FUNCTIONAL REQUIREMENT SPECIFICATION
FOR
SCADA FOR RAILWAYS’ GENERAL ELECTRIC POWER
SUPPLY AND BUILDING MANAGEMENT SYSTEM FOR
LARGE STATIONS, ETC.

RESEARCH DESIGNS & STANDARDS ORGANIZATION
MANAK NAGAR, LUCKNOW - 226 011
1.0 Foreword

On the Indian Railways (IR), remote supervision and control is well established in the area of traction power supply. But in the case of general electric power supply, supervision and control is largely manual. Here, the word ‘general’ refers to non-traction i.e. other than traction power supply. Introduction of automation and remote supervision/ control in general electric power supply will help IR to conserve electric energy and manpower resources; besides, this will bring about an overall improvement in the management of non-traction power supply and the quality of electrical services. It has therefore been decided to introduce remote supervision and control in non-traction power supply as well.

2.0 Scope

It is envisaged that major locations will be provided with Supervisory Control and Data Acquisition System (SCADA) and the same will cover the various non-traction sub-stations and their respective distribution feeders. It is also planned to introduce intelligent Building Management System (BMS) for large stations, their associated service/ operational areas and other important service buildings. Although the terms SCADA and BMS are often used interchangeably, here they are referring to different things. Here, SCADA relates to power supply system from incoming supply at sub-station down to feeder level. BMS also relates to power supply but to a finer level of granularity i.e. floors, blocks, rooms, important electrical loads of a building, HVAC, etc.

Broadly, the following functionality is sought to be achieved by SCADA: protection and automation of the power supply; acquisition and storage of parameters of the power supply system; monitoring and control of the entire power supply system; alarm management and logging function; comprehensive analyses; load management including power generation control; load shedding in the case of overload and crises; automatic load restoration; power quality monitoring; and power management.

The specific objectives of BMS are as follows: fast and selective monitoring and operation of the system with practical plant and room diagrams; central programming of all time-controlled building functions; detailed overview of the alarms for a fast localization and elimination of faults; support for flexible transmission of alarms to mobile devices, e.g. printers or mobile phones; system-wide monitoring of systems and processes with regard to the occurrence of certain criteria for the triggering of certain predefined actions; and archival, reporting and analysis of events.
To address those requirements, either a single unified specification can be drawn up or else separate specifications can be drawn up for SCADA and BMS.

3.0 Components of SCADA and BMS systems

3.1 Remote Terminal Units

Remote Terminal Units (RTU)s will be installed at the sub-stations and other important locations for acquiring data from power system devices. In addition, RTUs will also be used for direct control of devices from the Master station/ RCC. The RTU shall be capable of working with the relevant IEC 60870-5 family of protocols i.e. IEC 60870-5-101 (for direct serial data transmission through permanent direct links) and IEC 60870-5-104 (for data transmission between RTU and Master station/ RCC through TCP/IP). If there are any other suitable protocols, the same can also be considered. The choice of protocol will depend on considerations of lifecycle cost, interoperability with other popular standards, freedom with regard to extensibility of the system, etc. The telecommands, telesignals and measurands shall be discussed and finalized during the interactive sessions with firms.

3.2 Communication Medium

The feasibility of using radio communication between RTUs and Master station/ RCC needs to be examined. Only where this is not feasible, the provision of copper cable or OFC will be considered. The essential specification of routers, network switches and LAN extenders shall be laid down.

3.3 Software

The software should be capable of working on latest version of MS Windows or Linux operating system. There should be adequate protection against intrusions and viruses. The software and its modules should cover the entire system functionality. It should support the IEC 60870-5 family of standards, including IEC 60870-5-101 and IEC 60870-5-104. The software should be versatile and easily configurable. It should be suitable for all communication media, including wireless.

3.4 Master Station

The master station/ RCC shall consist of latest MS Windows operating system based SCADA software, running on server grade computers in dual-redundant mode and MMI running on desktop PCs. All equipment required for interconnection and smooth functioning shall form a part of Master station. This shall include laptop for trouble-shooting, LCD projectors for providing an enlarged view of the system in emergency situations, printers, suitable furniture, etc. The Master station should have a flexible architecture so as to support future extension in power supply infrastructure.
4.0 Tests

Testing of the complete system shall comprise the following: type test on RTUs; software functionality tests; routine tests SCADA/ BMS system; and tests after erection and commissioning.