ANNEXURE-5
Technical specification of Feeder Remote Terminal Unit (FRTU)

1. SCOPE

The remote control interface shall include all the functions required to monitor and control MV & LV Equipments within CSS.

2. FRTU Architecture

The FRTU Architecture shall support convenient installation, maintenance and expansion features.
The Architecture shall include a central processing module; and Digital and Analogue I/O modules.
The Central Processing Module shall be suitable to handle all types of communication protocols, perform data acquisition, perform address recognition, receive command messages, assemble response messages and execute control requests. The CPM shall have an internal Real Time Clock for data collection coordination and time tagging and provide time synchronization accomplished by IEC 104 protocol. The CPM shall have user configurable capabilities to establish connections, link failures and reconnections. The CPM shall effectively communicate with main SCADA as well as its peer FRTUs for fault detection and control operations over the same structure as the main SCADA.

Each Digital and Analogue I/O module shall be capable of interfacing with the respective inputs and outputs. These I/O modules shall be replaceable without reprogramming, reconfiguration and rewiring. A control disable switch shall be provided with each module with its status indication so that when the switch is put off the control outputs shall be disabled.
The required no. of I/O modules shall be decided by the Bidder.

3. Functions

The FRTU shall meet following main requirements:
   i)   Monitoring and control of medium voltage cubicles.
   ii)   Detection of amperometric faults, adjustable for each feeder.
   iii) Load current measurement on the line fitted with a fault detector.
   iv)   Data transmission to the remote control centre.
   v)   Chronological time-stamped event recording.
   vi)   Energy supply and storage with 9-hour autonomy in the event of mains failure for:
   - 24 VDC motor drives
   - Transmission equipment
   - Control unit
   vii) It shall be possible to view LBS/breaker status from the front mimic of FRTU .
   viii) It shall be possible to issue control command from the front panel of the FRTU with security button.
   ix)   It shall be possible to retrieve and display on a PC the time-stamped events recorded at the enclosure.
   x)   The minimum storage capacity shall be 50000 events.
The FRTU shall have remote or local control mode switch on its front panel.

In remote control mode, the enclosure shall ensure:
   - Transmission of remote measurements and time-stamped events.
   - Possibility of electrical remote control.
   - Inhibition of local electrical control pushbuttons.

In local mode, the enclosure shall ensure:
   - Transmission of remote measurements and time-stamped events.
   - Possibility of local electrical control of opening and closing operations by simultaneously pressing a pushbutton to select the unit to be operated and a validation pushbutton.
   - Inhibition of opening/closing remote control.

4. DC Power Supply

The FRTU main power supply is nominal 24VDC. The 24V DC battery shall be inbuilt and protected against overvoltages and overcurrents.

5. Time-tagged data archiving

All the archived data shall be retrieved locally and remotely by means of the configuration and operating software supplied with the control unit.

The data shall also be downloaded locally or remotely to a PC as a .CSV file.

Event and measurement time-stamping shall be accurate to one millisecond and the discrimination between two events shall be 10 ms.

Time-stamped event archiving

Any change of information status shall generate a stored time-stamped event.

The minimum storage capacity of the events to be transmitted to the remote control centre shall be 200 events.

Measurement archiving

Each measurement can be configured to be archived if required. A measurement declared archived can be stored:

- At regular intervals (the interval can be configured): mean or sampled value.
- When the high and low thresholds are exceeded (the thresholds can be configured).
- Daily: min. and max. daily values (the storage period can be configured: 24 h, 7 d, 14 d).
- The measurement storage conditions (configured individually) can be combined. The minimum storage capacity shall be 20000 measurements.

6. Communication with the remote control centre

Communication protocol

The control unit shall have following communication protocols:

IEC 870-5-101 / 104 protocol to transfer information to control center SCADA.

Modbus protocol to communicate with field MFM (Multi Functional Meters) on RS485.

Events transmission

It shall be possible to configure each time-stamped event to correspond to the appearance or disappearance of an "alarming event" or an "alarming" closure failure. A time-stamped event declared to be "alarming" establishes communication with the remote control centre.

Communication ports

The control unit shall have following communication ports:

- Two Ethernet port for interfacing with the IP compatible communication equipment.
- One RS232 Console port and for connecting external modem.
- Required no. Of RS485 port to connect field IED's / Energy Meters on RS485.

It shall be possible to increase the number of communication ports in the FRTU if required in Future.

7. Local communication networks

The control unit shall have a Modbus RS485 port for communication with the station equipment/ Multi Functional transducers:

- Power monitoring unit
- Multi Function meters

The Modbus protocol shall be open; it shall be programmed by the control unit configurator. Information from this slave equipment can be stored and dated when the status changes (can be configured for each event).

8. Remote configuration and operating tool

Data shall be configured using a PC connected to the control unit via an Ethernet and/or USB port.

It shall be possible to:

- prepare the configurations off-line and save them on a PC,
- restore a control unit configuration using a PC,
- save a control unit configuration to a PC.

It shall also be possible to configure data remotely using the operating and maintenance software supplied with the equipment in the case of GMS, GPRS and Ethernet networks.

Diagnosis

The diagnosis pages shall be used to retrieve station, switch and system data:

- Measurement and status display: this page is used to view in real time the TSS, TSD and TM status for each switch controlled by FRTU.
- Archived event retrieval.

- Users can acknowledge status locally.
- Protocol analyser. This analyser is used to observe the frames exchanged with the remote control centre to facilitate maintenance operations.

Data loading
- Loading a configuration from a file saved on a PC.
-Loading a new version of the communication card or protocol software with protected switching
- Unit configuration and Events and measurements archived as a Word or Excel file.

Parameter and alarm configuration
- Control module parameters & Delayed no-voltage alarm
- Fault detector , Automation & Communication parameters
- General parameters (type of protocol, use of ports, type of modem, etc.).
- Protocol parameters: interoperability table, alarm

9. Switch connection

Orders and information shall be transmitted from the switchgear interface to the switch control unit via a single cable connected to the enclosure by a rack-out connector mounted on the lower part of the enclosure. Each connector has a fail-safe device to prevent reversal between the various electrical controls. The socket can be "plugged" for simulation and test purposes.

10. List of information to be provided

The slave stations shall process at least the following information for remote indication and/or local display purposes:
- open/closed position , earthing of each MV switch,
- absence of AC voltage and local/remote control operating mode,
- detection of phase-to-phase or earth fault current flow,
- load current measurement ,
- charger fault,
- battery fault
- motor drive 24 V supply fault ,
- internal fault
- detailed diagnosis of the status of the uninterruptible power supply (charger, batteries).

11. FRTU should Support following Future Provisions

The FRTU must be capable to support PLC programming, in order to incorporate self healing grid logic for faster restoration of supply in absence of control centre SCADA. Self healing grid requires multiple communication support from FRTU (Simultaneous communication of FRTU with SCADA along with FRTU Peer to Peer communication). Hence, FRTU must support this configuration of communication to achieve self healing grid feature.

12. TESTING

Type Testing:

The FRTU offered by the Bidder shall have passed the required Type tests at Govt. Accredited laboratory in accordance with latest and updated IEC standards. Test certificates for the same shall be submitted along with the Bid.

Routine Testing:
All test shall be as per latest IEC standard.