e-ISSN: 2349-9745
p-ISSN: 2393-8161
Scientific Journal Impact Factor (SJIF): 1.711
International Journal of Modern Trends in Engineering and Research
www.ijmter.com

# AMR and SCADA in Outage Management System for MSEDCL

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**Abstract** – Automation is the need of hour in Electricity Distribution Companies for getting competitive advantage. Maharashtra State Electricity Distribution Company Ltd. (MSEDCL), the largest Electricity Distribution Company in India, is facing number of challenges including effective and efficient MBC (metering, billing and collection). To tackle these issues, AMR would be the best solution. The Areva make SCADA is also commissioned in some urban substations. At present both AMR and SCADA are working in isolation. In order to improve the operational efficiency, the footprints of SCADA need to be enhanced by integrating it with AMR. In this paper, a possible integration of AMR and SCADA for Effective Outage Management System is discussed.
**Keywords** – Outage Management System (OMS), Automated Meter Reading (AMR), SCADA.

## I. INTRODUCTION

In order to strengthen and improve various aspects of electricity distribution in India, MoP, and Government of India has designed Accelerated Power Development Reform Programme (APDRP). The scheme was approved in March 2003 by union cabinet for throughout the tenth five year plan. The objective of the Programme was to curb technical and commercial losses and provide better quality power supply to consumers. Strong emphasis has been placed on metering, billing and collection under the APDRP. With continuous enhancement in technology, DISCOMS are all set to install AMRs. IT based applications have been initiated by most states. MSEDCL, Tamilnadu Electricity Board, Andhra Pradesh Central Power Distribution Company has implemented SCADA for substation automation [1].

The Regulatory Board of India has emphasized the distribution companies in India for having their substations to be compatible with SCADA systems. The future licensing of the Utility is based on these factors which are monitored by the Regulator from time to time. For the Utility to upgrade its systems the Regulator helps the utility in providing the necessary funding from the available resources so as to implement the project [2].

The Utility has kept in focus the customer needs who are the actual end users of the whole system. Maximum customers get benefited by providing reliable power at a competitive price, with less outages and exact billing. These are the areas which are being focused and with the implementation of the SCADA systems the Utilities are positive of offering these benefits to the customer [3].

In recent years, SCADA system has begun to be installed at distribution system side to provide more system operation information; power companies also begin to install AMR system for the purpose of meter billing. Installing AMR system at consumer level has helped power sectors to obtain access to consumption data, power quality data and real-time outage data. With the rapid development of society, customers put forward higher requirements for power supply reliability, therefore more and more power sectors require installing outage management system (OMS).The integration of AMR and SCADA can give us effective OMS. In most of outage management systems, trouble call is regarded as main outage source at distribution network side, but this prolongs outage duration, reduces the cost-effectiveness, and information from trouble call is not entirely reliable, because they will cause problems on consumer expanded outage times. With the development of communication technology, for the need of electric utility operation, automated meter reading system (AMR) can be applied for outage management. OMS is one of main components of distribution management system; its main functions are to determine outage location, to provide technology for rapid

restoration outage. Electric companies may accurately locate outage and quickly restore outage through outage management [4].

## II. DISTRIBUTION SYSTEM IN MSEDCL

Mahavitaran (MSEDCL) is one of the largest public sector companies in India engaged in the business of electricity distribution with annual turnover of more than Rs. 25000 Crores. It serves about 1.8 Crores of consumers in Maharashtra [6]. More than 2500 numbers of 33/11 kV substations are working under the umbrella of Distribution network of MSEDCL. The Supervisory Control and Data Acquisition System (SCADA) is installed in some of the urban 33/11 kV substations. MSEDCL is also seen to be very aggressive on metering front. The company has already gone for TOD meters to industrial consumers. In order to improve MBC (metering, billing and collection), company has left no stone unturned. Spot billing, Photo meter Reading, and AMR are some of the steps taken by company. Primarily, the company is receiving power on 33 kV level from the 132kV and above substations of MSETCL. After stepping down voltage at 33/11 kV substations, the power is distributed on 11 kV feeders. The Distribution Transformers of voltage ratio 11 / 0.44 kV are used to further reduction of voltage as per the requirement. All 33/11 kV substations, 11 kV feeders and DTCs are coded by some particular number. The meter is installed to all 11 kV feeders and Distribution Transformers in City / urban area. In the radial feeder system, single element failure of system will effect on all downstream nodes. The root of the tree will represent 11kV feeder, the sub root of the tree will represent DTC. In this paper we shall limit Outage Management System up to DTC level.

## III. AMR WITH GPRS

MSEDCL intended to install AMR equipped with a GPRS, the meter would be able to transmit and receive small amount of data continuously to a central facility, via GPRS and the internet (Fig.1).


*Fig 1: GPRS Enabled AMR*

GPRS data transfer is charged by-the-byte, whereas standard telephone calls are charged by the minute. A GPRS connection is always ON, in contrast to standard landline modem-based systems (where time and money are wasted dialing-up and establishing the connection, especially if large numbers of meters need to be addressed). GPRS requires no wiring installation, or dedicated telephone line. As long as the meter has mobile phone network coverage, the system will function. GPRS provides a one-step method of creating a Web-enabled meter. Each GPRS equipped meter would have its own IP address on the internet. Sending updates to many meters at a time would not require dialing each one separately, but could be accomplished by broadcasting packets of data over the internet.

The main role of AMR system is to provide real-time data for metering purpose. AMR not only can provide meter data but also provide outage notification and power supply restoration data. AMR can help to real-time outage notification and power supply restoration. It also can record distribution

system instantaneous outage times in a given period. Trouble calls can be verified by meters polling. The meter response can be used to analyze the outage scope of distribution system and detect whether or not power supply is restored.

## IV. AUTOMATION IN MSEDCL

Mahavitaran (MSEDCL) has introduced SCADA of make Areva at 33/11 kV substations in urban cities [6]. There are many parts of a working SCADA system usually includes signal hardware (input and output), controllers, networks, user interface (HMI), communications equipment and software. All together, the term SCADA refers to the entire central system. The central system usually monitors data from various sensors that are either in close proximity or off site (sometimes miles away).

For the most part, the brains of a SCADA system are performed by the Remote Terminal Units (sometimes referred to as the RTU). The Remote Terminal Units consists of a programmable logic converter. The RTU are usually set to specific requirements, however, most RTU allow human intervention, for instance, in a factory setting, the RTU might control the setting of a conveyer belt, and the speed can be changed or overridden at any time by human intervention. In addition, any changes or errors are usually automatically logged for and/or displayed. Most often, a SCADA system will monitor and make slight changes to function optimally; SCADA systems are considered closed loop systems and run with relatively little human intervention.

One of key processes of SCADA is the ability to monitor an entire system in real time. This is facilitated by data acquisitions including meter readings, checking statuses of sensors, etc that are communicated at regular intervals depending on the system. Besides the data being used by the RTU, it is also displayed to a human that is able to interface with the system to override settings or make changes when necessary.

SCADA can be seen as a system with many data elements called points. Usually each point is a monitor or sensor. Usually points can be either hard or soft. A hard data point can be an actual monitor; a soft point can be seen as an application or software calculation. Data elements from hard and soft points are usually always recorded and logged to create a time stamp or history.

The real time data acquisition application at MSEDCL is acquiring data from RTUs at different sub-stations. The Subdivision Services are in turn acquiring data from respective substations SCADA servers installed by AREVA T&D for monitoring and control. The Real Time system is built on e-terra Control based system along with utilities built on Microsoft Visual Basic.Net/ORACLE10 g.

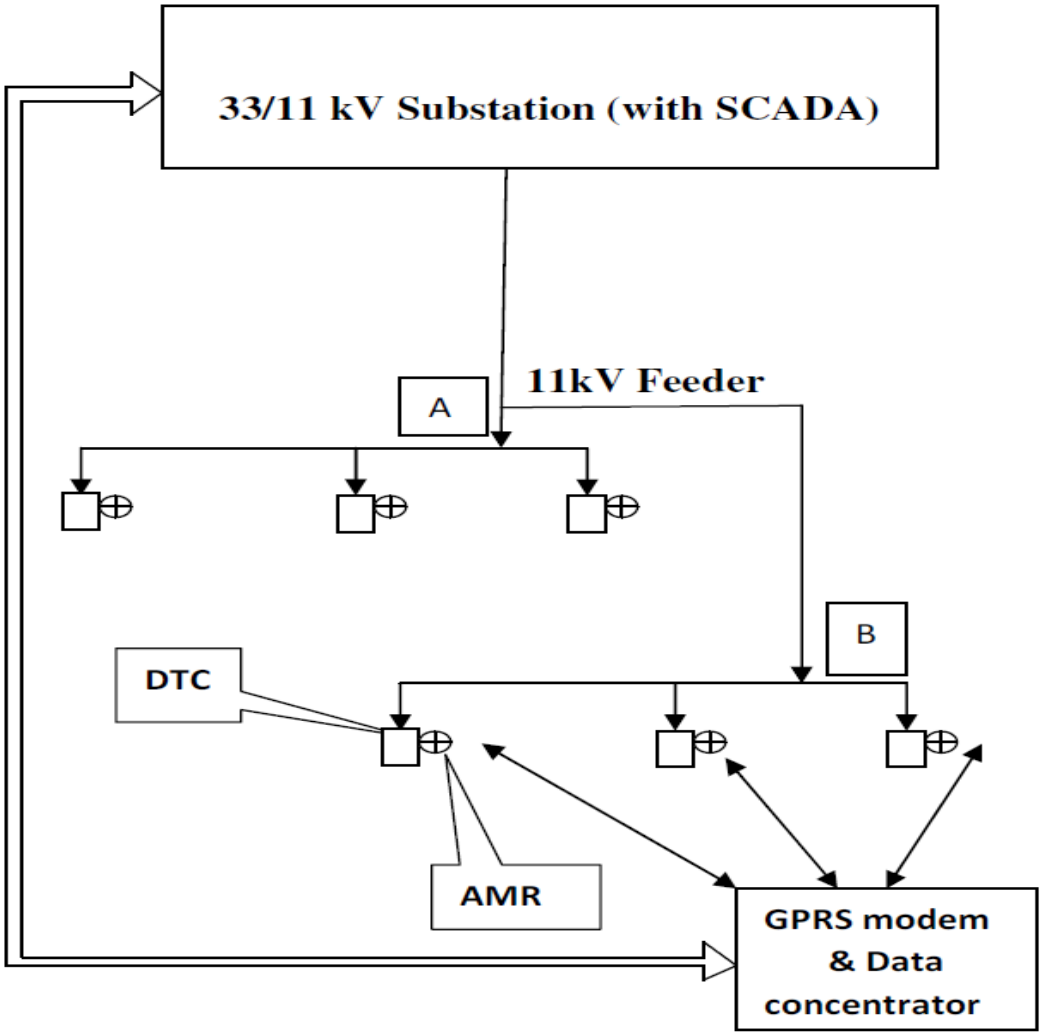
Unique SCADA system design implemented to ensure data from substations are reported to subdivisions, which is further communicated to divisions and town locations. Communication is mainly on 64 kbps Baud Leased Line except for few locations where LAN communications is used. The supervisory control and Data acquisition platform to control & monitors the RTUs (MICOM C264) located at substation. Multiple RTUs installed at substations to take care of data reporting requirement to multiple subdivisions. Reporting Hierarchy designed based on the feeder group and the number of subdivisions to which the feeders caters. Analogue signal are acquired through MFT (multifunction transducer) which are mounted in the control relay panel. The output of the transducer will be available from RS485 port on MODBUS protocol and data is directly taken into RTU. Data acquired from the field is collected by the RTU. Data acquired from the field include breaker & isolator status, current, voltage, power, power factor, frequency etc. This data is transferred to the subdivision SCADA Server over IEC 101 protocol. Subdivision is the Data center of the system.

## V. OUTAGE LOCATION

In existing SCADA system, the SCADA helps to see single line diagram of substation on line in real time. With integration to AMR the line diagram for the whole feeder can be seen on monitor. The live DTCs can be represented by special color, say red and DTCs without supply can be seen in

green color. Thus the single line diagram of feeder can provide us the information about the supply position to each DTCs of that particular 11 kV feeder.




## VI. CONCLUSION

The primary drivers for a utility's AMR investments are billing improvements and revenue management. Yet, AMR systems offer significant outage management benefits that can result in utility cost savings and enhanced customer satisfaction. The integration of AMR data into outage management system (OMS) business processes may offers utilities like MSEDCL several benefits:

- Increased crew and dispatch productivity
- Reduced Outage duration
- Enhanced customer satisfaction

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