ANNEXURE I

Software requirement specifications for Implementation of IEC60870-5-101 and IEC60870-5-103 on Remote Terminal Unit (RTU) for SCADA

1.0 Introduction

This document describes the software requirement specifications for the development of Remote Terminal Unit (RTU) to implement the IEC 60870-5-101 over Serial and IEC60870-5-103 as a Master and Slave for SCADA. The application shall be based on the IEC 60870-5-101 and IEC 60870-5-103 Source code library procured from M/s RBH Solutions Pvt Ltd. The application runtime environment will be QNX 6.5 Operating System over x86 hardware platform.

2.0 Scope:

The scope of the work includes:

2.1 Submitting the detailed design document in line with the requirement specifications.
2.2 Developing the software as per the approved design document.
2.3 Demonstration of the software features at vendor premises.
2.4 Supply of the software – source code of application and executables, along with the software documentation including data diagrams, flow charts, user's manuals etc.
2.5 Installing the software at BHEL R&D in their hardware and testing.
2.6 Training on the development and configuration of the software.
2.7 Support during / for the successful third party test certification at a reputed test lab.
2.8 Maintenance and Warranty for a period of one year after successful installation / third party test certification (whichever is later).

3.0 Deliverables

The deliverables will include:

3.1 IEC 60870-5-101 -Master & Slave and IEC 60870-5-103 -Master & Slave software integrated with BHEL application software and tested using third party test tool.
3.2 Utility software/tool for easy mapping between user data and 60870-5-101 variables and 60870-5-103 variables.
3.3 Design documentation and user manual of implementation software.
3.4 Training on implementation of software.

4.0 Detailed functional requirements of the software (Scope as defined in IEC60870-5-101 standard & IEC60870-5-103 standard)

4.1 IEC 60870-5-101 is a standard for power system monitoring, control & associated communications for tele-control, tele-protection and associated telecommunications for electric power systems. This is completely compatible with IEC 60870-5-1 to IEC 60870-5-5 standards and uses standard asynchronous serial tele-control channel interface between DTF and DCE. The standard is suitable for multiple configurations like point-to-point, star etc. Some of the basic supported features would be:

1. Supports unbalanced (only master initiated message) and balanced (can be master/slave initiated) modes of data transfer.
2. Link address and ASDU (Application Service Data Unit) addresses to be provided for classifying the end station and different segments under the same.
3. Data can be classified into different information objects and each information object to be provided with a specific address.
4. Facility to classify the data into high priority (class 1) and low priority (class 2) and transfer the same using separate mechanisms.

5. Possibility of classifying the data into different groups (1-16) to get the data according to the group by issuing specific group interrogation command from the master and obtaining data under all groups by issuing a general interrogation.
6. Cyclic and spontaneous data updating schemes.
7. Facility for Time synchronization.
8. Schemes for transfer of files.

4.2 IEC60870-5-103 is a standard for power system control and associated communications. It defines a companion standard that enables interoperability between protection equipment and devices of a control system in substation. The device complying with this standard can send the information using two methods for data transfer – either using explicitly specified application service data units (ADSU) or using generic services for transmission of all the possible information. The standard supports some specific protection functions and provides the vendor a facility to incorporate its own protective functions on private data ranges. As a companion standard it adds semantics to the definitions and functional profiles specified in the basic standards. Some of the basic supported features would be:

1. Initialization of the control system and protection devices
2. Time Synchronization-
3. General interrogation
4. Command transmission
5. Test mode
6. Blocking of monitor direction
7. Transmission of disturbance data

The scope includes building of IEC60870-5-101 Master & Slave and IEC60870-5-103 Master & Slave for transmit of user data as per configuration file. It can be assumed that the data of the input signals is transferred via IPC (Inter process communication) from the BHEL's software.

5.0 **General**

5.1 The application shall be developed based on the latest IEC60870-5-101 and IEC60870-5-103 source code libraries procured from M/s RBH Solutions Pvt Ltd.

5.2 The vendor should have the development environment and all the software and hardware components to carry out the development. The vendor should substantiate the same in the offer.

5.3 The offer should specify the development environment and the same has to be included in the Technical Proposal.

5.4 The successful bidder shall submit a design document within 2 weeks time from the date of Purchase Order.

1. After the design is approved by BHEL R&D, vendor shall take up the implementation.
2. BHEL R&D shall review the work at suitable stages of the development.
3. The implementation of the software shall be inspected periodically and should be carried out at BHEL R&D premises.
4. Vendor shall install the software at BHEL R&D, on the target hardware platform(X86) provided by BHEL.

5. Testing shall be conducted as per mutually agreed Acceptance criteria. This shall include modifications on the source code, compiling in the development environment and porting on to the runtime platform at BHEL R&D

5.5 The source code is deliverable to BHEL; the source code should be compiled and executed in the presence of BHEL in their in-house development environment for demonstration.

5.6 The application and configuration software modules for server are the sole property of BHEL R&D and should not be used for any other purpose by the vendor.