ANNEXURE - 1

KEMA Certified Remote Terminal Unit with Following Specifications	
Requirements	
1. Front and back door with lock and key	
2. Built in FAN and light	
3. Document Holder.	
4. H1100x L 530 x W 600 mm	
5. KEMA certified	
6. 230V, 10/15A Socket-cum-switch	
Technical Specifications	
Main memory	SDRAM 32 MB
Local non-volatile memory	FRAM 8 KB
Changeable non-volatile memory	SD card up to 2 GB
Max. number of data points	20000 (sum of process images over all 4 interfaces)
	Integrated Function keys and Display
Temperature	Variant 1-25°C to 70°C
	Variant 1-40°C to 70°C
Communication	
2 Ethernet/LAN interfaces (X1, X4)	· Ethernet acc. to IEEE 802.3 (10 Base-T or 100 Base-TX)
	· Galvanically insulated
	· Transmission rate 10 Mbit/s or 100 Mbit/s
	· Half duplex or full duplex
	· Auto-MDI(X)
	· Time synchronization via NTP server
	· Substation function
	· Line length 0...100 m
	· Rated impulse voltage 2 kV
1 serial interface (X2)	· Unbalanced interchange circuit RS-232, V.24/V.28
	· Galvanically not insulated
	· ESD protection
	· Transmission rate up to 115.2 kbit/s (depending on protocol)
	· Line length up to 2.5 m
1 serial interface (X3)	· Balanced interchange circuit RS-422/RS-485
	· Galvanically insulated
	· ESD protection
	· Configuration 4-wire/2-wire with/without terminating resistor (parameter-settable)
	· Transmission rate up to 115.2 kbit/s (depending on protocol)
	· Rated impulse voltage 2 kV
Power supply	
Power supply	DC 5.2 V, 1.5 W
Internal operating voltages	Logic - 3.3V/2.5V/1.2V DC LCD - 12 V DC
Optional power supply for external modem via X2 *)	· De-energized (for modem reset)
	· DC 5.2 V ± 5 %, 2.5 W
	· DC 12 V ± 5 %, 2.5 W
Connections/mechanics	
Ethernet/LAN (X1, X4)	RJ45 socket connector 8-pole (IEC 60603-7)
Serial RS-232 (X2)	Connection D-SUB 9-pole, male (DIN 41652)
Serial RS-485 (X3)	Removable screw terminal 6-pole with shield interception
DI/DO	12 DI and 8DOs (DI/DO card to be supplied along with RTU and all field inputs to be hardwired in the proposed RTU as per the TRANSCO norm
Protocols	IEC 60870-5-101,104,MODBUS

METERING EQUIPMENT		
S. No	Item	
1	*Multi-function Meter*	
	The Multi-function Meters shall be used for acquiring real time analog & digital inputs and issuing digital output commands. The meters shall be capable of bi-directional measurements as shall comply with the following specifications:	
	i. Wiring Configuration: 3 phase 4 wire /3 phase 3 wire, CT/PTs circuits.	
	ii. Nominal Input Voltage: 110 V (Ph- Ph voltage)	
	iii. CT Input: 1A/5A (per phase current).	
	iv. Display: Three display simultaneously, bright LED	
	v. Display Size: min. 12 mm	
	vi. PT ratio and CT ratio should be programmable at site.	
	vii. CT Withstand Capacity: 3 times RMS continuous and at least 20 times for 1 sec.	
	viii. CT Burden : < 0.1 VA	
	ix. Voltage Withstand Capacity: 1 kV Continuous and 2 KV for 1 sec.	
	x. PT Burden : <0.15 VA	
	xi. Communication Speed: < 50 milli-sec.	
	The Multi-function Meter shall have a local display to show all the real time electrical parameters. The parameters being displayed shall be selected through a push button and auto scroll basis.	
	Display parameters:	
	i. Three Phase Voltage	
	ii. Three Phase Current	
	iii. Frequency	
	iv. Per Phase & Total Power Factor (PF).,Lag/Lead	
	v. Per Phase & Total Active Power (MW),Import /Export	
	vi. Per Phase & Total Re-active Power (MVAR) Import/Export	
	vii. Per Phase & Total Apparent Power (MVA)	
	viii. Energy parameters.	
	The Multi-function Meters shall comply with the EMI/EMC level test requirements as specified for the RTU except for fast transient burst test requirement which shall be for level 4. The test reports shall be submitted by the vendor during detailed engineering.	

	Multi-function Meter shall provide at least the following parameters as a minimum with the specified accuracies.	
	Parameter	Accuracy
	Voltage	± 0.2%
	Current	± 0.2%
	Frequency	± 0.02%
	Active Power/Reactive power	± 0.2%
	Power Factor	measuring range shall be 0.6 to 1.0 lag & lead
	The parameters to be acquired from multifunction meters shall be selectable. MFM shall provide the 15 minute values (configurable 5 minute/15 minute/1 hour) of Active Energy Import, Active Energy Export, Reactive Energy Import and Reactive Energy Export.	
	i. Accuracy Standard For Analog Signal : IEC60688, 0.2	
	ii. Accuracy Standard For Energy : IS 14697/IEC 62053 : 22, 0.2S	
	iii. Aux. Power Supply : 110V DC	
	iv. Communication Port : Isolated RS 485	
	v. Communication protocol : Modbus RTU	
	vi. Mounting : Flush Panel	
	Optional Features:	
	i. Digital Inputs having dry contact Potential free or wet contact 110V DC	
	ii. Digital Outputs	
	iii. Communication Port : Isolated RS 485 Serial / Ethernet	
	iv. Communication Protocol : IEC 60870-5-101/104 & DNP 3.0	
2	*Contact Multiplying Relay*	
	The relays shall be of self reset type. The relay shall have a minimum of two changeover contacts each with minimum current carrying capacity of 5 A at 110V/220 V DC.	
	The relays shall conform to the following requirements:	
	a) Power frequency withstand voltage: 2 kV for 1 minute as per IEC standards.	
	b) Insulation resistance of 100 M ohms at 500 V DC.	
	c) 5 KV Impulse test as per IEC standards	
	The CMRs shall have a LED indication which shall light up when the CMR is energized (picked up) condition. The CMR coil shall be rated for the voltage existing at the site i.e. 110V DC	

3	*Interposing Relays (Double Contact Digital Output)*	
	Each control relay shall consist of two isolated single-pole double-throw contacts. The output contacts shall be rated to carry minimum current of 10 amps at 110 V DC, and shall provide arc suppression to permit interruptions of an inductive load. Relay coils shall be shunted with diodes to suppress inductive transients associated with energizing and de-energizing of the relay coils. The relays shall conform to the IEC standards	
4	*Local/Remote selector switch*	
	A manual Local/Remote selector switch shall be provided for each RTU to disable all control outputs by breaking the power supply connection to the control outputs. When in the "Local" position, the Local/Remote switch shall allow testing of all the control outputs of RTU without activating the control outputs to field devices. A status input indication shall be provided for the Local/Remote switch to allow the SCADA system to monitor the position of the switch.	

Technical Specifications for MODEM

	Interface	
1	MAC layer	Cambium Proprietary
2	Physical Layer	2 X 2 MIMO/0FDM
3	Ethernet Interfaced	10/100/1000 BaseT, Compatible with Cambium PoE & Standard PoE charges
4	Protocols Used	IPv4, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Internet Protocol (IP), Internet Control Message Protocol(ICMP), Simple Network Management Protocol (SNMPv2c), Hypertext Transfer Protocol over Secure Socket Layer (HTTPS), Spanning tree protocol (STP), Secure Socket Shell (SSH), IGMP (Internet Group Management Protocol) Snooping
5	Network Management	HTTPS, SNMPv2c, SSH
6	VLAN	802.1Q with 802.1p priority
	Peformance	
7	ARQ (Automatic Repeat Request)	Yes
8	Nominal Receive Sensitivity (w/FEC) @ 200 MHz channel	MCS0=-92 dBm to MCS15=-68dBM (per branch)
9	Nominal Receive Sensitivity (w/FEC) @ 40 MHz channel	MCS0=-89dBm to MCS15=-65dBM (per branch)
10	Modulation levels (Adaptive)	MCS0 (BPSK) to MCS15 (64QAM 5/6)
11	Quality of Service	Three level priority (Voice, High, Low) with packet classification by DSCP (Differentiated Services Code Point), COS (Class of Service), VLAN ID, IP & MAC (Media Access Control) address, Broadcast, Multicast and Station Priority
12	Transmit power range	-15 to +30 dBm (combined, to regional EIRP limit) (1 dB interval)
	Physical	
13	Surge Suppression	1 Joule Integrated
14	Environmental	IP 55
15	Temperature	-35°C to +60°C - with radome attached, the maximum temperaure is +47°C
16	Weight	2.8Kg
17	Wind Survival	145 kmph
18	Dimensions (maximum)	470 mm X 280 mm
19	Pole Diameter Range	64mm - 76mm
20	Power Consumption	10W (Maximum)
21	Input voltage	10 - 30V
	Security	
22	Encryption	128-bit AES (CCMP mode)

PRODUCT SPECIFICATIONS OF CISCO 1921 INTEGRATED SERVICES ROUTER	
Services and Slot Density	
Embedded hardware-based cryptography acceleration (IPsec + SSL)	Yes
RJ-45 onboard LAN/WAN 10/100/1000 ports	2
Enhanced High-Speed WAN Interface Card (EHWIC) slots	2
Doublewide EHWIC slots (use of a doublewide EHWIC slot will consume 2 EHWIC slots)	1
Cisco Integrated Services Module (ISM) slots	0
Memory (DDR2 DRAM): Default/maximum	512 MB/512 MB
USB flash memory (internal): Default/maximum	256 MB/256 MB
External USB flash-memory slots (Type A)	1
USB console port (mini-Type B) (up to 115.2 kbps)	1
Serial console port (up to 115.2 kbps)	1
Serial auxiliary port (up to 115.2 kbps	1
Integrated power supply	AC and DC power-supply models
Power-supply options	POE (external) - on AC models only
Redundant-power-supply support	No
Power Specifications	
AC input voltage	100-240V ~
AC input frequency	47-63 Hz
AC input current range AC power supply (maximum) (amps)	1.5-0.6
AC input surge current	<50A
Typical power (no modules)	25W
Maximum power capacity with AC power supply	60W
Maximum power capacity with PoE power supply (platform only)	70W
Maximum PoE device power capacity with PoE power supply	80W
DC power input	32-60 VDC, 4A, positive or negative, single source
DC input wire size	AWG 14 (2.0 mm^2)
Safety ground-wire size	AWG 14 (2.0 mm^2), minimum
Wire terminal (lug)	Amp/Tyco No.32957
Overcurrent protection	20A maximum
Physical Specifications	
Dimensions (H x W x D)	1.75 x 13.5 x 11.5 in. (44.5 x 342.9 x 292.1 mm)
Rack height	1 rack unit (1RU)
Rack-mount 19 in. (48.3 cm) EIA	Optional
Wall-mount (refer to installation guide for approved orientation)	Yes
Weight: With AC power supply (no modules)	6.75 lb
Weight: With PoE power supply (no modules)	7.5 lb
Airflow	Back to sides
Environmental Specifications	
Operating Conditions	
Temperature: 5906 ft (1800m) maximum altitude	0-40°C)
Temperature: 9843 ft (3000m) maximum altitude	0-25°C
Altitude	3,000m
Humidity	10 to 85% relative humidity (RH)
Acoustic: Sound pressure (typical/maximum)	32.99/58.33 dBA
Acoustic: Sound power (typical/maximum)	41.99/67.22 dBA
Transportation and Storage Conditions	
Temperature	-40 to 70°C
Humidity	5 to 95% RH
Altitude	4,570 m
Regulatory Compliance	
Safety	UL 60950-1
	CAN/CSA C22.2 No. 60950-1
	EN 60950-1
	AS/NZS 60950-1
	IEC 60950-1
EMC	47 CFR, Part 15
	ICES-003 Class A
	EN55022 Class A
	CISPR22 Class A
	AS/NZS 3548 Class A
	VCCI V-3
	EN 300-386
	EN 61000 (Immunity)
	EN 55024, CISPR 24
	EN50082-1
Telecom	TIA/EIA/IS-968
	CS-03
	ANSI T1.101
	IEEE 802.3
	RTTE Directive

Technical Specifications for Tower	
Type of Tower	Four legged Ground base tower
Height of Tower	15 mtrs
Foundations	Raft type foundation. M20 concrete shall be used. Material mixing & quality Control of concrete shall be as per IS 456 : 2000. High strength Deformed steel bars of grade Fe 415 conforming to IS:456 shall be used. Bending of bars shall be as per IS:2502 (1963)
Material	MS angles of grade 'A' as per IS : 2062 (1999) and IS:8500 (1991) shall be used
Finish	1) All MS angles are to be hot dip galvanized as per IS:4759 (1996) 2) Standard zinc for galvanizing should conform to IS 13229 (1991) or IS:209 (1992)

Technical Requirements for VoIP phone	
Protocols/Standards	SIP RFC3261, TCP/IP/UDP, RTP/RTCP, HTTP/HTTPS, ARP/RARP, ICMP, DNS (A record, SRV, NAPTR), DHCP, PPPoE, SSH, TFTP, NTP, STUN, SIMPLE, LLDP-MED, LDAP, TR-069, 802.1x, TLS, SRTP, CDP/SNMP/RTCP-XR
Network Interfaces	Dual switched auto-sensing 10/100/1000 Mbps Ethernet ports, integrated PoE
Graphic Display	132 x 64 (2.98'') backlit graphical LCD display
Feature Keys	3 line keys with dual-color LED and 3 SIP accounts, 3 XML programmable context sensitive soft keys, 5 (navigation, menu) keys, 8 BLF keys, 13 dedicated function keys for MUTE, HEADSET, TRANSFER, CONFERENCE, SEND and REDIAL, SPEAKERPHONE, VOLUME, PHONEBOOK, MESSAGE, HOLD, PAGE/INTERCOM, RECORD, HOME
Voice Codecs	Support for G.711µ/a, G.722 (wide-band), G.723, G.726-32, G.729 A/B, iLBC, in-band and out-of-band DTMF (In audio, RFC2833, SIP INFO), VAD, CNG, AEC, PLC, AJB, AGC
Telephony Features	Hold, transfer, forward (unconditional/no-answer/busy), call park/pickup, 4-way conference, shared-call-appearance (SCA) / bridged-line-appearance (BLA), downloadable phone book (XML, LDAP, up to 1000 items), call waiting, call history (up to 200 records), off-hook auto dial, auto answer, click-to-dial, flexible dial plan, hot desking, personalized music ringtones, server redundancy & fail-over
Headset Jack	RJ9 headset jack (allowing EHS with Plantronics headsets)
HD Audio	HD handset and speakerphone with support for wideband audio
Base Stand	2 angled positions and wall mountable
QoS	Layer 2 QoS (802.1Q, 802.1P) and Layer 3 QoS (ToS, DiffServ, MPLS)
Security	User and administrator level access control, MD5 and MD5-sess based authentication, 256-bit AES encrypted configuration file, TLS, SRTP, HTTPS, 802.1x media access control
Multi-language	English, German, Italian, French, Spanish, Portuguese, Russian, Croatian, simplified and traditional Chinese, Korean, Japanese and more
Upgrade/Provisioning	Firmware upgrade via TFTP / HTTP / HTTPS, mass provisioning using TR-069 or AES encrypted XML configuration file, FTP/FTPS
Power and Green Energy Efficiency	Universal Power Supply Input 100-240VAC 50-60Hz; Output +5VDC, 600mA; PoE: IEEE802.3af Class 2, 3.84W-6.49W; IEEE802.3az (EEE)
Physical	Dimension: 222.5mm (L) x 208.5mm (W) x 76.2mm (H) (with handset) Unit weight: 0.8kg; Package weight: 1.2kg
Temperature and Humidity	Operation: 0°C to 40°C, Storage: -10°C to 60°C, Humidity: 10% to 90% Non-condensing
Compliance	FCC: Part 15 (CFR 47) Class B CE : EN55022 Class B, EN55024 Class B; EN61000-3-2, EN61000-3-3, EN60950-1 RCM: AS/ACIF S004; AS/NZS CISPR22/24; AS/NZS 60950; AS/NZS 60950.1

S. No	Description	Vendor to confirm
1	Vendor needs to be registered vendor of TRANSCO. Documentary proof needs to be submitted.	Vendor to confirm
1	Vendor needs to have executed at least two similar purchase orders before. Vendor needs to submit the approval copy from TSSLDC for the establishment of DAS and Real time data transmission system for the submitted purchase orders.	Vendor to confirm

Scope of work
Preparation and Submission of RTU DAS architecture drawing to Transco.
Supply and installation of RTU panel as per Annexure - 1
The required field I/O s wiring between C & R Panels and RTU panels. The metering material to be supplied as per Annexure - 2
Preparation and loading of data base into RTU. The equipment for real time data transmission system needs to be supplied as per Annexures 3,4,5 and 6.
Testing & commissioning of RTU panel
Application forms submission in BSNL and follow-up for arranging MPLS VPN communication channel as per TS SLDC specs. The one time charges will be paid to the vendor who in turn will pay it to BSNL
Final commissioning of the system including Integration of RTU to TS SLDC through MPLS VPN Communication circuit from 1.5MW Solar Power Plant to TS Transco SLDC, Hyderabad and transfer of 33KV energy data