

1	2	3
Sl. No.	Item	Description
		Nos. of RMU Sites
A	Pre-Wired FRTU Panel	
1	Pre-Wired FRTU Panel with FRTU	Pre-Wired FRTU Panel FRTU Redundancy : Optional I/O Requirement: with 48 DI, 16 DO, 8 AI with Auxiliary relay for each Digital Input & Output Communication Ports per FRTU : 2 Nos. Ethernet ports/CPU (Both the ports should support IEC 104, IEC 61850 & other standard protocols for Communication with Control center and substation IEDs), 2 Nos. RS 485 electrical ports for communication with serial devices over IEC60870-5-103, MODBUS (Serial) protocol in the FRTU. Power supply: Redundant 18-72 VDC (24 V) Supply with MCBs with add-on NO contact Protocols : IEC60870-5-103, IEC 60870-5-104, IEC 61850 (ED1, ED2), RSTP, MODBUS (Serial & TCP/IP), SNMP (V1.0, V2.0, V3.0), NTP & SNTP, MQTT Software Licenses: RTU OS, Application Software, Configuration tools, Diagnostic tools. Logic building Application-Interlock logic, Calculation Package, Application Software Licenses with 1000 Physical I/O tags, 10 IEDs - IEC61850 (ED1, ED2), 10 IEDs - Serial Protocol, RTU shall Communicate to Eight Independent Remote SCADA Master on IEC 60870-5-104 Mounting: To be supplied with prewired panel (Reputed make panel, IP Class : IP55/65/67). Other Accessories: Interface Modules, Pre-fabricated cables for I/O modules, Auxiliaries Relays for Power Supply monitoring, MCBs for all type of Power Supplies
	Managed Layer2 Ethernet Switch (FRTU Panel)	Managed L2 Ethernet Switch for IED Communication & for SCADA Integration Communication Ports: 8 PORT (with 6 Copper ports and 2 Fibre Ports SM) 100/1000 MBPS Power Supply: Input power supply 18-72 VDC Supply Mounting Arrangement: To be mounted in FRTU Panel Preferred Make: Ruggedcom/Hirschman/MOXA/CISCO Software: Software for Local and Remote configuration of Ethernet Switches - Enabling Monitoring, Configuration, Maintenance and backup of configuration files Shall support: 802.1Q VLAN, 801.2p, 802.1d STP, 802.3ad (Port aggregation), 802.1w RSTP, 802.1s MSTP, 802.3ad LACP, IEEE 802.1ab Link Layer Discovery Protocol and also suitable for Ring Configuration, IEEE 1613 compliance, IEC 61850, MODBUS, Ethernet/IP Compliance, IEEE1588 V2, Suitable for PRP/HSR architecture, Web-based, Telnet & Command Line Interface (CLI) for quickly configuring major managed functions, SNMPv1/v2c/v3 for different levels of network management, SNTP.

70 Nos. 33/11 kV Primary Substations

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		Nos. of RMU Sites
	Networking Accessories	Networking Accessories for Integration of IEDs, Ethernet Switches & FRTU All required networking accessories like Patch Panel (for each ethernet switch), Patch cords (UTP as per the Ethernet Switch Configuration) of suitable length, Conduits for all Un-armored cables, RJ45 connectors, I/O boxes with Quad face plate and connectors etc.
		Sub Total of FRTU System
B	Contact Multiplier Relay with Mounting Base	
1	CMR with Mounting Base for Digital Inputs	Contact Multiplier Relay with Mounting Base: 1. Contact Material : Silver Alloy 2. Contact Rating : 5 Amps. @ 24 V/48 V DC 3. Contact Resistance : 50 Mohms max. (Initial) 4. Dielectric Strength : i) Between open contacts : 500 V RMS ii) Between Contact and Coil : 2000 V RMS 5. Insulation Resistance : 500 Mohms @ 500 V DC, 250 C 6. Operate time at Nominal Voltage : 20 milli seconds 7. Release time at nominal Voltage : 10 milli seconds 8. Ambient temperature : -40°C to +70°C 9. Life expectancy : i) Mechanical : 20 million DC Relay ii) Electrical : More than 100,000 Operations 10. Coil Resistance at Nominal Voltage (DC) : 30,000 Ohms +10% at 250°C 11. Type of Contact Multiplier : 1 NO + 1 NC with LED Indicator + Free wheeling 12. Type of mounting : DIN RAIL MOUNTING WITH SOCKET 13. No. of Poles : 1 NO + 1 NC 14. Other Accessories: Necessary TB, Din rail channel and other accessories
		Sub Total of Contact Multiplier Relay with Mounting Base
C	Interposing Relay with Mounting Base for Digital Output	

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1	Interposing Relay for Digital Output	Interposing Relay with Mounting Base for Digital Output 1. Auxiliary Power. : 24 V / 48 V DC 2. Input signal from field : 24 V / 48 V DC 3. Input impedance : More than 50 Kohms 4. Output signal of the RTU : 24 V / 48 V DC 5. Contact mechanism : Self Reset 6. Contact Make & Carry : 30 A for 3 Sec. & 5A continuously at 660V 7. Number of Contacts : 2 NO with LED Indicator + Free wheeling 8. Operating time : Less than 15 msec. 9. Other Accessories: Necessary TB, Din rail channel and other accessories
Sub Total of Interposing Relay with Mounting Base		
D	Battery Charger & Battery	
1	Battery Charger	Battery Charger : 1. Charger Input Voltage : Single phase (2 wire) voltage 250V AC +30% to -20%, Frequency 50Hz $\pm$ 5%. 2. Constant Voltage and Current limiting charger. Charger with inbuilt battery health monitoring is highly preferable. 3. Battery & charger Alarms : Potential free contacts must be available to integrate with SCADA for abnormality if any. Most preferred alarms are like: AC supply fail , DC supply fail, Battery Low, Battery Fail, Battery Charger fail, Battery polarity reverse. Serial Communication is preferred. 4. Charger current : 10 Ampere 5. Efficiency : Not less than 85% at full rated load 6. Current limit : 110% of rated load 7. Regulation : $\pm$ 1% 8. Insulation : Not less than 5 mega Ohms. 9. Protection : AC input MCCB & ELBS with input ON/OFF switch and fuses/ contactor.DC output MCCB with output ON/OFF switch and fuses.Current limit protection, soft start feature, surge suppressor.

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2	Battery	Battery: 1. Voltage : 24 VDC specified at 27 deg.C. 2. Battery Type : SMF, VRLA with chargers of conventional type 3. Voltage/cell : 2 Volts 4. Capacity of Batteries : 50 AH,10 Amps 5. Connecting cables : Cable size selection should provide the lowest voltage Drop possible between battery system and operating Equipment. 6. Method of charging : Constant voltage method and current limit(variable Current) 7. Efficiency : Not less than 90% at full rated load
		Sub Total of Battery Charger & Battery
E	4G Modem cum Router	

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Sl. No.	Item	Description
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1	4G Modem cum Router	4G Modem cum Router: 5G Fall back to 4G/3G/2G - Modem should support multiband connectivity with FDD 5G & TDD 5G - Support Band 1,3,5,8,40 and Band 48. Cellular interface : Cellular modem should have dual SIM provision for network redundancy /backup . Dual SIM operation ensures that the cellular connection is always available. It will automatically disconnect the 1st SIM card's low/weak cellular connection and will reconnect to establish a stronger connection using the 2nd SIM card. Network Protocols : TCP/IP ,UDP/IP, HTTP, ARP,DHCP, ICMP, SNMP, V1/V2 & V1, NTP, SSL/TLS Routing : Astatic Routing, RIP 1 &2 ,OSPF V2 & V1 VPN : Open VPN , IP Sec, L2TP, PPTP, GRE Alarm Message : Device shall have alarm notification on SNMP trap Management /Monitoring : Cellular modem should shall support Local / Remote management through web HTMLS , SSHP & Telnet- 4. It shall support monitoring through system logs & SNMP version V1/V2 & V3. Notification & command shall be possible over SMS. Firmware upgradation through Web, backup & restore of configuration shall be possible. SCADA Protocols : IEC 104 – 104 Master – Multi Slave Mode: The modem should be capable to reading FRTUs in IEC60870-5-104 protocol and communicate with SCADA system on IEC 60870-5-104 protocol upto 8 masters. Adequate data interlock mechanisms should be implemented to avoid data loss. No Of Antenna : The 5G Cellular modem Should have two antenna connection (MIMO).One is primary cellular antenna & second is diversity antenna(MIMO). Cable should have Low loss RF Cable with minimum 5M. Antenna Should be Omni directional with high gain (High gain ≥ 5). Power Supply : 18-72 V DC
		Sub Total of 4G Modem
F	Instrumentation Cable for Status, Control & Power Supply	

1	2	3
Sl. No.	Item	Description
		Nos. of RMU Sites
1	Instrumentation Cable 12 C X 0.5 mm ² , Armored cable for Status and Indications	Instrumentation Cable for Status and Indications 12 C X 0.5 mm ² , Armored, 1100 V Rated, Annealed Stranded Copper, PVC insulated, Overall shielded field cable Preferred Make: CCI / FINOLEX / HAVELLS / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika
2	Instrumentation Cable 7 C X 1.5 mm ² , Armored for Control Output	Instrumentation Cable for Control Output 7 C X 1.5 mm ² , Armored, 1100 V Rated, Annealed Stranded Copper, PVC insulated, Overall shielded field cable Preferred Make: CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika
3	Twisted Pair Shielded & Over all shielded Instrumentation Cable 5 P X 1.0 mm ² , Armored for Analog Input	Twisted paired Shielded & Overall Shielded Cable for Analog Inputs 5 P X 1.0 mm ² , Armored, Copper twisted paired and Overall shielded cable for Analog inputs from CRP/Field panel to the RTU panel Preferred Make: CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika
4	4 C X 2.5 mm ² Copper cable for extension of CT & PT	Control Cable for CT & PT Extension 4 C X 2.5 mm ² , multistrand copper cable for extending CT & CVT inputs to the MFM in the CRP panel. Preferred Make: CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika/Prime
5	2 C X 4 mm ² Cable for DC Power Supply	Power Supply Cable from RMU to FRTU Panel 2 C X 4 mm ² , Armored Multistrand Power Supply cable for extending Power Supply from DCDB to RTU Panel Preferred Make: CCI / FORT GLOSTER / FINOLEX / HAVELLS / Indian aluminum Cables / Universal Cables / Incab / Asian Cable / KEI / Polycab / Ruchika
Sub Total of Instrumentation Cable for Status, Control & Power Supply		
G	Communication Cable for MFM, IEDs Integration	
1	4P X 0.36 mm ² , Armored Communication Cable for MFM	Communication Cable: 4 P X 0.36 mm ² Armored multistrand Pair and Overall shielded, for Multifunction Meter looping. Preferred Make : Belden/LAPP/SATYAM/KEC/Digisol/Polycab/Parashield
2	Armored CAT6 SFTP Cable	Armored CAT6 SFTP Cable Preferred Make : Systemax/Finolex/Polycab/Digisol
3	Un-Armored CAT6 SFTP Cable	Un-Armored CAT6 SFTP Cable Preferred Make : Systemax/Finolex/Polycab/Digisol

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		Nos. of RMU Sites
		Sub Total of Communication Cable for MFM, IEDs Integration
H	Multi Function Meter	
1	Multi Function Meter	Multi Function Meter: Requirement : For all 33 & 11 KV Feeders, Bus Voltages (33 & 11 kV), Station Trf, ACDB Multifunctional 3-phase Power meter, four quadrant active and reactive energy polyphase static meter Form Factor: 96 X 96 mm Accuracy Class: 0.2 S as per IEC62053:22 Voltage Inputs: Operating range : 690 V AC line-to-line, 460 V AC line-to-neutral Current Inputs: 1A / 5A (User selectable CT secondary 1A / 5A, PT Secondary) Wiring configurations: 3OP2, 4LN3, 3DIR2, 4LL3, 3OP3, 3LN3, 3LL3, 3BLN3, 3BLL3 (All wiring configurations selected via the front panel) Communication Port: RS 485 Serial Port with removable connector Protocols: MODBUS RTU, Device Address (User Configurable - (1-247)) Auxiliary Supply: 18-72 V DC (24 V DC) Other Accessories: Necessary TB, Din rail channel and other accessories for flash mounting in RMU Preferred Make: Reputed Make
		Sub Total of Multi Function Meter
		Grand Total Supply (A+B+C+D+E+F+G+H)
I	Services for FRTU Panel, Communication and Other Supplied System	

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1	Services of FRTU Panel, Communication and Other Supplied System	Integration and Commissioning FRTU System a) Site Survey, Design, Engineering, Finalization of BOM, FDS b) Transportation, Delivery, Unloading and Storage c) Installation and Commissioning of Pre-wired FRTU Panel, Networking equipment & other Accessories d) Civil Activities for Installation of FRTU panel e) Cable laying, termination and continuity check of all cables (Instrumentation, Communication & Power cables) f) Integration of all Protection, MFM, and other IEDs. g) Powering up of all supplied materials h) Configuration of FRTU and its accessories i) I/O testing, Pre- SAT testing of Hardware and Software functionality j) Integrated FAT & SAT for Hardware and Software k) Integrated testing with Purchaser's SCADA System l) Demonstration of System Capacity and Performance Guarantee Test m) Submission of As-Built Drawings, FRTU Backup
		Total of Services (I)
		Grand Total of Supply + Services
J		Standard Warranty
1	Standard Warranty	Warranty Services for the Bidder's owned & Sub-Vendors supplied Hardware, Software, Up-gradation & Patch Management of Software during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.
		Total of Standard Warranty
K		Training (10 Man-days of Trainer)
1	Training	On-site Training on Supplied equipment and Application Software
		Total of Training
		Grand Total of Supply + Services+Standard Warranty + Training
L	Mandatory Spares	
1		FRTU Chassis
2		CPU Module of the FRTU

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Sl. No.	Item	Description
		Nos. of RMU Sites
3	Mandatory Spares (Unit Cost to be utilised for addition/ deletion of quantity as per site requirement)	Power Supply Module of the FRTU
4		Memory Module of the FRTU
5		Communication Module (Ethernet)
6		Communication Module (Serial)
7		DI Cards with Interface Module & Cables for Digital Inputs
8		DO Cards with Interface Module & Cables for Digital Output
9		AI Cards with Interface Module & Cables for Analog Inputs
11		Any Other Modules Specific to OEM Solution
12		Managed Ethernet Switch - FRTU
13		CMR Relay with Base
14		HDR Relay with Base
15		Battery Charger
16		Multi Function Meter
		Total of Mandatory Spares
Grand Total of Supply + Services+Standard Warranty + Training + Mandatory Spares		