# Industries to Automate the Total Process of Electricity Management – to Bring About an Integration of Scada-Gis-Dms and Sap Operations

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***Abstract***- Industry has made Delhi join the league of global cities like Singapore and Stockholm where SCADA has been successfully deployed. Its remote system for power management promises to reduce fault restoration time by over 60 per cent.

***Keywords***- SCADA, Power Management, Industry.

## I. INTRODUCTION

Delhiites have long suffered problems in electricity distribution. However, their worries now seem to be almost over with industries deploying state-of-the-art supervisory control and data acquisition (SCADA).

SCADA is a giant leap in automating the total process of electricity management. It integrates geographical information system (GIS), distribution management system (DMS) and SAP operations. This will lead to a quantum leap in operational efficiencies.

To improve the reliability and quality of power supply, the automated SCADA and GIS systems have been put in place. The entire electrical network is being mapped through GIS. This along with SCADA is leading to quicker fault locations and speedy redressal of faults. The integrated outage management system, running over GIS, helps to identify affected areas on geographical map and will facilitate the maintenance crew with route maps and network details for faster response time.

WHAT DOES SCADA DO?

A SCADA system is used to monitor or to control a chemical, physical or transport process. Integrated with power system management application functions, it provides an integrated distribution management system to improve the reliability of power supplies, manage the load effectively, reduce restoration times and increase the utilisation efficiency of the network equipment.

The functions of SCADA are:

1. Real-time data exchange
2. Real-time data processing
3. Tagging
4. Supervisory control
5. Switching orders
6. Load shedding and restoration.

Its DMS functions are:

1. Operational monitoring
2. Fault isolation and system restoration
3. Variable reactive power (VAR) control.
4. Voltage control
5. Distribution power flow
6. Load forecasting
7. Calculation of quality service indices.

THE CONCEPT

The term 'SCADA' usually refers to a central system that monitors and controls a complete site. The bulk of the site control is actually performed automatically by a remote terminal unit (RTU). Host control functions are almost always restricted to basic site over-ride or supervisory-level capability.

Data acquisition begins at the RTU or programmable logic control (PLC) level and includes meter readings and equipment status that are communicated to the SCADA as required. Data is then complied and formatted such that a control room operator using the human machine interface(HMI) can make appropriate supervisory decisions that may be required to over-ride normal RTU( or PLC) controls.( A SCADA system includes all the pieces, HMI, controllers, input/output (I/O) devices, networks, software,etc.)

Human – machine interface.HMI gathers information from the logic controllers or remote units using via some form of communication method, and combines and formats the information to perform more operations automatically. A sophisticated interface may be used for the database to provide instant trending, diagnostic data , scheduled maintenance procedures, logistic information, detailed schematics for a particular sensor or machine, and expert-system trouble-shooting guides.

HARDWARE SOLUTIONS

For SCADA implementation, industries has worked with some of the best names in the business including:

1. ABB (Sweden) for basic SCADA technology and primary equipment adaptation.
2. Barco Control System (Belgium) for large video screens.
3. Honeywell Automation for primary equipment adaptation.
4. Reliance Infocomm for fibre-optic communication.
5. HECL for back-up communication system using V-Sat communication.

SCADA solutions often have distributed control system components. Use of 'smart' RTUs or PLC, which are capable of autonomously executing simple logic processes without involving the master computer, is increasing. A functional-block programming language, IEC 61131-3 is frequently used to create programs which run on these RTUs and PLCs. This allows SCADA system engineers to perform both the design and implementation of a program to be executed on an RTU or PLC.

**System components**: The three components of the SCADA system are:

1. Multiple RTUs (also known as RTUs or outstations)
2. Master station and HMI computers.
3. Communication infrastructure.

**Remote terminal unit:**

The RTU connects to physical equipment and reads status data such as the open/closed status from a switch or a valve, and measurements such as pressure, flow, voltage or current. By sending signals to equipment, the RTU can open or close a switch or a valve, or set the speed of a pump.

The RTU can read digital status data or analogue measurement data, and send out digital commands or analogue setpoints.

An important part of most SCADA implementations are alarms. An alarm is a digital status point that has either the value 'normal' or 'alarm'. Alarms can be created such that when their requirements are met, they are activated. An example of an alarm is the ' fuel tank empty' light in a car. The SCADA operator's attention is drawn to the part of the system requiring attention by the alarm.

**Master station**: The term 'master station' refers to the servers and software responsible for communicating with the field equipment (RTUs, PLCs, etc.,), and then to the HMI software running on workstations in the control room, or elsewhere. In smaller SCADA systems, the master station may have just a PC. In larger SCADA systems, the master station may include multiple servers, distributed software applications and disaster recovery sites.

**Communication infrastructure and methods**. The ultimate purpose of the communication function in process monitoring and control is to achieve maximum system consistency. The data transmission method shall support upgraded reliable and efficient information throughput in particular for short and urgent messages with limited bandwidth.

SCADA systems have traditionally used combinations of radio and direct serial or modem connections to meet communication requirements. Industry SCADA system is based on fibre-optics and V-Sat to meet the requirements.

System used for SCADA communication include:

1. Metallic cable
2. Two-way land mobile radio
3. Trunked radio
4. Multiple address system
5. Spread spectrum
6. Microwave
7. Satellite
8. Cellular telephony
9. Power line carrier
10. Fibre optics

**BENEFITS OF SCADA SYSTEM:**

The benefits of SCADA include monitoring and control from one place. The various trends and reports can be generated from the SCADA system.

Single view of entire network. In the HMI, the grids are represented by single-line diagrams. Similarly, over-view diagrams are prepared that show the entire network connectivity. These can be viewed on a large screen. This helps the operator in finding alternate paths in case of a fault in a particular section of the network.

**Remote monitoring**. Acquiring data at the central place helps in close monitoring of the system and fast decision making. As the data is available at one place, it gives a much clearer view of the system performances and any discrepancy can be removed. Also, with this centralized data acquisition, preventive actions can be planned and implemented.

**Reduced outage downtime**. As the operator at the central control room is immediately intimated through alarms and events of the SCADA system, the outages can be restored faster, thereby reducing the downtime.

**Better voltage quality**. As the voltage parameter is one of the telemetered parameter, any discrepancy, viz, low voltage or high voltage, can be improved and a good-quality voltage profile maintained.

**Pinpointing and isolation of faults**. The DMS software module identifies the exact location of faults and suggests alternate paths for the affected areas, which can be restored immediately. This reduces the number of customers affected due to a fault.

**More accurate information**. As the data of the entire network is available at the control centre, with very precise information of the location and type of fault that has occurred, the customer can be fed with accurate information of the nature of fault and probable time of restoration.

**Reduced technical losses**. Input energy from the DTL and the energy received at the grid station are measured and the difference of the energy is known as transmission losses. Once the data is available at the control centre, steps are taken accordingly to reduce the losses.

## II. CONCLUSION

Industrial automation technology is certainly progressing at a fast and furious pace, but not without caution. No discussion on trends in the automation space can be complete without speaking of the security concerns therein.

Machines often work at such high speeds that it becomes difficult for humans to intervene and bring them to a halt. This is especially so in the case of processes that gains momentum very swiftly. Should something go wrong, these also race at an equal or greater speed towards catastrophe! The Three Mile Island, Chernobyl and Bhopal disasters are examples.

Therefore building sufficient security into automated systems is a perpetual challenge, given that security measures need to be as sophisticated as the processes and machines they monitor. So we must always keep in mind that automation needs to be trusted only to an extent, and a 'hand brake' should be entrusted with the users!

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