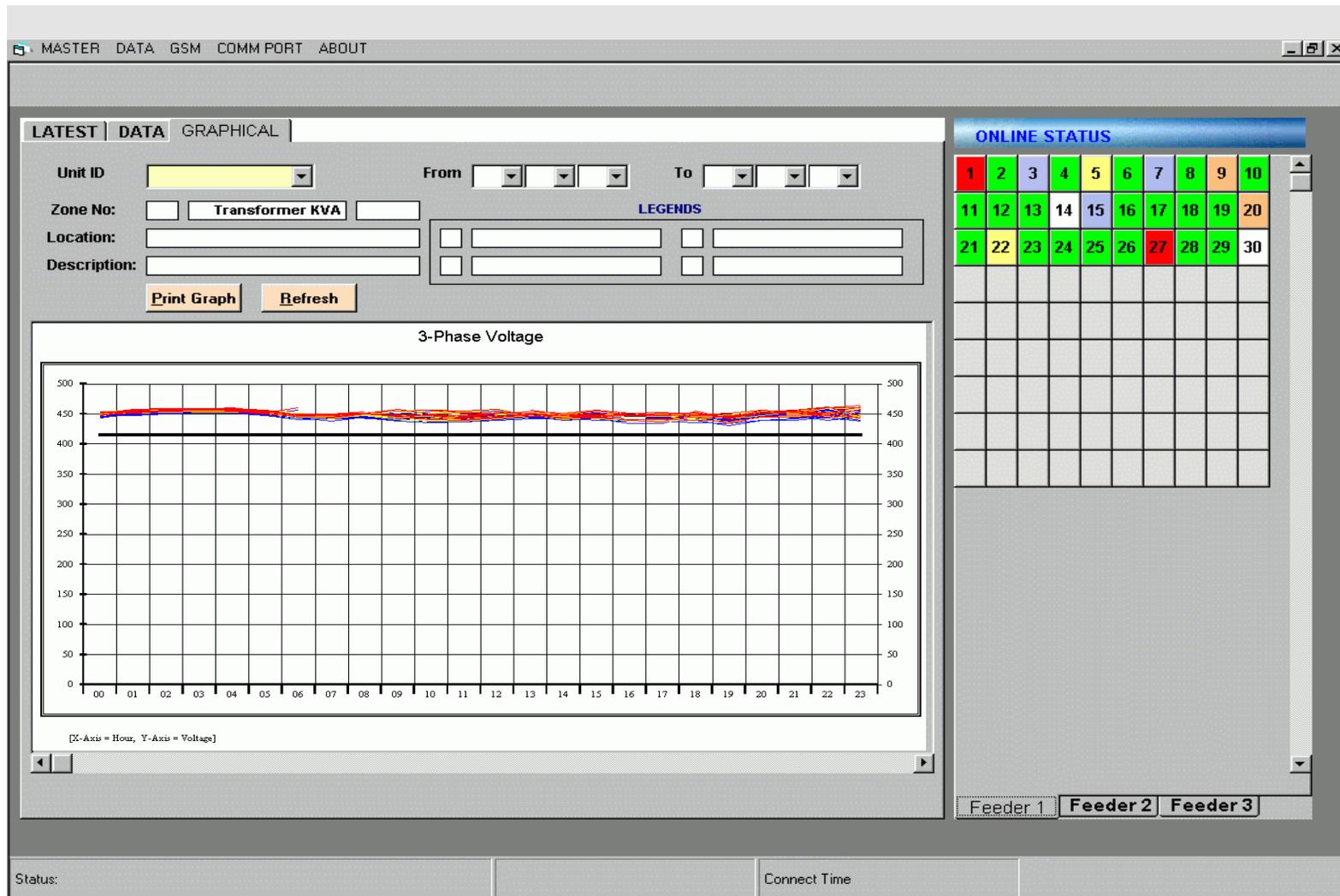
How Electricity Supply Company Benefits

• Complete monitoring of the Transformer loading and healthiness of APFC system.

• Monitoring the overloaded Transformers and timely action to prevent the same from
  getting damaged.

• Monitoring the possibility of Electricity thefts.

• Timely information on the faults to the concerned authority. This will make the
prompt
  action from them. Thus improving the overall Electricity supply quality.

• Usage of correct capacity of APFC system based on the trends and graphical
analysis.

• In time Preventive maintenance cutting down breakdown maintenance thus
reducing
  the manpower cost to Distribution companies.

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Thank You