



# KenGen

KENYA ELECTRICITY GENERATING COMPANY PLC

KGN-HYD-028-2022

**TENDER FOR SUPPLY, INSTALLATION & COMMISSIONING OF SCADA WIDE AREA NETWORK & BACKUP CONTROL CENTRE HARDWARE FOR KENGEN HYDROELECTRIC POWER PLANTS.**

**RFx 5000009819**

**(Citizen Contractors)**

**23<sup>rd</sup> June, 2022**

## **ADDENDUM NO. 5:**

In accordance with the “**Tender for Supply, Installation & Commissioning of SCADA Wide Area Network & Backup Control Centre Hardware for KenGen Hydroelectric Power Plants,**” KenGen hereby issues addendum No. 5.

### **NOTICE OF PRE-BID CONFERENCE MEETING**

There shall be pre-bid conference meeting on **Thursday, 30<sup>th</sup> June 2022 at 15:00:00 hrs** at **Hydro Plaza exhibition hall in Gitaru**, to answer all questions that bidder may want further clarifications for all the sites visited.

### **EXTENSION OF TENDER CLOSING DATE**

<b>INITIAL TENDER CLOSING DATE</b>	<b>EXTENDED TENDER CLOSING DATE</b>
Tender Closing Date: <b>14<sup>th</sup> July 2022 at 10.00 a.m.</b>	Tender Closing Date: <b>4<sup>th</sup> August 2022 at 10.00 a.m.</b>
Tender Opening Date: <b>14<sup>th</sup> July 2022 at 10.00 a.m.</b>	Tender Opening Date: <b>4<sup>th</sup> August 2022 at 10.30 a.m.</b>

# APPENDIX II

## TECHNICAL SCHEDULES

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June 2022

# TABLE OF CONTENTS

## INVITATION TO TENDER

### PART 1 - TENDERING PROCEDURES

- Section I: Instructions to Tenderers (ITT)
- Section II: Tender Data Sheet
- Section III: Evaluation and Qualification Criteria
- Section IV: Tendering Forms

### PART 2 - PROCURING ENTITY'S REQUIREMENTS

- Section V: Employer's Requirements
- Section VI: Technical Schedules**
- Section VII: Forms and Procedures
- Drawings

### PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS

- Section VIII: General Conditions of Contract
- Section IX: Special Conditions of Contract
- Section X: Contract Forms

### APPENDIX I (*attachment*)

- Section V: Employer's Requirements

### APPENDIX II (*attachment*)

- Section VI: Technical Schedules
- Guaranteed Technical Particulars (GTP)
- Preliminary bill of materials

### APPENDIX III (*attachment*)

- Specification drawings

## CONTENTS

TABLE OF CONTENTS.....	3
<b>SCHEDULES GENERAL REQUIREMENTS.....</b>	<b>5</b>
GENERAL CONDITIONS.....	5
GUARANTEED TECHNICAL PARTICULARS (GTP) .....	5
PRELIMINARY BILL OF MATERIALS .....	6
<b>GUARANTEED TECHNICAL PARTICULARS (GTP) .....</b>	<b>9</b>
1. SCOPE OF SUPPLY OF PLANT AND INSTALLATION SERVICES BY THE CONTRACTOR .....	9
2. GENERAL TECHNICAL SPECIFICATIONS.....	9
3. PARTICULAR TECHNICAL SPECIFICATIONS - NETWORK AND COMMUNICATION SYSTEMS.....	9
4. PARTICULAR TECHNICAL SPECIFICATIONS – CONTROL CENTERS HARDWARE.....	46
5. PARTICULAR TECHNICAL SPECIFICATIONS - SCADA CYBER SECURITY.....	77
6. PARTICULAR TECHNICAL SPECIFICATIONS - POWER SUPPLIES.....	92
7. PARTICULAR TECHNICAL SPECIFICATIONS - UNDERGROUND FIBRE OPTIC CABLE WORKS .....	104
8. PARTICULAR TECHNICAL SPECIFICATIONS - TOOLS & ACCESSORIES .....	117
<b>PRELIMINARY BILL OF MATERIALS .....</b>	<b>129</b>
DETAILED SCOPE OF SUPPLY FOR PLANT AND MANDATORY SPARE PARTS .....	129
A MASINGA.....	129
B KAMBURU.....	133
C GITARU.....	139
D KINDARUMA .....	148
E KIAMBERE.....	154
F HYDRO PLAZA .....	159
G MATENDENI .....	162
H KIANJIRU.....	166
I TURKWEL.....	169
J SONDU.....	174
K SANG'ORO.....	178
L STIMA PLAZA.....	180
M TANA .....	185
N WANJII .....	191
O MESCO.....	193
P TOOLS .....	195
Q Mandatory Spares and Accessories.....	196
DETAILS OF MAJOR EQUIPMENT IN SCOPE OF SUPPLY .....	199
SCOPE OF SUPPLY OF DESIGN SERVICES .....	202
SCOPE OF SUPPLY OF INSTALLATION AND OTHER SERVICES .....	203

## SCHEDULES GENERAL REQUIREMENTS

### GENERAL CONDITIONS

- 1.1.1 The following technical schedule forms **MUST** be completed in their entirety by the Tenderer at the time of tendering. Any entry not filled (except comments & deviations column or dashed entries) will render the **bid unresponsive**
- 1.1.2 The Schedules shall be filled in and completed by the Tenderer, and submitted with the Bid as part of the bidder's technical proposal
- 1.1.3 All data of Informative nature entered in the Schedules are also guaranteed values by the Tenderer. These data may only be altered following the Project Manager's written consent.
- 1.1.4 Bidder shall append their firms seal or stamp on each page of the schedules
- 1.1.5 These schedules shall be part of the bidders' technical offer. Where they are conflicts between what is stated in these schedules and what is stated elsewhere in another bidder's document, the information supplied by the bidder in these schedules shall take precedence. In case of conflict between what is stated by bidder in the guaranteed technical particulars and the bill of materials the guaranteed technical particulars shall take precedence.
- 1.1.6 All apparatus, accessories or fittings which may not have been specifically mentioned, but which are usual or necessary in the respective equipment for the completeness of the finished work in an operable status, shall be deemed to be included in the Contract and shall be provided by the Contractor without any extra charge. All equipment shall be complete in all details, whether or not such details are mentioned in these schedules or in the tender document.

### GUARANTEED TECHNICAL PARTICULARS (GTP)

- 1.1.7 All entries in the bidders guaranteed offer **MUST** be filled with numbers or descriptive statements illustrating what the bidder is offering for each given employer requirement. Responses such as "compliant", "supported", "yes", "in agreement" etc. **SHALL NOT** be accepted as entries in the bidders guaranteed figure other than where its **EXPRESSELY** allowed for as indicated in employer minimum requirements column (as stated in italics). Offers not meeting this requirement will be rendered unresponsive.

- 1.1.8 Bidders guaranteed figures shall be supported by documents such as technical data sheets, technical manuals, type test reports and the relevant manufacturer's technical specification documents. Bidders MUST submit documents supporting their entries along with the bid.
- 1.1.9 A statement either in the schedules or on the supporting document that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bid unresponsive or a contractor in breach of contract
- 1.1.10 All data (values) entered in the Schedules are guaranteed values by the Tenderer and cannot be departed from during project implementation
- 1.1.11 After tender award technical schedules shall become part of the contract documents.
- 1.1.12 Bids offering equipment/devices with capacity, rating, constituent component quantities or performance lower than procuring entity requirements by over 10% shall be rejected.
- 1.1.13 Bids offering equipment/devices/components of higher capacity, rating, constituent component quantities or performance than the employer minimum requirements stated in these schedules shall be accepted but shall however not earn any favour during evaluation and shall be treated to have met minimum requirements as required only.

## PRELIMINARY BILL OF MATERIALS

- 1.1.14 In the column "**offered by bidder**" the bidder shall indicate whether they are offering the stated equipment/device i.e., if it's part of the bidders offer by simply stating **YES or NO, no other responses are acceptable**
- 1.1.15 Preliminary bill of materials only summarises the overall scope of supply requirement for the bidder, the scope of supply requirement is not limited to what is stated in these schedules. Bidder shall study the technical specifications to ensure they have factored in all the equipment and materials necessary for the complete systems as defined in the technical specifications.
- 1.1.16 The preliminary bill of materials provided shall guide the bidder while costing his bid and to understand the required scope of supply by the employer.
- 1.1.17 The preliminary bill of materials shall be used by the employer to evaluate the bidders offer compliance to technical specifications. The final bill of materials for project implementation shall be prepared by the winning bidder at design stage. The contractor shall after design site visit revise this preliminary bill of materials to the final bill of

- materials for implementation based on procuring entity requirements, contract clarifications and other prevailing conditions at site
- 1.1.18 Bidder **MUST** insert manufacturer and model of equipment proposed for supply for all major equipment in scope of supply in the provided schedule. During design review approved bidder shall provide details for **ALL** equipment in scope of supply.
- 1.1.19 Equipment manufacturer and model/type entered by the bidder in the preliminary bill of materials can be changed prior to contract signing as long as the new proposed equipment meets all employer requirements or is equivalent to the equipment stated in the preliminary bill of materials.
- 1.1.20 During contract clarification meeting, the equipment manufacturer and model/type for the major equipment shall be agreed upon. The agreed upon equipment manufacturer and model/type shall become part of the contract and shall not be changed during project implementation without the **express consent** of the Project Engineer/Manger. The equipment in the final bill of materials **MUST** meet all tender requirements, clarification meeting shall not be used to alter any tender requirement.
- 1.1.21 Technical datasheets shall be provided for all equipment proposed in the preliminary bill of materials. Datasheets shall be provided in soft copy
- 1.1.22 Quantities of accessories (minor components not included in the schedule of prices) in the Preliminary bill of materials are estimates and actual quantities will be computed by the contractor during design stage. However, as a minimum all materials in the preliminary bill of materials **MUST** be supplied, materials that will fail to be utilised in panel assembly and wiring shall be delivered as spares.
- 1.1.23 All devices, materials and equipment necessary and usual for a completed equipment/cabinets/panels with the stated number of servers, workstations and network equipment etc. shall be supplied by the bidder irrespective of whether such materials are listed in the preliminary bill of materials.
- 1.1.24 In case of conflict between the preliminary bill of materials and technical specifications, technical specifications shall take precedence

# **GUARANTEED TECHNICAL PARTICULARS (GTP)**



## GUARANTEED TECHNICAL PARTICULARS (GTP)

### 1. SCOPE of SUPPLY of PLANT AND INSTALLATION SERVICES BY THE CONTRACTOR

As detailed in the preliminary bill of materials

### 2. GENERAL TECHNICAL SPECIFICATIONS

As detailed in the appendix 1

### 3. PARTICULAR TECHNICAL SPECIFICATIONS ~ NETWORK AND COMMUNICATION SYSTEMS

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.1	GENERAL REQUIREMENTS & INFORMATION	Bidder shall comply to the general requirements as per the specifications in clause 3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.2	<b>FUNCTIONAL REQUIREMENTS</b>		
3.2.1	General requirements	Bidder shall comply to the general requirements as per the specifications in clause 3.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.2.2	Backbone/Transport Network	Bidder shall provide backbone/Transport Network meeting all the requirements detailed in clause 3.2.2 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.2.3	Operations Telephone	Bidder shall provide Operations Telephone system meeting all the requirements detailed in clause 3.2.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.2.4	SCADA Application Network	Bidder shall provide SCADA Application Network meeting all the requirements detailed in clause 3.2.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.3</b>	<b>NETWORK DESIGN AND ARCHITECTURE</b>		
3.3.1	General	Proposed network architecture shall comply to the general requirements as per the specifications in clause 3.3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.3.2	Design and Operational Philosophy	Network and communication equipment design and operational philosophy shall meet all requirements in clause 3.3.2 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.3.3	Network Architecture	Network Architecture shall meet all requirements in clause 3.3.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.3.4	Network Performance Requirements	Network Performance shall meet all requirements in clause 3.3.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.3.5	Fibre Optic Links	Fibre Optic Links shall meet all requirements in clause 3.3.5 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.3.6	Radio Links	Radio Links shall meet all requirements in clause 3.3.6 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.3.7	Service Provider Links	Service Provider Links shall meet all requirements in clause 3.3.7 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.3.8	Operations Telephone System	Operations Telephone System shall meet all requirements in clause 3.3.8 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.3.9	Configuration And Management	Configuration And Management shall meet all requirements in clause 3.3.9 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.4	<b>EQUIPMENT SPECIFICATIONS</b>		
3.4.1	<b>Aggregation Routers</b>		
3.4.1.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 3.4.1.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.4.1.2	<b>Hardware Minimum Specifications</b>		
3.4.1.2.1	CPU	≥ 4-core 2GHz CPU	
3.4.1.2.2	Memory	≥ 8 GB DRAM	
3.4.1.2.3	Storage	≥ 16 GB	
3.4.1.2.4	1G Interfaces (Ports)	≥ 16x 1GE SFP/RJ45	
3.4.1.2.5	10 G Interfaces (Ports)	≥ 8x 10/1GE SFP+	
3.4.1.2.6	Performance	≥ 125 Mpps	
3.4.1.2.7	Power Supplies	Dual (2) DC Power Supplies	
3.4.1.2.8	Fans	Redundant fans: ≥3+1	
3.4.1.2.9	Airflow	Side to side or front to back Front to back preferred	
3.4.1.2.10	Operating Temperature Range	-40°C to +70°C	
3.4.1.2.11	Non-operating (Storage) Temperature	-40°C to +70°C	
3.4.1.2.12	Operating Humidity Range	5-95% RH, noncondensing	
3.4.1.2.13	Storage (Relative) Humidity	5-95% at 40°C per GR-63-CORE for network switching systems (NEBS)	
3.4.1.2.14	Power supply rating	48V DC	
3.4.1.2.15	Surge Rating	2KV differential mode	
3.4.1.2.16	Timing	SyncE, PTP,	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		Interfaces: 1pps, 10MHz, ToD Class C, Class B on RJ45 1GE	
3.4.1.2.17	Mounting	19" Rackmount	
3.4.1.2.18	Conformal Coated	Yes	
3.4.1.2.19	Mounting Options	Rack Mount 1U, Inclusive of all mounting accessories.	
3.4.1.2.20	Management Interfaces	USB console port, USB memory port, RJ45 console	
3.4.1.2.21	Sensors	Humidity Sensor	
3.4.1.2.22	Warranty, Licenses including Smartnet	3yr Hardware and Software Support by OEM (parts, labour & patches)	
<b>3.4.1.3</b>	<b>Software Minimum Specifications</b>		
3.4.1.3.1	Layer 2 Protocols and features provided	(a). VPWS, VPLS, IRB/BVI v4/v6 (b). Layer 2 forwarding and bridging Bridge Domains (BD) (c). Ethernet Flow Point (EFP) (d). IEEE 802.1Q VLANs and Q-in-Q (e). Ethernet Link Aggregation Group (LAG) (f). Link Aggregation Control Protocol (LACP) 802.3ad G.8032	
3.4.1.3.2	Layer 3 Protocols and features provided	(a). IPv4 and IPv6 unicast routing (b). Layer 3 interfaces: physical interfaces and sub interfaces (c). Virtual Routing and Forwarding (VRF) (d). Open Shortest Path First (OSPFv2, OSPFv3) (e). Border Gateway Protocol (BGP) v4/v6, LU, PIC, Path Selection, Attributes, TE, Authentication, Security, LS (f). Multiprotocol Border Gateway Protocol (MP-BGP) (g). Intermediate System to Intermediate System (ISIS, ISISv6) (h). Equal-Cost Multipath (ECMP)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<p>(i). Bidirectional Forwarding Detection (BFD) v4/v6, Timers, Routing Protocols, Bundle Interfaces, BFD unnumbered</p> <p>(j). Virtual Router Redundancy Protocol (VRRP)</p> <p>(k). Integrated Routing Bridging (IRB) with Bridge Virtual Interface (BVI)</p> <p>(l). Generic Routing Encapsulation (GRE)</p>	
3.4.1.3.3	MPLS Protocols and features provided	<p>(a). Label switching (LER, LSR)</p> <p>(b). Label Distribution Protocol (LDP)</p> <p>(c). BGP Labelled Unicast (BGP-LU)</p> <p>(d). L3 VPN, MPLS Traffic Engineering with RSVP-TE</p> <p>(e). Point-to-point L2VPN – Static, T-LDP, EVPN-VPWS</p> <p>(f). Multipoint L2VPN – VPLS, EVPN</p> <p>(g). L2/L3 EVPN with Anycast IRB</p> <p>(h). 6PE, 6VPE</p> <p>(i). IP Loop-Free Alternate (LFA) Fast Reroute (FRR)</p> <p>(j). RSVP-TE Fast Reroute (FRR)</p>	
3.4.1.3.4	Segment Routing (SR) Protocols and features provided	<p>(a). Segment Routing with MPLS data plane (SR-MPLS)</p> <p>(b). Segment Routing with IPv6 data plane (SRv6)</p> <p>(c). ISIS, OSPF, BGP extensions to segment routing</p> <p>(d). BGP Egress Peering Engineering (BGP-EPE)</p> <p>(e). Segment Routing Traffic Engineering (SRTE)</p> <p>(f). Segment Routing Path Computation Element (SR-PCE)</p> <p>(g). Topology Independent Loop-Free Alternate (TI-LFA)</p>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		(h). Segment Routing On-Demand Next-hop (SR-ODN)	
3.4.1.3.5	Multicast functions provided	(a). IPv4 and IPv6 multicast routing (b). PIM-SM, PIM-SSM (c). IGMPv3, MLDv2 (d). mLDP (e). mVPN (f). P2MP-TE	
3.4.1.3.6	Quality of Service (QoS) functions provided	(a). Class-based 3-level Hierarchical QoS (b). Virtual Output Queueing (VOQ) (c). Policing, Shaping (d). Multilevel priority queuing (e). Match, Stats, Classification, Queue management, Remarking (f). Classification based on L2/L3/L4 fields (g). Weighted Random Early Detection (WRED) (h). Deep packet buffer	
3.4.1.3.7	Timing Protocols and features provided	(a). SyncE with ESMC (b). External GNSS receiver (c). IEEE 1588-2008 PTP T-GM, T-BC, T-TSC (d). G.8265.1, G.8275.1, G.8275.2 (e). G.8273.2 Class C (Class B on RJ45 1GE)	
3.4.1.3.8	Security Protocols and features provided	(a). Control-plane and management plane protection (b). Local Packet Transport Services (LPTS) (c). Authentication, Authorization, and Accounting (AAA) (d). Terminal Access Controller Access-Control System Plus (TACACS+)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<p>(e). Secure Shell (SSH)                      (f). Layer 3 ingress and egress ACLs for IPv4 and IPv6                      (g). Layer 2 ingress ACLs                      (h). Unicast Reverse Path Forwarding (Unicast RPF)</p>	
3.4.1.3.9	OAM Protocols and features provided	<p>(a). CDP, LLDP, ICMP, DHCP Relay                      (b). IP SLA                      (c). MPLS OAM                      (d). Ethernet OAM: CFM, Y.1731 DM/SLM                      (e). TWAMP                      (f). NetFlow                      (g). SPAN/ERSPAN</p>	
3.4.1.3.10	Manageability	<p>(a). CLI, ICMP, EEM, FTP, TFTP, Telnet                      (b). SNMP MIB                      (c). NETCONF/gRPC (XML, JSON, GPB)                      (d). YANG models (native, open: OpenConfig, IETF)                      (e). Model/Event-Driven Telemetry                      (f). RPM-based SW infrastructure                      (g). Zero-Touch Provisioning (ZTP) with iPXE</p>	
<b>3.4.1.4</b>	<b>Product Standards</b>		
3.4.1.4.1	Regulatory Compliance	The router shall comply with CE markings according to directives 2004/108/EC and 2006/95/EC	
3.4.1.4.2	Network Equipment Building Standards (NEBS)	The router shall be designed to meet GR-63-CORE and GR-1089-CORE	
3.4.1.4.3	Safety	UL 60950-1 Second Edition CAN/CSA-C22.2 No. 60950-1 Second Edition EN 60950-1 Second Edition IEC 60950-1 Second Edition AS/NZS 60950-1	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		GB4943 CSA 62368-1	
3.4.1.4.4	EMC Standards	EN55032:2015 KN61000-3-12:2014 EN61000-3-2:2014 ICES-003:2016:Iss:6 EN55032:2012 EN61000-3-12:2011 KN61000-3-11:2014 47 CFR Part 15:2016 KN61000-3-3:2014 CISPR32:2015:Ed:2 CISPR32:2012:Ed:1 CNS13438:2006 KN32:2015 EN300 386:2012:V1.6.1 KN61000-3-2:2014 EN61000-3-11:2000 VCCI-CISPR 32:2016 EN61000-3-3:2013	
3.4.1.4.5	EMC Immunity	IEC 61000-4 series CISPR24:2010+A1:2015 CISPR35:2016:Ed:1 EN IEC61000-6-1:2019 EN300 386:2012:V1.6.1 EN55024:2010 EN55024:2010:A1 EN55035:2017 EN61000-6-1:2007 EN61000-6-2:2005 EN61000-6-2:2019 IEC61000-6-1:2016:Ed:3 IEC61000-6-2:2016:Ed:3 KN35:2015	
3.4.1.4.6	ETSI	ETS/EN 300 119 Part 4 ETS/EN 300 019 - Storage: Class 1.2, Transportation: Class 2.3, In- Use/Operational: Class 3.2	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		ETS/EN 300 753	
3.4.1.4.7	RoHS	The product is RoHS-6 compliant with exceptions for leaded-Ball Grid-Array (BGA) balls and lead press-fit connectors	
3.4.1.5	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 3.4.1.5 of procuring entity requirements <i>(Bidder to attach product certifications)</i>	
<b>3.4.2</b>	<b>Backbone L3 Ethernet switch</b>		
3.4.2.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 3.4.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.2.2</b>	<b>Hardware Minimum Specifications</b>		
3.4.2.2.1	1G Interfaces (Ports)	≥20x 1GE SFP/RJ45	
3.4.2.2.2	10G Interfaces (Ports)	≥4x 10/1GE SFP+	
3.4.2.2.3	Power supplies	Dual (2) DC Power Supplies	
3.4.2.2.4	Power supply rating	48V DC	
3.4.2.2.5	Airflow	Front-to-back airflow	
3.4.2.2.6	Fans	≥3 Integrated Fans	
3.4.2.2.7	Operating Environment	-40 to 65°C (GR3108 Class-2)	
3.4.2.2.8	Relative Humidity	5 to 95 percent, noncondensing	
3.4.2.2.9	Noise	≤ 48 dBA at 30°C ≤ 77 dBA at highest system performance	
3.4.2.2.10	Storage Environment Temperature	-40 to 70°C	
3.4.2.2.11	Seismic rating	Zone 4	
3.4.2.2.12	Hazardous substances	Reduction of Hazardous Substances (ROHS) 6	
3.4.2.2.13	DC input voltage range	24VDC to 60VDC	
3.4.2.2.14	Mounting	19-inch rack mount kit	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.2.2.15	Warranty and Licenses	3yr Hardware and Software Support by OEM (parts, labour & patches)	
<b>3.4.2.3</b>	<b>Software and configuration minimum Requirements</b>		
3.4.2.3.1	Layer 2 Protocols and features provided	<p>(a). Layer 2 forwarding and bridging Domains (BD)</p> <p>(b). Ethernet Flow Point (EFP)</p> <p>(c). IEEE 802.1Q VLANs and Q-in-Q</p> <p>(d). Ethernet Link Aggregation Group (LAG)</p> <p>(e). Link Aggregation Control Protocol (LACP) 802.3ad</p> <p>(f). G.8032</p> <p>(g). Jumbo frames on all ports</p> <p>(h). PVST, RPVST+</p>	
3.4.2.3.2	Layer 3 Protocols and features provided	<p>(a). IPv4 unicast routing</p> <p>(b). Virtual Routing and Forwarding (VRF)</p> <p>(c). OSPF/ISIS/BGP</p> <p>(d). VRRP/HSRP</p>	
3.4.2.3.3	L2 Multicast	IGMP Snooping	
3.4.2.3.4	Quality of Service (QoS) functions provided	<p>(a). Class-based 3-level Hierarchical QoS</p> <p>(b). Policing, Shaping</p> <p>(c). Priority queuing</p> <p>(d). Classification based on L2/L3 fields</p> <p>(e). Remarking</p> <p>Deep packet buffer</p>	
3.4.2.3.5	Security Protocols and features provided	<p>(a). Secure Boot infrastructure with signed image Trust Anchor module</p> <p>(b). Secure JTAG</p> <p>(c). DHCP Snooping, Dynamic ARP Inspection</p>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<p>(d). Authentication, Authorization, and Accounting (AAA) Terminal Access Controller Access-Control System Plus (TACACS+)</p> <p>(e). Secure Shell (SSH)</p> <p>(f). Layer 2 ingress ACLs</p>	
3.4.2.3.6	OAM Protocols and features provided	<p>(a). 1731 PM</p> <p>(b). 802.1ag CFM standards</p> <p>(c). Y.1564</p> <p>(d). CDP, LLDP, ICMP</p> <p>(e). Ethernet OAM: CFM, Y.1731 DM/SLM</p> <p>(f). TWAMP Responder</p> <p>(g). SPAN</p>	
3.4.2.3.7	Manageability	<p>(a). CLI</p> <p>(b). SNMP MIB</p> <p>(c). Managed by EPN-M</p> <p>(d). Can be managed by NSO (cli NED)</p> <p>(e). NETCONF</p> <p>(f). YANG models (native, open: Open Config, IETF)</p> <p>(g). Zero-Touch Provisioning (ZTP)</p>	
<b>3.4.2.4</b>	<b>Product Standards</b>		
3.4.2.4.1	Safety	<p>UL 60950-1, 2nd edition</p> <p>CAN/CSA C22.2 No. 60950-1-07 2nd edition</p> <p>IEC 60950-1, 2nd edition</p> <p>EN 60950-1, 2nd edition</p> <p>AS/NZS 60950.1:2003</p>	
3.4.2.4.2	Emissions and Immunity	<p>FCC CFR47 Part 15</p> <p>KN 32: 2015</p> <p>EN 55032:2012/ AC:2013</p> <p>EN 55032:2015</p> <p>CISPR 32 Edition 2</p>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		EN61000-3-2: 2014 EN61000-3-3: 2013 EN 300 386 V1.6.1 ICES-003 Issue 6: 2016 V-2/2015.04 V-3/2015.04 TCVN 7189: 2009 CNS13438: 2006 CISPR24: 2010 + A1: 2015 EN55024: 2010 + A1: 2015 KN35: 2015 TCVN 7317: 2003 EN 61000-6-1 : 2007	
3.4.2.4.3	NEBS	GR-63-CORE GR-1089-CORE SR-3580 NEBS Level 3 GR-3108	
3.4.2.4.4	ETSI	ETS/EN 300 019 - Storage: Class 1.2, Transportation: Class 2.3, In- Use/Operational: Class 3.2 ETS/EN 300 753	
3.4.2.5	Product Certifications	Bidder shall comply to the requirements as per the specifications in clause 3.4.2.5 of procuring entity requirements <i>(Bidder to state compliance to these                      requirements and indicate any                      deviations)</i>	
<b>3.4.3</b>	<b>Point to Point Ethernet Radios</b>		
3.4.3.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 3.4.3.1 of procuring entity requirements <i>(Bidder to state compliance to these                      requirements and indicate any                      deviations)</i>	
3.4.3.2	<b>Minimum specifications</b>		

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.3.2.1	Architecture	<ul style="list-style-type: none"> <li>• ODU: Outdoor Unit with point-to-point Parabolic Antenna</li> <li>• IDU: Indoor Unit PoE Device</li> <li>• Able to operate in line-of-sight (LOS), near-LOS and non-LOS propagation condition.</li> </ul>	
3.4.3.2.2	RF Bands	Sub-6 GHz, 4.9 to 6.05 GHz	
3.4.3.2.3	Channel Sizes	5 — 45 MHz channels	
3.4.3.2.4	Spectral Efficiency	≥ 10 bps/Hz maximum	
3.4.3.2.5	Aggregate throughput	≥450Mbps	
3.4.3.2.6	Channel Selection	<ul style="list-style-type: none"> <li>• Automatic selection on start-up</li> <li>• Continual self-optimization to avoid interference</li> </ul>	
3.4.3.2.7	Maximum Transmit Power	≥27 dBm	
3.4.3.2.8	System Gain	≥164 dB	
3.4.3.2.9	Modulation	Adaptive Modulation	
3.4.3.2.10	Duplex Scheme	Time Division Duplex (TDD)	
3.4.3.2.11	Antenna	Dual polarity antennas	
3.4.3.2.12	Range	≥ 200Km LOS	
3.4.3.2.13	Security	<ul style="list-style-type: none"> <li>• AES Symmetric encryption algorithm FIPS-197 compliant 128/256-bit Encryption</li> <li>• HTTPS and SNMPv3.</li> <li>• Identity-based user accounts Configurable password rules</li> <li>• User authentication and RADIUS support</li> <li>• Event logging and management.</li> <li>• logging via syslog</li> <li>• Disaster recovery and vulnerability management</li> </ul>	
3.4.3.2.14	Ethernet Protocol	IEEE802.3 packet based physical communication	
3.4.3.2.15	Latency	≤ 3 milliseconds one direction	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.3.2.16	Quality of Service (QOS)	8 classes	
3.4.3.2.17	Packet Classification	<ul style="list-style-type: none"> <li>Layer 2 and Layer 3 IEEE 802.1p</li> <li>IP MPLS</li> <li>Ethernet priority</li> </ul>	
3.4.3.2.18	Packet Performance/ Line rate	>850K packets per second	
3.4.3.2.19	Timing Transport	Synchronous Ethernet; IEEE 1588v2	
3.4.3.2.20	Frame Support	Jumbo frame up to 9600 bytes	
3.4.3.2.21	ODU Ethernet Ports	2x Gigabit Ethernet copper ports: <ul style="list-style-type: none"> <li>Data + PoE power input</li> <li>Data + 802.3at PoE output port</li> </ul> 1 x SFP port	
3.4.3.2.22	Time Division Multiplexing	<ul style="list-style-type: none"> <li>T1/E1 support</li> <li>G.823 compliant</li> <li>DC power input (compatible with AC+DC Power Injector output)</li> </ul>	
3.4.3.2.23	Network Management	In-band and out-of-band management	
3.4.3.2.24	System Management	<ul style="list-style-type: none"> <li>Web access via browser using HTTP or HTTPS/TLS3</li> <li>SNMP v1, v2c and v3, MIB-II</li> <li>IPv6/IPv4 dual-stack management support.</li> <li>Online spectrum analyser (no impact on payload traffic or network operation)</li> </ul>	
3.4.3.2.25	Installation	Built-in audio and graphical assistance for link optimization	
3.4.3.2.26	Power Supply Unit (PSU)	AC + DC power injector: <ul style="list-style-type: none"> <li>240 VAC 50 Hz (-40° to +60° C)</li> <li>48VDC</li> </ul>	
3.4.3.2.27	Enclosure type	Steel or metallic equivalent	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.3.2.28	Minimum Ethernet connections to ODU	<p>≥ Three (3)</p> <p>≥ one (1) Gigabit Base-LX/SX SFP port</p> <p>≥ One (1) Gigabit Base-T: Data + PoE power input</p> <p>≥ One (1) Gigabit Base-T: Data</p>	
3.4.3.2.29	Outdoor CAT5E/6A cable	<ul style="list-style-type: none"> <li>• Outside plant (OSP) type</li> <li>• copper-clad steel armour</li> <li>• waterproof jacket</li> <li>• Sunlight and abrasion resistant</li> <li>• ≤ 328 ft (100 m)</li> </ul>	
3.4.3.2.30	Cable Connector	<p>≥ 2 N-type Connector</p> <p>≥ 1 Bend insensitive multimode fibre optic cable with LC-LC connectors</p> <p>≥ 10 RJ45 connectors provided for ODUs, LPUs, PSUs and other devices.</p>	
3.4.3.2.31	Flexible Conduit	<ul style="list-style-type: none"> <li>• PVC Coated Galvanized Steel core</li> <li>• 10-20mm internal diameter for fibre optic cable</li> </ul>	
3.4.3.2.32	Lighting Protection and Grounding (per ODU)	≥ one (1) Coaxial Cable with grounding kit for antenna	
3.4.3.2.33	Mounting	Supply with all mounting accessories required	
3.4.3.2.34	Ingress Protection	IP66 and IP67	
3.4.3.2.35	Device Cooling	heat sink	
3.4.3.2.36	Grounding	Coaxial Cable Kits for Cable	
3.4.3.2.37	Surge protector and lightning protection unit	To be provided	
3.4.3.2.38	Continuous ambient operating temperature	-40° to +60°C	
3.4.3.2.39	Device Cooling	Natural, heat sink or solid state	
3.4.3.2.40	Wind Speed Survival	≥322 Kph	
3.4.3.2.41	Manufacturer Warranty	5 years	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.3.2.42	Country/Region of Origin	USA, European Union, Canada or Japan <i>(Bidder to provide documentary evidence)</i>	
3.4.3.2.43	Approval	Type approved by Communications Authority of Kenya (CA)	
<b>3.4.3.3</b>	<b>Antenna specifications</b>		
3.4.3.3.1	Antenna Type	Parabolic	
3.4.3.3.2	Dish size	≥ 1.2 m (4 ft)	
3.4.3.3.3	Gain	≥ 34.7dBi	
3.4.3.3.4	Operating Frequency	4.9-6.05 GHz	
3.4.3.3.5	3 dB Beamwidth	≥ 3°	
3.4.3.3.6	Polarization	Dual	
3.4.3.3.7	Front to Back Ratio (F/B)	≥ 49dB	
3.4.3.3.8	Voltage Standing Wave Ratio (VSWR)	1.5:1	
3.4.3.4	Product Standards	Offered equipment shall comply to the requirements as per the specifications in clause 3.4.3.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.4</b>	<b>Industrial Ethernet switches</b>		
3.4.4.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 3.4.4.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.4.2</b>	<b>Minimum specifications</b>		
3.4.4.2.1	Switch type	Managed Ethernet Switch	
3.4.4.2.2	Switching Method:	Store and forward	
3.4.4.2.3	Switching Latency:	<7 μs	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.4.2.4	Switch Throughput:	≥5.6 Gbps	
3.4.4.2.5	Maximum VLANs:	≥255	
3.4.4.2.6	MAC Address Table Size:	≥8192 addresses	
3.4.4.2.7	Power Over Ethernet (PoE)	<ul style="list-style-type: none"> <li>(i) 8 10/100BaseTx 802.3af / 802.3at compliant ports</li> <li>(ii) Data and power over a single Ethernet cable</li> <li>(iii) Auto-sensing ports that provide power only to PoE end devices</li> </ul>	
3.4.4.2.8	Network Management	<ul style="list-style-type: none"> <li>(i) Web-based, Telnet, CLI management interfaces</li> <li>(ii) SNMP v1/v2/v3 (56-bit encryption)</li> <li>(iii) Remote Monitoring (RMON)</li> <li>(iv) Rich set of diagnostics with logging and alarms.</li> </ul>	
3.4.4.2.9	Key Protocol and functions provided	<ul style="list-style-type: none"> <li>(i) Compliant with IEC 61850-9-2 Sampled Values and IEC 61850-8-1 GOOSE Message</li> <li>(ii) Compliant with IEEE 802.3, 802.3u, 802.3x, 802.3ab, 802.1d, 802.1p, 802.1Q, 802.1Q-2005, 802.1w', Link Aggregation</li> <li>(iii) Bridge Protocol Data Unit (BPDU) Guard.</li> <li>(iv) Port-Based MAC Security.</li> <li>(v) Simple plug-and-play operation – automatic learning, negotiation, and crossover detection</li> <li>(vi) MSTP 802.1Q-2005</li> <li>(vii) RSTP (802.1w) and Enhanced Rapid Spanning Tree</li> <li>(viii) eRSTP network fault recovery</li> <li>(ix) Quality of service (802.1p) for real-time traffic</li> </ul>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<p>(x) Port rate limiting</p> <p>(xi) IEEE 802.1Q-2005 VLAN, Qin Q and Priority Tagging Class of Service (CoS)</p>	
3.4.4.2.10	Enabled and supported security functions	<p>(i) Multilevel user passwords</p> <p>(ii) Secure File Transfer Protocol (SFTP) using SSH</p> <p>(iii) Web-based management using SSL</p> <p>(iv) RADIUS-Authentication service for device management</p> <p>(v) 1024-bit RSA encryption for key management and key exchange</p> <p>(vi) Enable/disable ports,</p> <p>(vii) MAC-based port security.</p> <p>(viii) Port-based network access control (802.1x);</p> <p>(ix) VLAN (802.1Q) to segregate and secure network traffic.</p> <p>(x) SNMPv3 encrypted authentication</p>	
3.4.4.2.11	Ruggedness	<p>(a). Immunity to EMI and heavy electrical surges</p> <p>(b). Meets IEEE 1613 Class 2 (electric utility substations)</p> <p>(c). Exceeds IEC 61850-3 (electric utility substations)</p> <p>(d). Exceeds IEC 61000-6-2 (generic industrial)</p> <p>(e). -40° C to +85°C operating temperature</p> <p>(f). Fan less operation</p>	
3.4.4.2.12	Total number 1GB Base-T Ethernet ports (RJ45)	≥Six (6) for non-POE option	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.4.2.13	Total number 1Gb SFP Ethernet ports	≥Two (2) for POE option ≥Four (4) for non-POE option	
3.4.4.2.14	Total number POE ports 100MB base-Tx or higher	≥eight (8) for POE option	
3.4.4.2.15	Fibre connector types	SFP Pluggable Optics	
3.4.4.2.16	Bi-directional single strand fibre	Supported	
3.4.4.2.17	Long haul gigabit optics distances	≥ 70Km	
3.4.4.2.18	Management Console port	≥One (1)	
3.4.4.2.19	Front side LED's	(i) power supply status LED's (ii) Device status LED (iii) Alarm status LED	
3.4.4.2.20	Alarm Output Contact	≥One (1) Form-C failsafe contact relay	
3.4.4.2.21	Alarm Output Contact wiring	Terminal blocks	
3.4.4.2.22	Power supply type	Dual Power Input: 54VDC (44-57VDC), 160W	
3.4.4.2.23	Power supply input	≥ 45VDC to ≥ 57VDC	
3.4.4.2.24	Maximum Combined Power Output at PoE Ports	273 W	
3.4.4.2.25	Power supply connections	Terminal blocks	
3.4.4.2.26	Enclosure type	Rugged Construction Cast aluminium/steel Enclosure Conformal coating	
3.4.4.2.27	Ingress Protection	IP40	
3.4.4.2.28	Mounting Option	DIN rail Panel mount	
3.4.4.2.29	Device Cooling	Natural, heat sink or solid state	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.4.2.30	Continuous ambient operating temperature	-40° C to +85°C	
3.4.4.2.31	Operating Relative Humidity (non-condensing)	0 to 95%	
3.4.4.2.32	Manufacturer Warranty	5 Years	
<b>3.4.4.3</b>	<b>Type tests</b>		
3.4.4.3.1	EMI and Environmental Type Tests	Equipment shall comply to the requirements as per the specifications in clause 3.4.4.3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and attach type test certificate)</i>	
3.4.4.3.2	IEEE 1613 (C37.90.x) EMI Immunity Type Tests	Equipment shall comply to the requirements as per the specifications in clause 3.4.4.3.2 of procuring entity requirements <i>(Bidder to state compliance to these requirements and attach type test certificate)</i>	
3.4.4.3.3	Environmental Type Tests	Equipment shall comply to the requirements as per the specifications in clause 3.4.4.3.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and attach type test certificate)</i>	
3.4.4.4	Product Standards	Equipment shall comply to the requirements as per the specifications in clause 3.4.4.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.5</b>	<b>Fibre Optic Media Converter /Multiplexer (120Km)</b>		

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.5.1	General Requirements	Equipment shall comply to the general requirements as per the specifications in clause 3.4.5.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.5.2</b>	<b>Minimum specifications</b>		
3.4.5.2 .1	fibre Connectors	1000Base-X LC connector	
3.4.5.2 .2	Operating wavelength:	long-haul 1550nm Single mode	
3.4.5.2 .3	Operating distance:	≥120Km on 9/125um fibre, optical power budget: 35dB	
3.4.5.2 .4	Number of LC Ports	≥2	
3.4.5.2 .5	Total Number of Ports	≥2	
3.4.5.2 .6	LC Port Type	Duplex	
3.4.5.2 .7	Form Factor	Rack-mountable	
3.4.5.2 .8	Packet Bit Error Rate (BER)	<10 <sup>-12</sup>	
3.4.5.2 .9	Operating Temperature	0° C to 50° C	
3.4.5.2 .10	Storage Temperature	minimum range of -25° C to 70° C	
3.4.5.2 .11	Operating Humidity	5% to 90% non-condensing	
3.4.5.2 .12	Storage Humidity	5% to 95% non-condensing	
3.4.5.2 .13	Operating Altitude	Up to 3,048 meters (10,000 feet)	
3.4.5.2 .14	Compliance:	FCC part 15, Subpart B, Class A, ANSIC63.4:2003CE EN55022:2006, Class A EN55024:1998+A1:2001+A2:2003LV D: EN 60 950-1:2001 Canada, ISEDC RSS-247 Issue 2	
3.4.5.3	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 3.4.5.3 of procuring entity requirements	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.6</b>	<b>Hybrid IP PBX</b>		
3.4.6.1	General Requirements	Equipment shall comply to the general requirements as per the specifications in clause 3.4.6.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.6.2</b>	<b>Minimum specifications</b>		
3.4.6.2.1	Equipment Type	Digital Hybrid IP- PBX System Switching (ANALOG & IP)	
3.4.6.2.2	Equipment Design	Modular and server-based IP communication platform	
3.4.6.2.3	Supported User Extension	≥ 100	
3.4.6.2.4	Concurrent Calls	≥ 50	
3.4.6.2.5	Foreign Exchange Subscriber (FXS) nodes	≥ 16	
3.4.6.2.6	CPU	<ul style="list-style-type: none"> <li>• ≥ 4 Cores</li> <li>• ≥ 3.00 GHz CPU Frequency</li> </ul>	
3.4.6.2.7	RAM	<ul style="list-style-type: none"> <li>• ≥ 8GB RAM</li> </ul>	
3.4.6.2.8	Storage	<ul style="list-style-type: none"> <li>• ≥ 2 TB SSD</li> </ul>	
3.4.6.2.9	Operating principle	<ul style="list-style-type: none"> <li>• Stored program control</li> <li>• Distributed processor architecture</li> <li>• High system reliability</li> </ul>	
3.4.6.2.10	System Capacity	≥ 100 TDM ≥ 200 IP ports	
3.4.6.2.11	IP PBX Security	<ul style="list-style-type: none"> <li>• Firewall</li> <li>• Intrusion Prevention System (IPS)</li> <li>• Encryption, TLS</li> </ul>	
3.4.6.2.12	10/100/1000 Base-T Ethernet Interface	≥ Two (2)	
3.4.6.2.13	IP Protocol	<ul style="list-style-type: none"> <li>• H. 323 (for lines)</li> </ul>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<ul style="list-style-type: none"> <li>SIP (for lines/extensions)</li> </ul>	
3.4.6.2.14	WAN ethernet ports interface	≥One (1) 1G base T	
3.4.6.2.15	Analog Extension Modules	<ul style="list-style-type: none"> <li>≥ 11km Usage of long lines</li> <li>Sending and receiving DTMF</li> <li>12khz / 16khz credit signal generation</li> <li>Sending FSK or MF CallerID</li> <li>Automatic line tests</li> <li>Adjustable volume levels</li> </ul>	
3.4.6.2.16	Digital Extension Modules	<ul style="list-style-type: none"> <li>≥1.3 km of Line length</li> <li>Usage of 2-wire cables</li> <li>Usage of digital phone sets with various features</li> </ul>	
3.4.6.2.17	GSM module	Support 2G/3G/4G networks with a high gain outdoor antenna	
3.4.6.2.18	GSM Module subscriber lines	≥ Two (2)	
3.4.6.2.19	GSM Outdoor antenna	<ul style="list-style-type: none"> <li>Surge protection</li> <li>Grounding and Lightning protection</li> <li>Mounting accessories</li> <li>700-2700MHz wide band frequency range</li> <li>≥12dBi gain</li> <li>IP67</li> <li>Sunlight/UV and weatherproof</li> <li>Fibre glass or heavy-duty plastic material</li> </ul>	
3.4.6.2.20	VoIP functions	<ul style="list-style-type: none"> <li>Standard SIP protocols</li> <li>IP extension/trunk support</li> <li>IETF Session Initiation Protocol (SIP), RFC3261</li> </ul>	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<ul style="list-style-type: none"> <li>• Realtime Transport Protocol (RTP), RFC 3550</li> <li>• Realtime Transport Control Protocol (RTCP)</li> <li>• Session Description Protocol (SDP) RFC 2327</li> <li>• DTMF/Tone support while using media gateway</li> <li>• RFC 2833, SIP INFO or in-band DTMF detection, generation</li> <li>• Media gateway configuration over network</li> </ul>	
3.4.6.2.21	Audio Codecs and Algorithms	<ul style="list-style-type: none"> <li>• G722</li> <li>• G711 A-law, U-law</li> <li>• G729A/B</li> <li>• G723.1</li> <li>• iLBC</li> <li>• Encryption with SRTP/TLS*</li> <li>• T.38 fax-over-IP*</li> <li>• Advanced dynamic jitter buffer</li> <li>• Packet loss compensation (PLC)</li> <li>• Central collection and querying of QoS statistics</li> <li>• Echo prevention, G.168 compliant</li> <li>• Audio activity detection</li> <li>• Noise suppression, RFC3389</li> <li>• Automatic gain control</li> </ul>	
3.4.6.2.22	Audio recording	<ul style="list-style-type: none"> <li>• File compression</li> <li>• Online audio recording to NFS server</li> <li>• Storing and retrieval in a SQL server</li> </ul>	
3.4.6.2.23	SIP trunks	≥ 32	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.6.2.24	PBX SERVICES	<ul style="list-style-type: none"> <li>• Message box for busy or missed calls</li> <li>• “I’m not available” message record</li> <li>• Listening to voicemails</li> <li>• Leaving a message for extension</li> <li>• Intervention</li> <li>• Queuing</li> <li>• Parking</li> <li>• Call forwarding</li> <li>• Extensive call forwarding</li> <li>• Call hunting</li> <li>• Group call hunting</li> <li>• Conference</li> <li>• Removing from conference</li> <li>• Call recording</li> <li>• Automatic redialling</li> </ul>	
3.4.6.2.25	USB:	≥ 2 (USB 2.0)	
3.4.6.2.26	WAN	Static routing or dynamic routing	
3.4.6.2.27	Time synchronisation	SNTP	
3.4.6.2.28	Monitoring/management	<ul style="list-style-type: none"> <li>• Web HTTPS</li> <li>• SNMP</li> <li>• syslog</li> </ul>	
3.4.6.2.29	User management and role-based access	LDAP and RADIUS	
3.4.6.2.30	Power Supply	48 VDC	
3.4.6.2.31	Connectors	<ul style="list-style-type: none"> <li>• RJ45 (Ethernet, Lines / Extensions)</li> <li>• RJ11 (RS232)</li> <li>• Pin type-2 pin (External Devices)</li> </ul>	
3.4.6.2.32	Peripherals	<ul style="list-style-type: none"> <li>• Standard Telephones</li> <li>• PC/Serial Printer</li> <li>• Alarm</li> <li>• Paging</li> </ul>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<ul style="list-style-type: none"> <li>DECT base station</li> </ul>	
3.4.6.2.33	Telephone punch down terminal block	≥ 25 pairs	
3.4.6.2.34	Data Surge Protection Device (SPD)	≥ 25	
3.4.6.2.35	Operating environment:	<ul style="list-style-type: none"> <li>Temperature: -5°C to +40°C</li> <li>Humidity: 20% to 80% non-condense</li> </ul>	
3.4.6.2.36	Mobility	IP DECT Manager, Base Stations and IP DECT handsets that support SIP	
3.4.6.2.37	Certificates	ITU-T G.722	
3.4.6.2.38	Manufacturer Warranty	≥3 years	
<b>3.4.7</b>	<b>IP telephone set</b>		
3.4.7.1	General Requirements	Equipment shall comply to the general requirements as per the specifications in clause 3.4.7.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.7.2</b>	<b>Minimum Specifications</b>		
3.4.7.2.1	Casing Material	Cold rolled steel body Colour: YELLOW	
3.4.7.2.2	Handset Material	ABS material handset with stainless steel spiral cord	
3.4.7.2.3	Keypad	Weather sealed tactile digital keypad. Chrome key and frame made of zinc alloy. Vandal resistance	
3.4.7.2.4	Temperature Operating	-30°C to +65°C	
3.4.7.2.5	Temperature Storing	-40°C to +75°C	
3.4.7.2.6	Weather Resistance	IP54-IP65	
3.4.7.2.7	Ringling Tone typical	Shrill warble tone 80 dBA @ 1 metre	
3.4.7.2.8	Hook switch	Electronic / magnetic with no visible moving parts	
3.4.7.2.9	M.T.B. F	≥50,000 hours	
3.4.7.2.10	Power Input:	12-50V DC / POE	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.7.2.11	Port:	WAN: 10/100Base- T RJ-45 for LAN, Auto MDIX LAN: 10/100Base- T RJ-45 for PC, Auto MDIX	
3.4.7.2.12	Power Usage	Idle:1.5W/ Active:1.8W	
3.4.7.2.13	SIP 2.0 (RFC3261)	Yes	
3.4.7.2.14	Codec	G.711A/u, G.7231 high/low, G.729, G.722	
3.4.7.2.15	Echo cancellation	Support G.168 and hand-free can support 96ms	
3.4.7.2.16	full duplex	Yes	
3.4.7.2.17	SIP Support	domain, SIP support authentication (none, basic, MD5), DNS name of server	
3.4.7.2.18	DTMF	SIP info, DTMF Relay, RFC2833	
3.4.7.2.19	WAN/LAN	support Bridge mode	
3.4.7.2.20	Static IP address	Yes	
3.4.7.2.21	DHCP get IP on WAN port	Yes	
3.4.7.2.22	VLAN	Yes	
3.4.7.2.23	Web config	Yes	
3.4.7.2.24	Approvals CE	Radio & Telecommunications Terminal Equipment Directive 2004/108/EC	
3.4.7.2.25	Approval FCC	Part 15 Subpart B Class B	
<b>3.4.8</b>	<b>Cordless IP DECT Multi-Cell System (Base station and DECT Manager)</b>		
3.4.8.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 3.4.8.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.8.2</b>	<b>Minimum Specifications</b>		
3.4.8.2.1	Call Technology	Seamless handover and roaming	
3.4.8.2.2	Simultaneous calls	≥100	
3.4.8.2.3	Base stations	≥30	
3.4.8.2.4	handsets	≥100	
3.4.8.2.5	VoIP accounts	≥100	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.8.2.6	Simultaneous calls per base station	≥ 8	
3.4.8.2.7	Handover	Within group	
3.4.8.2.8	Roaming	Supported	
3.4.8.2.9	Air Synchronization	Supported	
3.4.8.2.10	Over-The-Air (OTA) encryption	Supported	
3.4.8.2.11	Call Functions	Call hold, call transfer, 3-way conference	
3.4.8.2.12	Switching between calls	Supported	
3.4.8.2.13	Management	<ul style="list-style-type: none"> <li>• Auto-provision via TFTP/FTP/HTTP/HTTPS/RPS</li> <li>• Auto-provision with PnP</li> <li>• Handset upgrade: OTA (Over-The-Air)</li> <li>• Configuration: browser/phone/auto-provision</li> <li>• Trace package and system log export</li> </ul>	
3.4.8.2.14	Audio Features	<ul style="list-style-type: none"> <li>• Full-duplex speakerphone</li> <li>• Hearing Aid Compatibility (HAC) compliant</li> <li>• DTMF</li> <li>• Wideband codec: Opus, AMR-WB (optional), G.722</li> <li>• Narrowband codec: AMR-NB (optional), PCMU, PCMA, G.726, G.729, iLBC</li> <li>• VAD, CNG, AGC, PLC, AJB</li> </ul>	
3.4.8.2.15	Network Features	<ul style="list-style-type: none"> <li>• SIP v1 (RFC2543), v2 (RFC3261)</li> <li>• SNTP/NTP</li> <li>• VLAN (802.1Q and 802.1P)</li> <li>• 802.1x, LLDP</li> <li>• STUN Client (NAT Traversal)</li> </ul>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<ul style="list-style-type: none"> <li>• UDP/TCP/TLS</li> <li>• IP assignment: static/DHCP</li> <li>• Support outbound proxy server backup</li> </ul>	
3.4.8.2.16	Security	<ul style="list-style-type: none"> <li>• Open VPN</li> <li>• Transport Layer Security (TLS)</li> <li>• HTTPS (server/client), SRTP</li> <li>• Digest authentication</li> <li>• Secure configuration file via AES encryption</li> <li>• Support SHA256/SHA512/SHA384</li> </ul>	
3.4.8.2.17	DECT Frequency bands	<ul style="list-style-type: none"> <li>• 1880 – 1900 MHz (Europe)</li> <li>• 1920 – 1930 MHz (US)</li> </ul>	
3.4.8.2.18	DECT Standards:	CAT-iq2.0	
3.4.8.2.19	Interface	<ul style="list-style-type: none"> <li>• 1 x RJ45 10/100M Ethernet port</li> <li>• Power over Ethernet (IEEE 802.3af), Class 1</li> </ul>	
3.4.8.2.20	Indoor Range	≥50m	
3.4.8.2.21	Outdoor Range	≥300m	
3.4.8.2.22	Wall mountable	Compliant	
3.4.8.2.23	Ingress Protection rating	IP67	
3.4.8.2.24	Outdoor Installation	UV & weatherproof	
3.4.8.2.25	External AC adapter	<ul style="list-style-type: none"> <li>• AC 100-240V Input</li> <li>• DC 5V/1.2A Output</li> </ul>	
3.4.8.2.26	Operating humidity	10~95%	
3.4.8.2.27	Operating temperature	0~+40°C	
<b>3.4.9</b>	<b>Ruggedized DECT Handset</b>		
3.4.9.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 3.4.9.1 of procuring entity requirements	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.9.2</b>	<b>Minimum specifications</b>		
3.4.9.2 .1	Indoor range	≥50m	
3.4.9.2 .2	Outdoor range	≥300m	
3.4.9.2 .3	Standby time	≥360 hours	
3.4.9.2 .4	Talk time	≥28 hours	
3.4.9.2 .6	Display	<ul style="list-style-type: none"> <li>• ≥1.8" TFT color display</li> <li>• Intuitive user interface with icons and soft keys</li> <li>• Caller ID with name and number</li> <li>• Notification Light: voice mail, missed call</li> <li>• Date &amp; time (manual/auto synchronization)</li> <li>• Keypad backlight</li> </ul>	
3.4.9.2 .7	Simultaneous calls per handset	≥2	
3.4.9.2 .8	3-way conference	Yes	
3.4.9.2 .9	Audio Features	<ul style="list-style-type: none"> <li>• Full-duplex speakerphone</li> <li>• Hearing Aid Compatibility (HAC) compliant</li> <li>• FNR (Flexible Noise Reduction)</li> <li>• Acoustic warning for low battery status</li> <li>• DTMF</li> </ul>	
3.4.9.2 .10	DECT Frequency bands	<ul style="list-style-type: none"> <li>• 1880 – 1900 MHz (Europe)</li> <li>• 1920 – 1930 MHz (US)</li> </ul>	
3.4.9.2 .11	DECT Standards:	CAT-iq2.0	
3.4.9.2 .12	Battery	1460 mAh, Lithium-ion, 3.7 V, 5.4 WH	
3.4.9.2 .13	Charger	DC 5V/0.6A Output	
3.4.9.2 .14	Ruggedness	<ul style="list-style-type: none"> <li>• Scratch resistant,</li> <li>• disinfectant resistant.</li> </ul>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<ul style="list-style-type: none"> <li>Ingress Protection rating of IP67</li> <li>shock resistant</li> </ul>	
3.4.9.2 .15	Power Adapter	<ul style="list-style-type: none"> <li>Input 240 V, 50 Hz, 0.2 A</li> <li>Output: 5 V, 0.6 A</li> </ul>	
3.4.9.2 .16	Packaging contents	<ul style="list-style-type: none"> <li>Belt Clip</li> <li>Charging Cradle</li> <li>Rechargeable Battery</li> <li>Power Adapter</li> <li>Quick Start Guide</li> </ul>	
<b>3.4.10</b>	<b>Analogue (POTS) telephone set</b>		
3.4.10.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 3.4.10.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.10.2</b>	<b>Minimum Specifications</b>		
3.4.10.2.1	Material	High impact thermoset resin industrial housing and ergonomic heavy-duty handset Corrosion resistant hardware	
3.4.10.2.2	Ingress Protection	IP-66 compliant	
3.4.10.2.3	Back-lit LCD display	2-line x 16 character	
3.4.10.2.4	Handset base	Reversible base for desktop or wall mount configurations	
3.4.10.2.5	Audio modes	handset and hands-free speaker phone Noise cancelling microphone	
3.4.10.2.6	Earpiece	Material Magnetic reed hook switch to reduce parts subject to wear	
3.4.10.2.7	Operating temperature	-30° to +60°C	
3.4.10.2.8	Handset Retainer	Removable latches on cradle	
3.4.10.2.9	Handset Keypad	Large urethane coated watertight silicon	
3.4.10.2.10	Hearing-aid compatible (HAC) receiver	Compatible	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.10.2.11	Auxiliary relay	Built in to switch up to 0.5A @ 30VDC	
<b>3.4.11</b>	<b>Network And Communication Cabinets</b>		
3.4.11.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 3.4.11.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
3.4.11.2	Panel design and Wiring	Panel design and Wiring shall meet all requirements in clause 3.4.11.2 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>3.4.11.2</b>	<b>Wall Mount 9U Panel Minimum Specifications</b>		
3.4.11.2.1	Design & Description	<p>(a). Wall-mounted enclosure with optimum accessibility due to hinged part.</p> <p>(b). With three parts, glass door, hinged swing type mounting rack and wall fixed mounting part</p> <p>(c). with punched rails and mounting angles, depth-variable</p> <p>(d). To comply with tender requirements clause 2.7.1</p>	
3.4.11.2.2	Material Wall and hinged part	Sheet steel, 1.5 mm	
3.4.11.2.3	Material Viewing window	Single-pane safety glass, 3 mm	
3.4.11.2.4	Surface finish	Powder-coated	
3.4.11.2.5	Coat thickness outdoor type	>200micron	
3.4.11.2.6	Coat thickness indoor type	>90microns	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.11.2.7	Colour	RAL 7035	
3.4.11.2.8	Enclosure parts	<p>(a). Wall section with solid gland plate, top and bottom, two vertical mounting rails and C rails, horizontal, for cable clamping</p> <p>(b). Hinged part with 25 mm pitch pattern of holes in the front and rear frame, and two 482.6 mm (19") mounting angles at the front, infinitely depth-variable</p> <p>(c). 4 wall mounting brackets,</p> <p>(d). 10mm Glazed door</p> <p>(e). double-kit key</p> <p>(f). Mini-comfort handle for lock inserts or equivalent</p> <p>(g). Security lock with at least two keys</p>	
3.4.11.2.9	Size	9 U	
3.4.11.2.10	Dimensions	Width: 600 mm, Height: 478 mm, Depth: 473 mm or equivalent	
3.4.11.2.11	Internal Installation depth	≥420 mm	
3.4.11.2.12	Depth hinged part	≥316 mm	
3.4.11.2.13	Depth of wall section	≥135 mm	
3.4.11.2.14	IK Code	IK08	
3.4.11.2.15	Load capacity of hinged part (static)	450 N	
3.4.11.2.16	Basic material	Sheet steel	
3.4.11.2.17	Protection category acc. to IEC 60 529	IP 55	
3.4.11.2.18	Wiring and workmanship	As per tender clause 2.7.1	
<b>3.4.11.3.3</b>	<b>Ground mounting supports minimum requirements</b>		
3.4.11.3.3.1	General description	Support brackets with angled roof and ground mounting concrete plinths	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.11.3.3.2	Supports type	At least three (3) angle brackets or hollow sections	
3.4.11.3.3.3	Supports Material	Sheet steel, $\geq 2\text{mm}$	
3.4.11.3.3.4	Roof material	Galvanised iron, $\geq 0.5\text{ mm}$	
3.4.11.3.3.5	Surface treatment	400micron powder paint with at least three coats	
3.4.11.3.3.6	Colour	RAL 9006	
3.4.11.3.3.7	Concrete plinth	Class 25 concrete with a depth of at least 500mm	
3.4.11.3.3.8	Dimensions	Overall Width: 700 mm, height: 2000mm, Roof Depth: 700 mm	
3.4.11.3.3.9	Anchor	At least four anchor bolts	
<b>3.4.11.4</b>	<b>42U Panel Minimum Specifications</b>		
3.4.11.4.1	Overall requirements, wiring and workmanship	As per tender clause 2.7.1	
3.4.11.4.2	Material	Sheet steel, $\geq 2\text{mm}$	
3.4.11.4.3	Surface treatment	Powder coats At least three coats, $\geq 90\text{-micron}$ thickness	
3.4.11.4.4	Glazed front door	Single-pane safety glass, 3 mm	
3.4.11.4.5	Colour	RAL 7035	
3.4.11.4.6	Load capacity	$\geq 8,000\text{ N}$	
3.4.11.4.7	IK Code	IK08	
3.4.11.4.8	Panel Size	42U	
3.4.11.4.9	Dimensions	Width: 800 mm Height: 2,000 mm Depth: 800 mm	
3.4.11.4.10	Rack mount size	482.6 mm (19")	
3.4.11.4.11	Protection category according to IEC 60529	IP 54 Enclosure components and parts	
3.4.11.4.12	enclosure	frame with doors and roof plate	
3.4.11.4.13	Sheet steel side panels	Two (2)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.11.4.14	Glazed aluminium door at the front, 180° hinges	One (1)	
3.4.11.4.15	Lock front and rear: Comfort handle for profile half-cylinders and security lock each with at least two keys	Two (2)	
3.4.11.4.16	Mounting angles, 482.6 mm (19") with variable depth and width	Four (4)	
3.4.11.4.17	Spacers, height 50 mm, to raise a cover plate above the fan cut-out in the roof plate,	lot	
3.4.11.4.18	482.6 mm (19") fastener, 1 U, conductive	≥12	
3.4.11.4.19	Multi-tooth screws, conductive	≥25	
3.4.11.4.20	IPPC wooden pallet	lot	
3.4.11.4.21	Roof plate, solid multi-piece, with fan cut outs	lot	
3.4.11.4.22	Sheet steel rear door, solid, vertically divided, 180° hinges	lot	
3.4.11.4.23	100mm base plate (plinth)	Lot	
3.4.11.4.24	Cable ducts horizontal 60mm x 80mm and 100mmX80mm, quantity as per design	Lot, as per design	
3.4.11.4.25	Sheet steel horizontal Punched section with mounting flange for device mounting	≥8	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
3.4.11.4.26	DIN rails	Lot, as per design	
3.4.11.4.27	Sheet steel Side Pieces between 19-inch mounting rail side wall	Two (2)	
3.4.11.4.28	1U sheet steel blanking plates	Lot, as per design	
3.4.11.4.29	Solid sheet steel glanding plate with factory punched cable glanding holes	Two (2)	
3.4.11.4.30	Electrical and other accessories	As per the scope of supply	

## 4. PARTICULAR TECHNICAL SPECIFICATIONS – CONTROL CENTERS HARDWARE

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.1	GENERAL REQUIREMENTS & INFORMATION	Bidder shall comply to the general requirements as per the specifications in clause 4.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
4.2	<b>FUNCTIONAL REQUIREMENTS</b>		
4.2.1	General requirements	Bidder shall provide all the systems and services as detailed in the general requirements clause 4.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
4.2.2	Server Virtualization requirements	Bidder shall provide server virtualization as detailed in clause 4.2.2 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
4.2.3	Operating systems for SCADA and Other Applications	Bidder shall provide Operating systems for SCADA and Other Applications as detailed in clause 4.2.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.2.4	SCADA system Administration and Management requirements	Bidder shall provide SCADA system Administration and Management requirements as detailed in clause 4.2.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
4.2.5	Data Storage and Backup requirements	Bidder shall provide Data Storage and Backup requirements as detailed in clause 4.2.5 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
4.3	<b>DESIGN &amp; ARCHITECTURE REQUIREMENTS</b>		
4.3.1	General Requirements	Control centre architecture shall meet all requirements as detailed in the general requirements clause 4.3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
4.3.2	Overall Architecture	Bidder shall provide Overall Architecture requirements as detailed in clause 4.3.2 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
4.3.3	Gitaru & Kamburu Control Centres Architecture	Bidder shall provide Gitaru & Kamburu Control Centres Architecture requirements as	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		detailed in clause 4.3.3 of procuring entity requirements <i>(Bidder to state compliance to these                      requirements and indicate any                      deviations)</i>	
4.3.4	Hardware Architecture	Bidder shall provide Hardware Architecture requirements as detailed in clause 4.3.4 of procuring entity requirements <i>(Bidder to state compliance to these                      requirements and indicate any                      deviations)</i>	
4.3.5	Local Area Network Architecture	Bidder shall provide Local Area Network Architecture requirements as detailed in clause 4.3.5 of procuring entity requirements <i>(Bidder to state compliance to these                      requirements and indicate any                      deviations)</i>	
4.3.6	Software Architecture	Bidder shall provide Software Architecture requirements as detailed in clause 4.3.6 of procuring entity requirements <i>(Bidder to state compliance to these                      requirements and indicate any                      deviations)</i>	
4.3.7	Data Storage and Back up Architecture	Bidder shall provide Data Storage and Back up Architecture requirements as detailed in clause 4.3.7 of procuring entity requirements <i>(Bidder to state compliance to these                      requirements and indicate any                      deviations)</i>	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.3.8	Performance Requirements	Bidder shall provide and design systems to meet Performance requirements as detailed in clause 4.3.8 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4</b>	<b>EQUIPMENT SPECIFICATIONS</b>		
<b>4.4.1</b>	<b>Gitaru Production Host Servers Specifications</b>		
4.4.1.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 4.4.1.1 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.1.2</b>	<b>Minimum specifications</b>		
4.4.1.2.1	Processor type	Intel® Xeon® Gold series or Intel® Xeon® Platinum series <i>(Bidder to state exact model on offer)</i>	
4.4.1.2.2	No of processors & sockets	≥One (1)	
4.4.1.2.3	No of cores on each processor	≥Eighteen (18)	
4.4.1.2.4	No of threads on each processor	≥Thirty-six (36)	
4.4.1.2.5	Processor Base Frequency	≥ 3.0GHz	
4.4.1.2.6	Processor L3 Cache	≥ 39MB	
4.4.1.2.7	Ultra-Path Interconnect links	3@11.2 GT/s	
4.4.1.2.8	Processor TDP	≤220W	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.1.2.9	Maximum Memory Speed supported by processor	≥ 3200 MHz	
4.4.1.2.10	Number of RAM slots	≥ Twenty-four (24)	
4.4.1.2.11	Installed RAM type	DDR4, RDIMM, ECC	
4.4.1.2.12	Installed RAM Speed	≥3200MT/s	
4.4.1.2.13	No of installed RAM modules	≥Eight (8)	
4.4.1.2.14	Size of each Installed RAM module	≥ 32GB	
4.4.1.2.15	Total installed RAM	≥ 256GB	
4.4.1.2.16	Storage drives bay:	≥8 SFF chassis on the front side, for hot swappable drives	
4.4.1.2.17	RAID & Storage controller	≥12GB/s SAS with mixed HDD & SSD support (Bidder to state exact controller model and type on offer)	
4.4.1.2.18	Type of installed drives Hot plug	SFF, SAS, 12G, 2.5-inch, mixed use SSD drives	
4.4.1.2.19	Size of each installed SSD drives	≥ 960GB	
4.4.1.2.20	Number of installed SSD drives	≥ Two (2)	
4.4.1.2.21	Total SSD storage size	≥ 1.92TB	
4.4.1.2.22	SSD cell type	SLC or eMLC	
4.4.1.2.23	SSD minimum endurance rating	≥ 3 DWPD (writes per day) & ≥ 5256 TBW (Terabytes Written) i.e Five-year guarantee at three drive writes per day	
4.4.1.2.24	Optical drive	One (1) DVD+/-RW drive	
4.4.1.2.25	Network controllers	≥Two (2) quad port 10Gb Base-T Ethernet controller and	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		≥One (1) four port 1Gb Base-T Ethernet controller <i>(Bidder to state exact controllers' model and type on offer)</i>	
4.4.1.2.26	Total number 10Gb Base-T Ethernet ports (RJ45)	≥Eight (8)	
4.4.1.2.27	Total number 1Gb Base-T Ethernet ports (RJ45)	≥Four (4)	
4.4.1.2.28	PCIE Expansion slots- PCIe X8, X16	≥ Eight (8)	
4.4.1.2.29	USB ports	≥ Two (2) rear ports & ≥ Two (2) front ports	
4.4.1.2.30	USB 3.0 ports	≥ Two (2)	
4.4.1.2.31	Video ports	≥ one (1) DVI/DP/VGA rear port and ≥ one (1) 1 VGA/HDMI/DP front port <i>(The chosen ports MUST be supported by the KVM switch offered. Bidder to state the exact ports on offered server)</i>	
4.4.1.2.32	Power supply type	Hot plug, dual redundant power supply (1+1)	
4.4.1.2.33	Number of hot plug Power supply units	Two (2)	
4.4.1.2.34	Power rating of each power supply unit	≥ 1100W	
4.4.1.2.35	Power input rating	220-240V AC, 50Hz	
4.4.1.2.36	Power supply Cord	C13 to C14, PDU Style	
4.4.1.2.37	Mounting	Rack type	
4.4.1.2.38	Form factor (fully configured)	1U or 2U	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.1.2.39	Operating temperature without derating	0 to 35°C continuous	
4.4.1.2.40	Mounting accessories	Rack rails and cable management arm to be provided	
4.4.1.2.41	Manufacturer Warranty	3 years parts, and 3 years basic support	
4.4.1.2.42	Virtualisation software	As detailed in scope of supply and bill of materials	
4.4.1.2.43	Windows server licenses type	Perpetual Volume licenses only <i>(OEM or FPP and subscription licenses are not acceptable)</i>	
4.4.1.2.44	Windows Server licenses to be supplied	As detailed in scope of supply and bill of materials	
4.4.1.3	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 4.4.1.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and attach product certificates)</i>	
<b>4.4.2</b>	<b>Network Attached Storage Server Specifications</b>		
4.4.2.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 4.4.2.1 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.2.2</b>	<b>Minimum specifications</b>		
4.4.2.2.1	Processor type	Intel® Xeon® scalable series <i>(Bidder to state exact model on offer)</i>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.2.2.2	No of processors & sockets	≥One (1)	
4.4.2.2.3	No of cores on each processor	≥Ten (10)	
4.4.2.2.4	No of threads on each processor	≥Twenty (20)	
4.4.2.2.5	Processor Base Frequency	≥ 2.2GHz	
4.4.2.2.6	Processor L3 Cache	≥ 13.75MB	
4.4.2.2.7	Processor Ultra-Path Interconnect links	≥ 2@10.4 GT/s	
4.4.2.2.8	Processor TDP	≤100W	
4.4.2.2.9	Maximum Memory Speed supported by processor	≥ 2400 MHz	
4.4.2.2.10	Number of RAM slots	≥ Twenty-four (24)	
4.4.2.2.11	Installed RAM type	DDR4, ECC	
4.4.2.2.12	Installed RAM Speed	≥2400MT/s	
4.4.2.2.13	No of installed RAM modules	≥Two (2)	
4.4.2.2.14	Size of each Installed RAM module	≥ 32GB	
4.4.2.2.15	Total installed RAM	≥ 64GB	
4.4.2.2.16	Storage drives bay	≥ 24 SFF chassis on the front side, for hot swappable drives	
4.4.2.2.17	RAID & Storage controller	12GB/s SAS with mixed HDD & SSD support <i>(Bidder to state exact controller model and type on offer)</i>	
4.4.2.2.18	Type of installed SSD drives (for operating system)	Hot plug SFF, SAS, 12G, 2.5-inch, mixed use SSD	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.2.2.19	Size of each installed SSD drives	≥ 400GB	
4.4.2.2.20	Number of installed SSD drives	≥ Two (2)	
4.4.2.2.21	Total SSD storage size (for operating system)	≥ 800 GB	
4.4.2.2.22	SSD cell type	SLC or eMLC	
4.4.2.2.23	SSD minimum endurance rating	≥ 1 DWPD (writes per day)	
4.4.2.2.24	Installed HDD Type and speed	10K RPM, SAS 12Gbps 512n, 2.5in Hot-plug SFF Hard Drive	
4.4.2.2.25	Size of each installed RAID 5 HDD drives	≥ 2.4 TB	
4.4.2.2.26	Number of installed RAID 5 HDD drives	≥ Twelve (12)	
4.4.2.2.27	Total HDD storage size	≥ 24 TB	
4.4.2.2.28	SAS 12Gbps Host bus adapter ports for external storage connection	≥Two (2)	
4.4.2.2.29	Network controllers	≥ Two (2) quad port 10Gb Base-T controller ≥ one (1) quad port 1Gb Base-T Ethernet controller <i>(Bidder to state exact controllers' model and type on offer)</i>	
4.4.2.2.30	Total number 10Gb Base-T Ethernet ports (RJ45)	≥Eight (8)	
4.4.2.2.31	Total number 1Gb Base-T Ethernet ports (RJ45)	≥Four (4)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.2.2.32	PCIE Expansion slots- PCIe X8, X16	≥ Eight (8)	
4.4.2.2.33	USB ports	≥ Two (2) rear ports & ≥ Two (2) front ports	
4.4.2.2.34	USB 3.0 ports	≥ Two (2)	
4.4.2.2.35	Video ports	≥ one (1) DVI/DP rear port and ≥ one (1) 1 VGA/HDMI/DP front port <i>(The chosen ports MUST be supported by the KVM switch offered. Bidder to state the exact ports on offered server)</i>	
4.4.2.2.36	Power supply type	Hot plug, dual redundant power supply (1+1)	
4.4.2.2.37	Number of hot plug Power supply units	Two (2)	
4.4.2.2.38	Power rating of each power supply unit	≥ 700W	
4.4.2.2.39	Power input rating	220-240V AC, 50Hz	
4.4.2.2.40	Power supply Cord	C13 to C14, PDU Style	
4.4.2.2.41	Mounting	Rack type	
4.4.2.2.42	Form factor (fully configured)	1U or 2U	
4.4.2.2.43	Operating temperature without derating	0 to 35°C continuous	
4.4.2.2.44	Mounting accessories	Rack rails and cable management arm to be provided	
4.4.2.2.45	Operating system	OEM Windows storage server 2019	
4.4.2.2.46	Windows storage Server® 2019 perpetual volume Client Access Licenses (CAL)	≥ten (10)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.2.2.47	Manufacturer Warranty	3 years parts, and 3 years basic support	
<b>4.4.2.3</b>	<b>External LTO Tape-Based Storage</b>		
4.4.2.3.3.1	External Tape Backup type	≥LTO-8	
4.4.2.3.3.2	Native Capacity	≥ 12TB	
4.4.2.3.3.3	Native transfer rate per half-height drive (1080GB/hr)	≥300MB/s	
4.4.2.3.3.4	native transfer rate per full-height drive (1296GB/hr)	≥360MB/s	
4.4.2.3.3.5	Hardware encryption Device-level	AES-256	
4.4.2.3.3.6	LTFS	Capable	
4.4.2.3.3.7	SAS interface	≥6Gb/s	
4.4.2.3.3.8	Compression	2.5:1	
4.4.2.3.3.9	Serial Attached SCSI (SAS) Cables, 6Gb Mini to HD-Mini SAS Cable, 5M	≥Two (2)	
4.4.2.3.3.10	LTO Ultrium 8 Media Cartridge	≥12TB Native / ≥30TB Compressed	
4.4.2.3.3.11	LTO Tape Cleaners	≥one (1)	
4.4.2.3.3.12	No of tapes (cartridges)	≥ten (10)	
4.4.2.3.3.13	Power input rating 220-240V AC, 50Hz		
4.4.2.3.3.14	Power supply Cord	C13 to C14, PDU Style	
4.4.2.3.3.15	Operating temperature without derating	0 to 35°C continuous	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.2.3.3.16	Manufacturer Warranty	≥3 years	
4.4.2.4	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 4.4.2.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and attach product certificates)</i>	
<b>4.4.3</b>	<b>Management Host Servers &amp; CDC Production Host Servers Specifications</b>		
4.4.3.1	General requirements	Bidder shall comply to the general requirements as per the specifications in clause 4.4.3.1 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.3.2</b>	<b>Minimum specifications</b>		
4.4.3.2.1	Processor type	Intel® Xeon® <i>(Bidder to state exact model on offer)</i>	
4.4.3.2.2	No of processors & sockets	≥One (1)	
4.4.3.2.3	No of cores on each processor	≥Eight (8)	
4.4.3.2.4	No of threads on each processor	≥Sixteen (16)	
4.4.3.2.5	Processor Base Frequency	≥ 3.2GHz	
4.4.3.2.6	Processor L3 Cache	≥ 16MB	
4.4.3.2.7	Processor TDP	≤100W	
4.4.3.2.8	Maximum Memory Speed supported by processor	≥3200 MHz	
4.4.3.2.9	Number of RAM slots	≥Four (4)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.3.2.10	Installed RAM type	DDR4, ECC	
4.4.3.2.11	Installed RAM Speed	≥3200MT/s	
4.4.3.2.12	No of installed RAM modules	≥Two (2) for management hosts ≥Four (4) for production hosts	
4.4.3.2.13	Size of each Installed RAM module	≥ 32GB	
4.4.3.2.14	Total installed RAM	≥ 64GB for management hosts ≥ 128GB for production hosts	
4.4.3.2.15	Storage drives bay	≥8 SFF chassis on the front side, for hot swappable drives	
4.4.3.2.16	RAID & Storage controller	≥12GB/s SAS with mixed HDD & SSD support (Bidder to state exact controller model and type on offer)	
4.4.3.2.17	Type of installed drives	Hot plug SFF, SAS, 12G, 2.5-inch, mixed use SSD drives	
4.4.3.2.18	Installed SSD cell type	SLC or eMLC	
4.4.3.2.19	Size of each installed SSD drives	≥ 960GB	
4.4.3.2.20	Number of installed SSD drives	≥ Two (2)	
4.4.3.2.21	Total SSD storage size	≥ 1.92TB	
4.4.3.2.22	SSD minimum endurance rating	≥ 3 DWPD (drive writes per day) & ≥ 5256 TBW (Terabytes Written) i.e Five-year guarantee at three drive writes per day	
4.4.3.2.23	Video ports	≥ one (1) VGA/DVI/DP/HDMI ports. (The chosen ports MUST be supported by the KVM switch offered. Bidder to state the exact ports on offered server)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.3.2.24	Maximum native video resolution supported	≥1600 x 1200	
4.4.3.2.25	Network controller	≥ One (1) 1Gb/10Gb base-T four port Ethernet port Controller. ≥ One (1) 10Gb base-T four port Ethernet port Controller. <i>(Bidder to state exact controller model, configuration, and type on offer)</i>	
4.4.3.2.26	Gigabit Ethernet ports (RJ45)	≥Four (4)	
4.4.3.2.27	Total number 10Gb Base-T Ethernet ports (RJ45)	≥Four (4)	
4.4.3.2.28	PCIE Expansion slots- PCIe X8, X16	≥Three (3)	
4.4.3.2.29	USB ports	≥ Two (2) rear ports & ≥ Two (2) front ports	
4.4.3.2.30	USB 3.0 ports	≥ One (1)	
4.4.3.2.31	Power supply type	Hot plug, dual redundant power supply (1+1)	
4.4.3.2.32	Number of hot plug Power supply units	Two (2)	
4.4.3.2.33	Power rating of each power supply unit	≥ 600W	
4.4.3.2.34	Power input rating	220-240V AC, 50Hz	
4.4.3.2.35	Power supply Cord	C13 to C14, PDU Style	
4.4.3.2.36	Mounting	Rack type	
4.4.3.2.37	Form factor (fully configured)	1U or 2U	
4.4.3.2.38	Operating temperature without derating	0 to 35°C continuous	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.3.2.39	Mounting accessories	Rack rails and cable management arm to be provided	
4.4.3.2.40	Manufacturer	Warranty 3 years parts, and 3 years basic support	
4.4.3.2.46	Windows server licenses type	Perpetual Volume licenses only OEM or FPP and subscription licenses are not acceptable	
4.4.3.2.47	Windows server licenses to be supplied	As detailed in scope of supply and bill of materials	
4.4.3.3	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 4.4.3.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and attach product certificates)</i>	
<b>4.4.4</b>	<b>Cabinets &amp; Accessories</b>		
4.4.4.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 4.4.4.1 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.4.2</b>	<b>Server Rack minimum specifications</b>		
4.4.4.2.2.1	Overall requirements, wiring and workmanship	As per tender clause 2.7.2	
4.4.4.2.2.2	Material	Sheet steel, $\geq 1.5\text{mm}$	
4.4.4.2.2.3	Surface treatment	Powder coats At least three coats, $\geq 90\text{-micron}$ thickness	
4.4.4.2.2.4	Mounting position of the 482.6 mm (19") level	front and rear	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.4.2.2.5	Colour	RAL 7035	
4.4.4.2.2.6	Load capacity	≥15,000 N	
4.4.4.2.2.7	IK Code	IK08	
4.4.4.2.2.8	Panel Size	42U	
4.4.4.2.2.9	Dimensions	Width 600 mm Height: 2,000 mm Depth: 1000 mm	
4.4.4.2.2.10	Rack mount size	482.6 mm (19") Enclosure components and parts	
4.4.4.2.2.12	Enclosure frame with doors and roof plate	lot	
4.4.4.2.2.13	Sheet steel side panels	Two (2)	
4.4.4.2.2.14	Sheet steel door at the front, vented (vented surface area approx. 85% perforated), 180° hinges	One (1)	
4.4.4.2.2.15	Lock front and rear: Comfort handle for profile half-cylinders and security lock each with at least two keys	Two (2)	
4.4.4.2.2.16	Mounting angles, 482.6 mm (19") with variable depth and width	Four (4)	
4.4.4.2.2.17	Spacers, height 50 mm, to raise a cover plate above the fan	lot	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
	cut-out in the roof plate,		
4.4.4.2.2.18	482.6 mm (19") fastener, 1 U, conductive	≥12	
4.4.4.2.2.19	Multi-tooth screws, conductive	≥25	
4.4.4.2.2.20	IFPC wooden pallet	lot	
4.4.4.2.2.21	Roof plate, solid multi-piece, with fan cut outs	lot	
4.4.4.2.2.22	Sheet steel rear door, vented (vented surface area approx. 85% perforated) vertically divided, 180° hinges	lot	
4.4.4.2.2.23	100mm base plate (plinth)	Lot	
4.4.4.2.2.24	Cable ducts horizontal 60mm x 80mm and 100mmX80mm, quantity as per design	Lot, as per design	
4.4.4.2.2.25	Sheet steel horizontal Punched section with mounting flange for device mounting and frame reinforcement	≥6	
4.4.4.2.2.26	DIN rails	Lot, as per design	
4.4.4.2.2.27	Sheet steel Side Pieces between 19-	Two (2)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
	inch mounting rail side wall		
4.4.4.2.2.28	1U sheet steel blanking plates	Lot, as per design	
4.4.4.2.2.29	Solid sheet steel glanding plate with factory punched cable glanding holes	Two (2)	
4.4.4.2.2.30	Electrical and other accessories	As per the scope of supply	
<b>4.4.5</b>	<b>Rack Console KVM switch</b>		
4.4.5.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 4.4.5.1 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.5.2</b>	<b>Minimum specifications</b>		
4.4.5.2.1	Secondary Console Ports	≥Two (2) USB ≥One (1) video (DVI/VGA/DP/HDMI)	
4.4.5.2.2	External USB Mouse Ports	≥one (1)	
4.4.5.2.3	Number of KVM Ports (RJ-45 Female)	≥Eight (8)	
4.4.5.2.4	LAN Ethernet Ports (RJ45)	≥one (1)	
4.4.5.2.5	Port selection Push buttons	≥Eight (8)	
4.4.5.2.6	Port online status LEDs	≥Eight (8)	
4.4.5.2.7	Port selected status LEDs	≥Eight (8)	
4.4.5.2.8	Ethernet status LED	Two (2)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.5.2.9	Console power status LED	one (1)	
4.4.5.2.10	LCD power status LED	one (1)	
4.4.5.2.11	KVM cable console connector	one (1) RJ45 male	
4.4.5.2.12	KVM cable type	Cat5e/6/7	
4.4.5.2.13	KVM cable length	≥2m	
4.4.5.2.14	KVM host adapter cable connectors	<ul style="list-style-type: none"> <li>• Two (2) USB and</li> <li>• One (1) video (DVI/DP)</li> <li>• Video connector to be compatible with the server &amp; workstation video ports</li> </ul>	
4.4.5.2.15	KVM cables to be supplied for each Console unit	≥Eight (8) <i>(Unutilised cables to be provided as spares)</i>	
4.4.5.2.16	LCD Monitor Panel size	19.0 inch	
4.4.5.2.17	LCD Monitor Maximum resolution	≥ 1280 x 1024@75Hz	
4.4.5.2.18	LCD Monitor brightness	≥250cd/m <sup>2</sup>	
4.4.5.2.19	LCD Monitor Contrast ratio	≥1000:1	
4.4.5.2.20	LCD Monitor Viewing angle	≥170°(V) / 160°(H)	
4.4.5.2.21	LCD Monitor Display colours	≥16. 7 M (True 8bit)	
4.4.5.2.22	Power supply Internal	220-240V AC, 50Hz power supply unit.	
4.4.5.2.23	Power supply Cord	C13 to C14, PDU style	
4.4.5.2.24	Operating temperature without derating	0 to 40°C continuous	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.5.2.25	Enclosure & support brackets	Robust steel construction.	
4.4.5.2.26	Mounting type	1U rack	
4.4.5.2.27	Mounting accessories	Rack slide rails to be provided	
4.4.5.2.28	Manufacturer warranty	≥three (3) years	
4.4.5.3	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 4.4.5.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.6</b>	<b>Thin Client PC</b>		
4.4.6.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 4.4.6.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.6.2</b>	<b>Minimum specifications</b>		
4.4.6.2.1	Processor cores/Threads	≥ Two (2)/Four (4)	
4.4.6.2.2	Processor Base Frequency	≥ 2.4GHz	
4.4.6.2.3	Processor Cache	≥ 4MB	
4.4.6.2.4	Processor TDP	≤25W	
4.4.6.2.5	Operating system	OEM Windows 10/11 IoT Enterprise LTSC	
4.4.6.2.6	RAM type	≥DDR4-2400	
4.4.6.2.7	Size of Installed RAM	≥ 8GB	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.6.2.8	Type of secondary storage	eMLC, NAND flash memory	
4.4.6.2.9	Size of secondary storage	≥ 64GB	
4.4.6.2.10	Flash memory Endurance	≥100 TBW (Terabytes written)	
4.4.6.2.11	Graphics Memory size	≥1024 MiB (Separate or in RAM)	
4.4.6.2.12	GPU clock	≥1000MHz	
4.4.6.2.13	Video ports	≥ Two (2) DVI/DP/HDMI ports	
4.4.6.2.14	Maximum video resolution supported on each video port	≥3840 x 2160 @ 60 Hz	
4.4.6.2.15	Supported Display outputs	≥ Two (2) @ 3840 x 2160 resolution (Minimum of dual display output)	
4.4.6.2.16	Gigabit Ethernet ports (RJ45)	≥One (1)	
4.4.6.2.17	USB ports	≥ Two (2) rear ports & ≥ Four (4) front ports	
4.4.6.2.18	USB 3.0 ports	≥ Two (2)	
4.4.6.2.19	Audio	Internal amplified speaker system	
4.4.6.2.20	Audio ports	standard 3.5mm line in and line out ports	
4.4.6.2.21	Type of Power supply units	External	
4.4.6.2.26	Power rating of power supply unit	≥ 65W	
4.4.6.2.27	Power input rating	220-240V AC, 50Hz	
4.4.6.2.28	Power supply Cord	C13/C14 to BS1363(IEC type G-British type) plug or C13 to C14 for panel mount applications	
4.4.6.2.29	Mounting	Desktop or panel mount	
4.4.6.2.36	Device Cooling	Natural, heat sink or solid state	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		fan less	
4.4.6.2.37	Continuous operating ambient temperature	10° C to +35°C	
4.4.6.2.38	Operating Relative Humidity (non-condensing)	10 to 85%	
4.4.6.2.39	Operating altitude without derating	≥1000 m	
4.4.6.2.30	Supported remote desktop protocols	(i) Microsoft: Remote FX (RFX), RDP (ii) VMware®: RDP, PCoIP	
4.4.6.2.31	Preinstalled Software applications	(i) Microsoft Remote Desktop Client (ii) VMware™ Horizon View™ Client (iii) Microsoft firewall (iv) Windows defender (v) Internet Explorer	
4.4.6.2.32	Manufacturer Warranty	≥3 years	
4.4.6.3	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 4.4.6.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and attach product certificates)</i>	
4.4.7	<b>27.0 Inch LED backlit LCD monitor</b>		
4.4.7.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 4.4.7.1 of procuring entity requirements	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.7.2</b>	<b>Minimum Specifications</b>		
4.4.7.2.1	Panel size	27.0 inch (68.5 cm)	
4.4.7.2.2	Native resolution	≥ 2560 x 1440	
4.4.7.2.3	brightness	≥350cd/m <sup>2</sup>	
4.4.7.2.4	Contrast ratio	≥1000:1	
4.4.7.2.5	Viewing angle	≥170°(V) / 160°(H)	
4.4.7.2.6	Display colours	≥16. 7 M (True 8bit)	
4.4.7.2.7	Number of Video input ports	≥ Three (3)	
4.4.7.2.8	Type of Video input ports	HDMI DP DVI <i>Shall have at least one of each type</i>	
4.4.7.2.9	Audio Speakers	≥2W x 2 stereo	
4.4.7.2.10	Audio inputs and outputs	One 3.5mm audio in and one 3.5mm audio out	
4.4.7.2.11	Display tilt	-5° ~ +20°	
4.4.7.2.12	Swivel (angle)	+60° ~ -60°	
4.4.7.2.13	Pivot (angle/direction)	90 ° (clockwise)	
4.4.7.2.14	Height adjustment	0-120mm	
4.4.7.2.15	Power supply Internal	220-240V AC, 50Hz power supply unit	
4.4.7.2.16	Power supply Cord	C13/C14 to BS1363(IEC type G-British type) plug	
4.4.7.2.17	Operating temperature	0 to 40°C continuous	
4.4.7.2.18	Base and support brackets	Robust steel construction.	
4.4.7.2.19	Manufacturer warranty	Three (3) years	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.7.3	Product Certifications	Bidder shall comply to the requirements as per the specifications in clause 4.4.7.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.8</b>	<b>65.0 Inch LED / IPS backlit Display</b>		
4.4.8.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 4.4.8.1 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.8.2</b>	<b>Minimum Specifications</b>		
4.4.8.2.1	Screen Size	≥ 65"	
4.4.8.2.2	Panel Technology	IPS	
4.4.8.2.3	Back Light Type	Direct	
4.4.8.2.4	Aspect Ratio	16:9	
4.4.8.2.5	Native Resolution	≥ 3840 x 2160 (UHD)	
4.4.8.2.6	Refresh Rate	50 Hz	
4.4.8.2.7	Brightness	≥ 400 nits	
4.4.8.2.8	Contrast Ratio	1,200:1	
4.4.8.2.9	Dynamic CR	1,000,000:1	
4.4.8.2.10	Colour gamut DCI	≥ 80%	
4.4.8.2.11	Viewing Angle (H x V)	178° x 178°	
4.4.8.2.12	Colour Depth	≥ 1.07 Billion colours (8 bit + FRC)	
4.4.8.2.13	Response Time (Gray to Gray)	≤ 8 ms	
4.4.8.2.14	Surface Treatment (Haze)	≤ 1%	
4.4.8.2.15	Lifetime (Min)	≥ 50,000 Hrs	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.8.2.16	Operation Hours (Hours/Day)	24/7	
4.4.8.2.17	Portrait / Landscape	Portrait & Landscape	
4.4.8.2.18	Digital / HDMI	Yes (3), HDCP2.2/1.4	
4.4.8.2.19	External Control RS232C IN / OUT	≥ 1 ≥1 (4-pin RJ11)	
4.4.8.2.20	External Control RJ45(LAN)	≥ 1	
4.4.8.2.21	USB	≥ USB2.0 Type A (2)	
4.4.8.2.22	Audio Out	≥ 1	
4.4.8.2.23	Built-in Speaker	≥ 1	
4.4.8.2.24	Internal Memory	≥ 8GB	
4.4.8.2.25	Wi-Fi Built-in	Yes	
4.4.8.2.26	Sensor Temperature Sensor	Yes	
4.4.8.2.27	Auto Brightness sensor	Yes	
4.4.8.2.28	Local Key Operation	Yes (Power On/Off only)	
4.4.8.2.29	USB Plug & Play	≥ 1	
4.4.8.2.30	Content Share	Yes	
4.4.8.2.31	Video Tag	≥ 4, Max One HDMI input	
4.4.8.2.32	Play via URL	Yes	
4.4.8.2.33	Rotation Screen Rotation	Yes	
4.4.8.2.34	External Input Rotation	Yes	
4.4.8.2.35	Gapless Playback	Yes	
4.4.8.2.36	Setting Data Cloning	Yes	
4.4.8.2.37	SNMP	Yes	
4.4.8.2.38	ISM Method	Yes	
4.4.8.2.39	3rd Party Compatibility	Yes	
4.4.8.2.40	Smart Energy Saving	Yes	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.8.2.41	Operation Temperature	0°C to 40°C	
4.4.8.2.42	Operation Humidity	10% to 80%	
4.4.8.2.43	Power Supply	240 Vac, 50Hz	
4.4.8.2.44	Power Type Built-In Power	Typ. 130W Max. 185W	
4.4.8.2.45	BTU (British Thermal Unit)	≤ 819BTU/Hr	
4.4.8.2.46	FCC (EMC) Certification	Class A	
4.4.8.2.47	ErP(Environmental) Certification	Yes	
4.4.8.2.48	Accessories	Remote Control (Battery 2ea) Power Cord, Regulation Book Phone to D-Sub9 Gender Stand Cable Holder	
4.4.8.2.49	Manufacturer warranty	Three (3) years	
<b>4.4.8.3</b>	<b>Wireless presentation system</b>		
4.4.8.3.1- 4.4.8.3.5	General requirements	Offered equipment shall comply to the requirements as per the specifications in clause 4.4.8.3 of procuring entity requirements  <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
4.4.8.3.6.1	Operating system Windows (supported)	<ul style="list-style-type: none"> <li>• 7/8/8.1/10/11 32 &amp; 64 bit</li> <li>• macOS 10.14/10.15</li> <li>• Android 9 &amp; 10</li> <li>• iOS 11, 12 &amp; 13</li> </ul>	
4.4.8.3.6.2	Video outputs	≥1 HDMI 1.2	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.8.3.6.3	Output resolution	1920x1080 @60Hz	
4.4.8.3.6.4	Audio Via	<ul style="list-style-type: none"> <li>• HDMI</li> <li>• Analog via Audio Jack 3.5mm</li> <li>• S/PDIF</li> </ul>	
4.4.8.3.6.5	Frame rate	≤ 30fps	
4.4.8.3.6.6	Number of sources simultaneous on screen	2	
4.4.8.3.6.7	Number of simultaneous connections	16	
4.4.8.3.6.8	Authentication protocol	WPA2-PSK in stand-alone mode	
4.4.8.3.6.9	Wireless transmission protocol	IEEE 802.11 a/g/n	
4.4.8.3.6.10	Reach	≤ 30m (100 ft) in between devices	
4.4.8.3.6.11	Frequency band	<ul style="list-style-type: none"> <li>• 2.4 GHZ</li> <li>• 5 GHz</li> </ul>	
4.4.8.3.6.12	Connections	≥1 Ethernet LAN 100Mbit ≥3 USB ≥1 Audio analog line out on mini jack socket (3.5mm) ≥1 digital S/PDIF	
4.4.8.3.6.13	Noise Level	Fan less	
4.4.8.3.6.14	Anti-theft	system Kensington lock	
4.4.8.3.6.15	Certifications	FCC/CE	
4.4.8.3.6.16	Power supply Standard	220VAC plug	
4.4.8.3.6.17	Operating temperature	0 to 40°C continuous	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.8.3.6.18	Humidity Storage	0 to 90% relative humidity, non-condensing	
4.4.8.3.6.19	Manufacturer warranty	Three (3) years	
4.4.8.4	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 4.4.8.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.9</b>	<b>Dual display KVM switch</b>		
4.4.9.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 4.4.9.1 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.9.2</b>	<b>Minimum specifications</b>		
4.4.9.2.1	Number of host computer input connections	≥ Two (2)	
4.4.9.2.2	Number of video inputs	≥ Four (4) <i>(two dual display inputs)</i>	
4.4.9.2.3	Number of displays supported	≥ Two (2) <i>(dual display support)</i>	
4.4.9.2.4	Maximum video resolution supported	≥3840 x 2160 @60Hz	
4.4.9.2.5	Type of display ports supported by the switch.	DVI or DP or HDMI <i>(The type of video input and output ports MUST be compatible with the thin client's video outputs, bidder to specify ports on offer)</i>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
4.4.9.2.6	Number USB input ports	≥ two (2), one per PC input.	
4.4.9.2.7	Number of USB console ports on the KVM switch for connection of keyboard, mouse and other peripherals	≥ Four (4)	
4.4.9.2.8	USB type supported	USB 2.0 & USB 1.1 must be supported	
4.4.9.2.9	Output (console) Audio terminals	Two (2) 3.5mm audio in out jack ports	
4.4.9.2.10	Input (host) Audio terminals	Four (4) 3.5mm audio in and out jack ports	
4.4.9.2.11	Port selection	Hotkey, Pushbutton	
4.4.9.2.12	LEDs input online /Selected	Two (2) one for each host with colour status	
4.4.9.2.13	Power supply	220-240V AC, 50Hz internal or external power supply unit.	
4.4.9.2.14	Power supply Cord	C13/C14 to BS1363(IEC type G-British type) plug	
4.4.9.2.15	Operating temperature	0 to 40°C continuous	
4.4.9.2.16	Casing/Enclosure	Robust steel construction.	
4.4.9.2.17	Mounting	Desktop	
4.4.9.2.18	Manufacturer warranty	Three (3) years	
4.4.9.3	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 4.4.9.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
<b>4.4.10</b>	<b>KVM Extenders - Receiver &amp; Transmitter</b>		
4.4.10.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 4.4.9.1 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>4.4.10.2</b>	<b>Minimum specifications</b>		
4.4.10.2.1	Maximum video resolution supported	≥3840 x 2160 in dual display configuration.	
4.4.10.2.2	Number of video inputs on the transmitter unit and video outputs on the receiver unit	≥ Two (2) <i>(dual display support)</i>	
4.4.10.2.3	Type of display ports supported by the extender.	DVI or DP or HDMI <i>(The type of video input and output ports MUST be compatible with the KVM switch and the display units)</i>	
4.4.10.2.4	Number USB HID ports on the transmit unit	≥ one (1)	
4.4.10.2.5	Number of USB ports on the receiver unit for connection of keyboard, mouse and other peripherals	≥ Four (4)	
4.4.10.2.6	USB type supported	USB 2.0 & USB 1.1 must be supported	
4.4.10.2.7	Audio terminals on transmitter and receiver	3.5mm audio in, 3.5mm audio out	
4.4.10.2.8	Type of connection between the	Gigabit base-T ethernet	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
	transmitter and receiver		
4.4.10.2.9	Number of Gigabit ethernet ports on each KVM transmitter and receiver	≥ Two (2) <i>(Redundant gigabit ethernet support)</i>	
4.4.10.2.10	Type of Gigabit ethernet ports	RJ45	
4.4.10.2.11	Power supply	220-240V AC, 50Hz internal or external power supply unit.	
4.4.10.2.12	Power supply Cord	C13 to C14, PDU Style	
4.4.10.2.13	Operating temperature	0 to 40°C continuous	
4.4.10.2.14	Casing Robust	steel construction	
4.4.10.2.17	Mounting	DIN/panel/rack mount for Transmitter unit Desktop mount for receiver unit	
4.4.10.2.18	Manufacturer warranty	Three (3) years	
4.4.10.3	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 4.4.10.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
4.4.11	Other Operator workstation Accessories	Bidder shall provide all specified accessories per workstation meeting requirements in clause 4.4.11 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	

## 5. PARTICULAR TECHNICAL SPECIFICATIONS ~ SCADA CYBER SECURITY

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
<b>5.1</b>	<b>General Requirements</b>		
5.1.2 & 5.1.3	Introduction and existing systems	Bidder shall comply to the general requirements as per the specifications in clause 5.1.2 and 5.1.3 <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>5.1.4</b>	<b>Technical Evaluation criteria for the cyber security solution</b>		
<b>5.1.4.1</b>	<b>Cyber security solution provider</b>		
5.1.4.1.3	Cyber security solution provider qualifications	Cyber security solution provider MUST demonstrate experience in design/development, deployment, and commissioning of ICS/OT cyber security projects for large industry or utility with at least five plants. Solutions provider MUST have completed at least three projects for large plants or utilities in the last eight years. Bidder shall provide documentary evidence in form of completion certificates or recommendation letters from at least three clients/employer as per the format given in the tendering forms for the solutions provider <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.1.4	The cyber security solutions provider personnel minimum qualifications and experience		

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
5.1.4.1.4 (a)	The cyber security solutions provider personnel minimum qualifications and experience	Degree in engineering or ICT related field <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.1.4 (b)	The cyber security solutions provider personnel minimum qualifications and experience	Cyber security certification such as Certified Information Systems Security Professional (CISSP) or equivalent <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.1.4 (c)	The cyber security solutions provider personnel minimum qualifications and experience	Provide documentary evidence of having carried out development (programming) and commissioning of industrial control applications for SCADA, HMI or PLC or other controllers for at least five years and carried out at least three projects. Recommendation letters from employer or clients must be provided. <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.1.4 (d)	The cyber security solutions provider personnel minimum qualifications and experience	Provide documentary evidence of having at least three years' experience in implementing ICS/OT cyber security project implementations including design, deployment, and commissioning. <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
5.1.4.1.4 (e)	The cyber security solutions provider personnel minimum qualifications and experience	Provide documentary evidence of having carried out at least three cyber security projects as the team lead for at least three firms with large industrial plants or utility plants. <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.1.4 (f)	The cyber security solutions provider personnel minimum qualifications and experience	Filled Personnel form and recommendation letters to be provided. Recommendation letters MUST be from employers or clients who can converse in English <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.1.5	Cyber security solution provider qualifications	The cyber security solutions provider shall be certified as partner, contractor or consultant by a leading cyber security vendor meeting the criteria in clause 5.1.4.2. Documentary evidence to be provided. <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.1.6	Cyber security solution provider qualifications	The cyber security solutions provider shall have experience carrying out cyber security compliance audits or risk audits or penetration tests for OT/ICS installations as per NERC CIP standards or ISO 27000 series standards or any other ISO or IEC standard. Bidder shall provide	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		documentary evidence in form of completion certificates or recommendation letters from at least two clients/employer as per the format given in the tendering forms <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.2	<b>Cyber security vendor</b>		
5.1.4.2.2	Cyber security equipment and services	All Cyber security equipment and services supplied under this tender MUST be from the same vendor <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.2.3(a)	Cyber security vendor qualification requirements	The cyber security solution vendor MUST have a minimum of 10 years in the security market. <i>(Bidder to attach and reference a publicly accessible document)</i>	
5.1.4.2.3 (b)	Cyber security vendor qualification requirements	The cyber security solution vendor MUST have a local office with local personnel capable of handling OT and IT security solutions maintenance and support <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.1.4.2.3 (c)	Cyber security vendor qualification requirements	The cyber security solution vendor MUST attach and reference at least five (5) published Gartner Magic Quadrant (MQ) reports over the last 5 years that show the vendor’s leadership positions in Enterprise	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		Network Firewalls. <i>(Bidder to attach at least five published reports)</i>	
5.1.4.2.3 (d)	Cyber security vendor qualification requirements	The cyber security solution vendor MUST attach and reference at least Three (3) published NSS labs NGFW test reports over the last 3 years that show the vendor’s solution/platform overall exploit block rate of over 98%. <i>(Bidder to attach at least three published reports)</i>	
5.1.4.2.3 (e)	Cyber security vendor qualification requirements	The cyber security solution vendor MUST attach and reference at least Two (2) published NSS Labs Breach Prevention reports over the last three years showing the vendors solution/platform has a security effectiveness of over 98%. <i>(Bidder to attach at least two published reports)</i>	
5.1.4.3	Cyber security Solution/Platform	Bidder MUST provide a cyber security solution/platform/system with the following features or functions: <ol style="list-style-type: none"> <li>1. Intrusion Prevention System (IPS)</li> <li>2. Application Control (deep packet inspection) with over 5,000 web 2.0 applications</li> <li>3. Threat Emulation with OS and CPU level inspection.</li> <li>4. Threat Extraction to scrub files of active content.</li> <li>5. URL Filtering supporting enforcement of timed access to sites and the ability to educate users.</li> <li>6. Anti-Bot and Anti-Virus.</li> </ol>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<p>Analysing over 200 million addresses for bots and more than 250,000 websites</p> <p>7. Anti-Spam and Email.</p> <p>8. IPsec VPN with support for multiple authentication options such as User Certificates, CAPI, one-time tokens, software and hardware smartcards</p> <p>9. Mobile Access, for SSL VPN access to corporate web applications</p> <p>10. Identity Awareness for visibility into users' and group activity.</p> <p>11. Management of security policies from a single pane of glass</p> <p>12. Governance Risk and Compliance monitoring and reporting.</p> <p><i>bidder shall attach a publicly accessible reference document confirming that the proposed security solution meets all the requirements</i></p>	
5.1.3	Scope of works	<p>Bidder shall supply all the equipment and services as detailed in the scope of works clause 5.1.3 of procuring entity requirements.</p> <p><i>(Bidder to state compliance to these requirements and indicate any deviations)</i></p>	
5.2	<b>FUNCTIONAL REQUIREMENTS</b>		
5.2.1	General requirements	<p>Bidder shall offer the general requirements as per the specifications in clause 5.2.1 of procuring entity requirements</p>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.2.2	Security Gateways configuration	Security Gateways configuration shall meet all requirements in clause 5.2.2 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.2.3	Security Management	Security Management shall meet all requirements in clause 5.2.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.2.4	Data Loss Prevention (DLP)	Data Loss Prevention (DLP) shall meet all requirements in clause 5.2.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.2.5	Best Practice Governance Risk and Compliance (GRC)	Best Practice Governance Risk and Compliance (GRC) shall meet all requirements in clause 5.2.5 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.2.6	Behavioral Anomaly Detection/Monitoring	Behavioral Anomaly Detection/Monitoring shall meet all requirements in clause 5.2.6 of procuring entity requirements	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.2.7	Remote Access	Remote Access shall meet all requirements in clause 5.2.7 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.2.8	Access Control	Access Control shall meet all requirements in clause 5.2.8 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.2.9	Software update (Patch) management	Software update (Patch) management shall meet all requirements in clause 5.2.9 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>5.3</b>	<b>DESIGN AND ARCHITECTURE</b>		
5.3.1	General Requirements	Bidder shall develop architecture meeting the requirements as per the specifications in clause 5.3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.3.2	Network segmentation	Network segmentation shall meet requirements in clause 5.3.2 of procuring entity requirements	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.3.3	Basic Rules for the Cyber Security Architecture	Developed architecture shall meet the basic Rules for the Cyber Security Architecture detailed in clause 5.3.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.3.4	Performance Requirements	Cyber security solution shall meet Performance Requirements given in clause 5.3.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.3.5	Configuration And Management	Configuration and Management shall meet all requirements in clause 5.3.5 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.4	<b>EQUIPMENT SPECIFICATIONS</b>		
5.4.1	<b>Enterprise Grade Cyber Security Appliance (Gateway)</b>		
5.4.1.1	Cyber security applications/functions	Offered equipment shall comply to the requirements in clause 5.4.1.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
5.4.1.2	<b>Minimum Performance &amp; Hardware specifications</b>		
5.4.1.2.1	Threat Prevention (Mbps)	≥2,000	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
5.4.1.2.2	Next Generation Firewall (Mbps)	≥5,000	
5.4.1.2.3	IPS Throughput (Mbps)	≥3,500	
5.4.1.2.4	Firewall Throughput (Mbps)	≥7,500	
5.4.1.2.5	Firewall 1518 Byte UDP Packets (Mbps)	≥17,000	
5.4.1.2.6	VPN AES-128 Throughput (Mbps)	≥4,000	
5.4.1.2.7	Connections per Second	≥66,000	
5.4.1.2.8	Concurrent Connections	≥2,400,000	
5.4.1.2.9	Security	(a). Firewall, (b). VPN, (c). User Awareness, (d). QoS, (e). Application Control, (f). URL Filtering, (g). IPS, (h). Anti-Bot, (i). Antivirus, (j). Anti-Spam and (k). Sandblast Threat Emulation (sandboxing)	
5.4.1.2.10	Unicast, Multicast Routing and Clustering	OSPFv2, BGPv4 and 4++, RIP, PIM (SM, DM, SSM), IGMP, ClusterXL High Availability	
5.4.1.2.11	IPv6	local network and internet connections, dual stack tunnelling IPv4 over IPv6 networks, prefix delegation	
5.4.1.2.12	Mobile Access License (Users)	500 remote SNX or Mobile VPN client users	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
5.4.1.2.13	WAN Port	≥2x10/100/1000Base-T RJ-45 / 1000BaseF SFP ports	
5.4.1.2.14	DMZ Port	≥1x 10GbE Base-T RJ-45 / 10GbE SFP+	
5.4.1.2.15	LAN Switch Ports	2x 2.5GbE Base-T RJ-45 and 16x 10/100/1000Base-T RJ-45 ports Or ≥18x 10/100/1000Base-T RJ-45 ports	
5.4.1.2.16	Console Ports	≥1x USB-C and 1x RJ-45console port	
5.4.1.2.17	USB Port	≥2x USB 3.0 ports	
5.4.1.2.18	Storage	≥256GB SSD and Micro-SD card slot with 32 and 64 GB card options	
5.4.1.2.19	eMMC Storage size	≥32 GB	
5.4.1.2.20	MTBF	≥15.64 years @ 25°C	
5.4.1.2.21	AC Input	110 – 240VAC, 50 – 60 Hz	
5.4.1.2.22	Power Supplies rating	≥150W	
5.4.1.2.23	Number of power supplies	≥Two (2)	
5.4.1.2.24	Power Consumption (Max)	≤93.6W	
5.4.1.2.25	Enclosure type	Steel or metallic equivalent	
5.4.1.2.26	Enclosure Protection as per IEC 60529	≥IP20	
5.4.1.2.27	Mounting	Rack type	
5.4.1.2.28	Form factor (fully configured)	1U	
5.4.1.2.29	Mounting accessories	Rack slide rails to be provided	
5.4.1.2.30	Continuous ambient operating temperature	-5° C to +40°C	
5.4.1.2.31	Operating Relative Humidity (non-condensing)	5 to 95%	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
5.4.1.2.32	Operating altitude without derating	≥1000 m	
5.4.1.2.33	Storage environment	-45°C ~ 60°C (5~95%, non-condensing)	
5.4.1.2.34	Manufacturer	Warranty ≥3 years	
5.4.1.2.35	Safety   Emissions   Environment	UL/c-UL 62368-1 IEC 62368-1 CB / EMC EMI EN55024 EN55032 Class B VCCI AS NZS CISPR 32 IC ICES 03 FCC: Part 15 Class B / RoHS, REACH WEEE	
<b>5.4.2</b>	<b>Industrial Grade Cyber Security Appliance</b>		
5.4.2.1	Cyber security applications/functions	Offered equipment shall comply to the requirements as per the specifications in clause 5.4.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>5.4.2.2</b>	<b>Minimum Performance &amp; Hardware Specifications</b>		
5.4.2.2.1	Threat Prevention (Mbps)	≥400	
5.4.2.2.2	Next Generation Firewall (Mbps)	≥700	
5.4.2.2.3	IPS Throughput (Mbps)	≥770	
5.4.2.2.4	Firewall Throughput (Mbps)	≥1,900	
5.4.2.2.5	Firewall 1518 Byte UDP Packets (Mbps)	≥4,000	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
5.4.2.2.6	VPN AES-128 Throughput (Mbps)	≥1,100	
5.4.2.2.7	Connections per Second	≥13,500	
5.4.2.2.8	Concurrent Connections	≥500,000	
5.4.2.2.9	Security	(a). Firewall, (b). VPN, (c). User Awareness, (d). QoS, (e). Application Control, (f). URL Filtering, (g). IPS, (h). Anti-Bot, (i). Antivirus and (j). Sandblast Threat Emulation (sandboxing)	
5.4.2.2.10	Unicast, Multicast Routing and Clustering	OSPFv2, BGPv4 and 4++, RIP, PIM (SM, DM, SSM), IGMP, ClusterXL High Availability	
5.4.2.2.11	IPv6	local network and internet connections, dual stack tunneling IPv4 over IPv6 networks, prefix delegation	
5.4.2.2.12	Mobile Access License (Users)	200 remote SNX or Mobile VPN client users	
5.4.2.2.13	Protocols	Over 70 protocols, including the most popular in the industry: Modbus, IEC61850, Bacnet, CIP, S7, IEC-104, DNP3 and many more	
5.4.2.2.14	WAN Port	≥1x 10/100/1000Base-T RJ-45 / 1x 1000BaseF SFP port	
5.4.2.2.15	DMZ Port	≥1x 10/100/1000Base-T RJ-45 / 1x 1000BaseF SFP port	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
5.4.2.2.16	LAN Ports	≥8x 10/100/1000Base-T RJ-45 ports	
5.4.2.2.17	Wi-Fi (optional)	802.11 n/ac MIMO 3x3	
5.4.2.2.18	Radio Band (association rate)	One radio band non-concurrent: 2.4GHz (max 450 Mbps) or 5GHz (max 1,300 Mbps)	
5.4.2.2.19	3/4G/LTE (optional)	3/4G/LTE Embedded modem, CAT6 with Main and Auxiliary antennas	
5.4.2.2.20	SIM (optional)	Dual SIM (Nano and Micro)	
5.4.2.2.21	Console Port	1x USB-C	
5.4.2.2.22	USB Port	≥1x USB 3.0	
5.4.2.2.23	SD Card Slot	Micro-SD slot	
5.4.2.2.24	Serial Port	1x DB9 female connector, supports RS232 serial protocols, (RS422, R485 ready)	
5.4.2.2.25	Operating	-40°C ~ 75°C (-40°F ~ +167°F)	
5.4.2.2.26	Storage	-45°C ~ 60°C, (-49°F ~ 140°F), 5~95%, non-condensing	
5.4.2.2.27	Power Redundancy	Dual power supplies support (AC and DC input option)	
5.4.2.2.28	Power Adapter AC	Input 110 – 240VAC, 50 – 60 Hz, AC socket IEC 320-C14 Type	
5.4.2.2.29	Power Adapter Options	12-50V/10A 120W industrial grade (-40° ~ 70°C, -40° ~ 158°F) power adapter	
5.4.2.2.30	DC power Input	12 to 60VDC, 48VDC nominal, Maximum Range 10.2VDC to 72VDC	
5.4.2.2.31	Power Consumption (Max)	Wired:25.1W, Wi-Fi-LTE: 30.7W	
5.4.2.2.32	Heat Dissipation	Wired: 85.6 BTU/hr., Wi-Fi-LTE: 104.8 BTU/hr	
5.4.2.2.33	DC Input (@ 25°C)	≤268.8 years	
5.4.2.2.34	AC Input, Industrial grade (@ 25°C)	≤30.2 years	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
5.4.2.2.35	Operating altitude without derating	≥1000 m	
5.4.2.2.36	Manufacturer Warranty	≥3 years	
5.4.2.3	Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 5.4.2.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>5.4.3</b>	<b>Cyber security Management server Appliance (Optional)</b>		
5.4.3.1	General requirements	Offered appliance shall comply to the general requirements as per the specifications in clause 5.4.3.1 of procuring entity requirements <i>(Bidder to indicate if the server appliance is offered (optional if existing appliance is compatible with the new gateways) and state compliance to these requirements and indicate any deviations if applicable)</i>	
5.4.3.2	Minimum specifications	Offered appliance shall comply to the requirements as per the specifications in clause 5.4.3.2 of procuring entity requirements <i>(Bidder to indicate if the server appliance is offered (optional if existing appliance is compatible with the new gateways) and state compliance to these requirements and indicate any deviations if applicable)</i>	

## 6. PARTICULAR TECHNICAL SPECIFICATIONS ~ POWER SUPPLIES

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
<b>6.1</b>	<b>PANEL POWER SUPPLIES</b>		
6.1.1	General Requirements	Panel power supplies shall comply to the general requirements as per the specifications in clause 6.1.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.1.2</b>	<b>Switched Power Supply units</b>		
6.1.2.1	General requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 6.2.1.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.1.2.2</b>	<b>Minimum specifications</b>		
6.1.2.2.1	Nominal input voltage	100VAC...240VAC, 90VDC...300VDC	
6.1.2.2.2	Input voltage range	85 VAC...264 VAC 90 VDC...300VDC (UL 508 250VDC)	
6.1.2.2.3	Type of supply voltage	AC/DC	
6.1.2.2.4	Electric strength max	300VAC	
6.1.2.2.5	Short-term input voltage	300VAC	
6.1.2.2.6	AC Frequency range	45Hz ...65Hz	
6.1.2.2.7	Current consumption	8.7A(120VAC),4.5A(230VAC) 9.4A(110VDC),4.6A(220VDC)	
6.1.2.2.8	Inrush current limitation	<15A (typical)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.1.2.2.9	Inrush current integral I2t	<1.6 A, 2s	
6.1.2.2.10	Power failure bypass	>20ms (120VAC) >22ms (230VAC)	
6.1.2.2.11	Typical response time	<0.65s	
6.1.2.2.12	Protective circuit	Transient surge protection Varistor	
6.1.2.2.13	Input fuse, integrated	20A (fast blow internal)	
6.1.2.2.14	Nominal power rating	960W	
6.1.2.2.15	Nominal power consumption at full load	1046VA	
6.1.2.2.16	Discharge current to PE	< 3.5 mA	
6.1.2.2.17	Efficiency	> 93 % (for 230 V AC and nominal values)	
6.1.2.2.18	Nominal output voltage	48 V DC $\pm$ 1 %	
6.1.2.2.19	Setting range of the output voltage (USet)	30 V DC ... 56 V DC (> 48 V DC, constant capacity restricted)	
6.1.2.2.20	Nominal output current (In)	20A (-25degs....60degs, Uout = 48VDC)	
6.1.2.2.21	POWER BOOST (IBoost)	22.5 A (-25°C ... 40°C permanent, UOUT = 48 V DC)	
6.1.2.2.22	Selective Fuse Breaking (ISFB)	100 A (12 ms)	
6.1.2.2.23	Magnetic circuit breaker tripping	B2 / B4 / B6 / B10 / C2 / C4 / C6	
6.1.2.2.24	Derating	60 °C ... 70 °C (2.5%/K)	
6.1.2.2.25	Feedback voltage resistance	max. 60 V DC	
6.1.2.2.26	Protection against overvoltage at the output (OVP)	< 60 V DC	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.1.2.2.27	Active current limitation	Approx. IBOOST = 22.5 A (for short-circuit)	
6.1.2.2.28	Output power	960 W	
6.1.2.2.29	Max. Power dissipation in no-load condition	13A	
6.1.2.2.30	Power loss nominal load max.	74W	
6.1.2.2 (a)	Design and test standards	Offered equipment shall comply to the requirements as per the specifications in clause 6.1.2.2 (a) of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.1.3</b>	<b>Inverter Power Supply Units</b>		
6.1.3.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 6.1.3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.1.3.2</b>	<b>Minimum Specifications</b>		
6.1.3.2.1	Power rating	3KVA	
6.1.3.2.2	Rated Input Voltage (VDC)	<ul style="list-style-type: none"> <li>• 48VDC option</li> <li>• 110VDC option</li> </ul>	
6.1.3.2.3	DC Input Voltage	<ul style="list-style-type: none"> <li>• 48V (40 – 60)</li> <li>• 110V (90 – 160)</li> </ul>	
6.1.3.2.4	Rated Input Current (A)	<ul style="list-style-type: none"> <li>• 63A for 48V option</li> <li>• 27 A for 110V option</li> </ul>	
6.1.3.2.5	Bypass Volt (Vac)	260V - 180V ( $\pm 10V$ )	
6.1.3.2.6	Input Current (A)	15A	
6.1.3.2.7	Transfer Time (ms)	$\leq 5ms$	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.1.3.2.8	Rated Capacity (VA)	3000	
6.1.3.2.9	Output Power (W)	2400	
6.1.3.2.10	Voltage and Frequency	230V 50Hz	
6.1.3.2.11	Voltage Precision (V)	± 1.5%	
6.1.3.2.12	Frequency Precision (V)	50 Hz ± 0.1%	
6.1.3.2.13	Output wave	Pure Sine Wave	
6.1.3.2.14	Wave Distortion	Total Harmonics Distortion (THD) (Resistant Load) ≤ 3 % (Linear Load)	
6.1.3.2.15	Dynamic Reaction Time (Load 0 <----> 100%)	8 % (load 0 <----> 100%)	
6.1.3.2.16	Power Factor (PF)	0.8	
6.1.3.2.17	Overload	120%. 30s	
6.1.3.2.18	Inversion Efficiency (80% Resistant Load)	≥ 70 – 85	
6.1.3.2.19	Transfer Time (ms)	≤ 5 ms	
6.1.3.2.20	Isolation (IN/OUT)	1500 Vac, 1min	
6.1.3.2.21	Noise (1m)	≤ 40 dB	
6.1.3.2.22	Operating Temperature	-20°C to +50°C	
6.1.3.2.23	Humidity	0 ~ 90%, non-condensing	
6.1.3.2.24	Protection	Function Input Low / High Voltage, Output Overload / Shortage, Reversed Input Connecting Protection	
6.1.3.2.25	Monitoring signals (contacts)	(a) DC input voltage failure (b) AC voltage input failure (c) Overload (d) Bypass operation (e) Output failure	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.1.3.2.30	Settable prioritisation of DC input or AC bypass input	To be supported	
6.1.3.3	Product Certifications	Offered equipment shall comply to the requirements as per the specifications in clause 6.1.3.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.2</b>	<b>HYBRID UPS</b>		
6.2.1	General Requirements	Hybrid UPS systems offered shall comply to the general requirements as per the specifications in clause 6.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.2.2</b>	<b>Solar Hybrid Inverter Charger</b>		
6.2.2.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 6.2.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.2.2.2</b>	<b>Minimum specifications</b>		
6.2.2.2.1	Rated Power	$\geq 7000\text{VA}/7000\text{W}$	
6.2.2.2.2	Voltage	230VAC	
6.2.2.2.3	Frequency Range	50 Hz	
6.2.2.2.4	AC Voltage Regulation (Batt. Mode)	$230\text{VAC} \pm 5\%$	
6.2.2.2.5	Surge Power	$\geq 15000\text{VA}$	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.2.2.2.6	Peak Efficiency	≥93%	
6.2.2.2.7	Waveform	Pure sine wave	
6.2.2.2.8	Battery Voltage	48 VDC	
6.2.2.2.9	Floating Charge Voltage	54 VDC	
6.2.2.2.10	Overcharge Protection	≤66 VDC	
6.2.2.2.11	Maximum PV Array Power	≥8000W	
6.2.2.2.12	Maximum PV Array Open Circuit Voltage	≥500Vdc	
6.2.2.2.13	PV Array MPPT Voltage Range	≥90~430Vdc	
6.2.2.2.14	Maximum Solar Charging Current	≥80A	
6.2.2.2.15	Maximum AC Charging Current	≥80A	
6.2.2.2.16	Maximum Charging Current	≥80A	
6.2.2.2.17	Communication Port	Ethernet/RS232/USB/Dry contact	
6.2.2.2.18	Humidity	5% to 95% Relative Humidity (Noncondensing)	
6.2.2.2.19	Operating Temperature	-10°C ~ 55°C	
6.2.2.2.20	Storage Temperature	-15°C ~ 60°C	
<b>6.2.3</b>	<b>Solar batteries</b>		
6.2.3.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 6.2.3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.2.3.2</b>	<b>Minimum requirements</b>		

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.2.3.2.1	Battery Storage Capacity	12V 200 Ampere-hours (Ah)	
6.2.3.2.2	Battery type	maintenance free stationery valve regulated lead acid (VRLA) batteries	
6.2.3.2.3	Electrolyte type	Gel	
6.2.3.2.4	Float Voltage	13,6 - 13,8VDC @25degC	
6.2.3.2.5	Cycle Voltage	14,25 - 14,6 VDC @25degC	
6.2.3.2.6	Depth-of-Discharge	rated at 60% without damage to the battery cells	
6.2.3.2.7	Cycle Life at 50% DOD	≥1500 cycles	
6.2.3.2.8	Charge/discharge rate	20HR	
6.2.3.2.9	Rated operating temperature	25degC	
6.2.3.2.10	Operating temperature range	Charge -20degsC to 50degsC. Discharge -40degsC to 60degsC	
6.2.3.2.11	Short Circuit Current	~3483A	
6.2.3.2.12	Dimensions (mm) LxWxH (H1-H2)	Approx. 518x273x213-236 (subject to the supplied battery)	
<b>6.2.3.3</b>	<b>Design and Testing Standards</b>		
6.2.3.3.1	Design and Testing Standards	Offered equipment shall comply to the requirements as per the specifications in clause 6.2.3.3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.2.4</b>	<b>Solar Panels</b>		

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.2.4.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 6.2.4.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.2.4.2</b>	<b>Solar panels Minimum specifications</b>		
	<b>Electrical Parameters at Standard Test Conditions</b>		
6.2.4.2.1	Power Output, Pmax	300-330 W	
6.2.4.2.2	Power Output tolerances	0/+5	
6.2.4.2.3	Module efficiency	≥16.6%	
6.2.4.2.4	Voltage at Pmax	37.4 V	
6.2.4.2.5	Current at Pmax	8.84 A	
6.2.4.2.6	Open circuit voltage	46.4 V	
6.2.4.2.7	Short circuit current	9.29 A	
	<b>Electrical parameters at Nominal Operating Cell Temperature</b>		
6.2.4.2.9	Power Output, Pmax	240.7 W	
6.2.4.2.10	Voltage at Pmax	34.0 V	
6.2.4.2.11	Current at Pmax	7.07 A	
6.2.4.2.12	Open circuit voltage	42.8 V	
6.2.4.2.13	Short circuit current	7.51 A	
	<b>Thermal Characteristics</b>		
6.2.4.2.14	Nominal operating cell temperature	46 ±2 °C	
6.2.4.2.15	Temperature coefficients od Pmax	-0.42	
6.2.4.2.16	Temperature coefficient of Voc	-0.32	
6.2.4.2.17	Temperature coefficient of Isc	0.05	
	<b>Operating Conditions</b>		
6.2.4.2.18	Max. system voltage	1000Vdc	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.2.4.2.19	Max. series fuse rating	15A	
6.2.4.2.20	Limiting reverse current	15A	
6.2.4.2.21	Operating temperature range	-40°C to 85°C	
6.2.4.2.22	Max. static load, front	54000Pa	
6.2.4.2.23	Max. static load, back	24000Pa	
6.2.4.2.24	Max. hailstone impact (diameter / velocity)	25mm/23m/s	
	<b>Panel construction</b>		
6.2.4.2.25	Front cover	low iron tempered glass of at least 3.2mm	
6.2.4.2.26	Cells	At least 72 cells made of multicrystalline silicon, each of 156.75mmx156.7mm and having 4 or 5 busbar.	
6.2.4.2.27	Panel frame	Anodised aluminium alloy	
6.2.4.2.28	Panel Ingress protection	>IP67	
6.2.4.2.29	Connectors	MC4 or PV-ZH202 with an ingress protection degree of over IP68	
6.2.4.2.30	Panel dimensions	2000mmx992mmx40mm (L x W x H) or equivalent meeting power rating requirements	
<b>6.2.4.3</b>	<b>Ground mounting structure minimum requirements</b>		
6.2.4.3.1	General description	Angled horizontal mounting rails, vertical Support columns and ground mounting concrete plinths	
6.2.4.3.2	Supports type	angle brackets or hollow sections	
6.2.4.3.3	Supports columns Material	Sheet steel, ≥2mm	
6.2.4.3.4	Horizontal mounting rails material	Sheet steel, ≥1.5mm	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.2.4.3.5	Surface treatment	400micron powder paint with at least three coats	
6.2.4.3.6	Colour	RAL 9006	
6.2.4.3.7	Concrete plinth	Class 25 concrete with a depth of at least 500mm	
6.2.4.3.8	Dimensions	As per approved design	
6.2.4.3.9	Anchor	At least two anchor bolts per support column	
6.2.4.3.10	Design wind loading	≥200Kph	
6.2.4.4	Design and Testing Standards	Offered equipment shall comply to the requirements as per the specifications in clause 6.2.4.4 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>6.2.5</b>	<b>Power Supply/Battery Cabinet</b>		
6.2.5.1.1- 6.2.5.1.7	Panel general requirements	Power Supply/Battery Cabinet shall meet the requirements as per the specifications in clause 6.2.5 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
6.2.5.1.8.1	Overall requirements, wiring and workmanship	As per tender clause 2.7.1	
6.2.5.1.8.2	Material	Sheet steel, Frames ≥2mm Side panels ≥1.5mm doors ≥2mm	
6.2.5.1.8.3	Surface treatment	At least three coats, ≥90-micron thickness Powder coats	
6.2.5.1.8.4	Doors and side panels	perforated	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
6.2.5.1.8.5	Colour	RAL 7035	
6.2.5.1.8.6	Load capacity	≥20,000 N	
6.2.5.1.8.7	IK Code	IK08	
6.2.5.1.8.8	Dimensions	Width : 600 mm Height: 2,000 mm Depth: 800 mm	
<b>Enclosure components and parts</b>			
6.2.5.1.8.9	Enclosure frame with doors and roof plate	lot	
6.2.5.1.8.10	Sheet steel side panels	Two (2)	
6.2.5.1.8.11	Lock front and rear each with at least two keys	Two (2)	
6.2.5.1.8.12	IPPC wooden pallet	lot	
6.2.5.1.8.13	Roof plate, solid multi-piece, with fan cut outs	lot	
6.2.5.1.8.14	Sheet steel rear door, solid, vertically divided, 180° hinges	lot	
6.2.5.1.8.15	100mm base plate (plinth)	Lot	
6.2.5.1.8.16	Cable ducts horizontal 60mm x 80mm and 100mmX80mm, quantity as per design	Lot, as per design	
6.2.5.1.8.17	Sheet steel horizontal frames for battery mounting	≥4	
6.2.5.1.8.18	DIN rails	Lot, as per design	
6.2.5.1.8.19	Solid sheet steel glanding plate with	Two (2)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
	factory punched cable glanding holes		
6.2.5.1.8.20	Electrical and other accessories	As per the scope of supply	

## 7. PARTICULAR TECHNICAL SPECIFICATIONS ~ UNDERGROUND FIBRE OPTIC CABLE WORKS

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
7.1	GENERAL REQUIREMENTS/ Scope of Works	Bidder shall supply all the equipment and services as detailed in the scope of works clause 7.1 of procuring entity requirements. <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.2	<b>SURVEY AND DESIGN</b>		
7.2.1	General Requirements	Survey and design shall comply to the general requirements as per the specifications in clause 7.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.2.2	Route Design	Route Design shall meet all requirements in clause 7.2.2 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.2.3	As-Built Documents.	As-Built Documents shall meet all requirements in clause 7.2.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.3	<b>Fibre Optical Cable</b>		
7.3.1.1	General Requirements	Offered equipment shall comply to the general requirements as per the	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		specifications in clause 7.3.1.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.3.1.2</b>	<b>Minimum specifications</b>		
7.3.1.2.1	Number of cores	48	
7.3.1.2.2	Cable type	Single mode (OS 2)	
7.3.1.2.3	Transmission Speeds	25 Gbps across one pair without multiplexing	
7.3.1.2.4	UV protection	UV resistant jacket	
7.3.1.2.5	Operating Temperature	Outstanding loss consistency across a wide range of temperatures.	
7.3.1.2.6	Mechanical Protection	Rugged corrugated steel armour for extra crush and rodent resistance. Steel wire shall also be used as the central strength member.	
7.3.1.2.7	Rodent protection	Rodent protection by a suitably treated jacket.	
7.3.1.2.8	Water protection	Get filled loose tubes to protect against water penetration Dry, super absorbent polymers (SAPs) Eliminate water migration in cable interstices.	
7.3.1.2.9	Fire and smoke resistance	Flame retardant jacket, low smoke zero halogen	
7.3.1.2.10	Bending	Cable shall withstand repeated wrapping and unwrapping without damage or attenuation change	
7.3.1.2.11	Installation	Underground installation	
7.3.1.2.12	Attenuation	≤0.4 [dB/km] @ 1310nm ≤0.30[dB/km] @ 1550nm	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
7.3.1.2.13	Attenuation vs Wavelength Max difference	$\leq 0.03$ [dB/km] @1285-1330nm $\leq 0.02$ [dB/km] @1525-1575nm	
7.3.1.2.14	Dispersion coefficient	$\geq -3.4 \leq 3.4$ [ps/(nm • km)] @ 1285-1340 nm $\leq 18$ [ps/(nm • km)] @ 1550 nm $\leq 22$ [ps/(nm • km)] @ 1625 nm	
7.3.1.2.15	Zero dispersion wavelength	1312 $\pm$ 12 [nm]	
7.3.1.2.16	Zero dispersion slope	Typical value $\leq 0.091$ [ps/(nm <sup>2</sup> • km)] 0.086 [ps/(nm <sup>2</sup> • km)]	
7.3.1.2.17	Cladding diameter	125.0 $\pm$ 1.0[ $\mu$ m]	
7.3.1.2.18	Cladding non-circularity	$\leq 1.0$	
7.3.1.2.19	Coating diameter	245 $\pm$ 7[ $\mu$ m]	
7.3.1.2.20	Coating strip force	1.7 [N] $\geq 1.3 \leq 8.9$ [N]	
<b>7.3.2</b>	<b>Conduits</b>		
7.3.2.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 7.3.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.3.2.2</b>	<b>Minimum specifications</b>		
7.3.2.2.1	Conduit Type	HDPE	
7.3.2.2.2	Inner Layer	Silicone with cream inner side	
7.3.2.2.3	Colour	White with red strip	
7.3.2.2.4	Labelling	KENGEN-SCADA - yyyy= mm/yyyy (Month & Year of manufacture) =Spacing of the labelling will be 1.0m.	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		(The year will be changed to the right year of manufacture) <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.3.2.2.5	Outside diameter (mm)	32	
7.3.2.2.6	Inside diameter (mm)	26	
7.3.2.2.7	Standard straight length (m)	15000M X 2	
7.3.2.2.8	Standard length coils (m)	Min 50	
7.3.2.2.9	Min. bending radius (mm) 6m length	n/a	
7.3.2.2.10	Min. bending radius (mm)	coils 150	
<b>7.3.3</b>	<b>Warning Tape</b>		
<b>7.3.3.1</b>	<b>Minimum specifications</b>		
7.3.3.1.1	Tape Type	PVC OR PE	
7.3.3.1.2	Width	10cm	
7.3.3.1.3	Thickness	0.1mm	
7.3.3.1.4	Standard length (m)	15000m	
7.3.3.1.5	Background Colour	Yellow	
7.3.3.1.6	Mark words	-Enlarged up to the full width -Durable -Printed in black colour 2m apart	
7.3.3.1.7	The words	‘CAUTION: Do not dig! KENGEN O.F.C Cable underneath: Contacts KENGEN (0711036766/0711036767) shall be displayed on the warning tape at intervals of half (0.5) meters	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.3.4</b>	<b>Markers</b>		
<b>7.3.4.1</b>	<b>Minimum specifications</b>		
7.3.4.1.1	Marker Type	<ul style="list-style-type: none"> <li>Joint Marker – Used to indicate positions where the cable has been spliced/joined.</li> <li>Directional markers – Used to indicate the cable route direction. The marker will be buried to a 300mm depth</li> </ul>	
	Marker	Material Prefabricated concrete block	
7.3.4.1.1	Marker Colour	MUST be white (2 coats) with the wordings done in conspicuous black colour	
7.3.4.1.3	Labelling	Text height of 25mm (with < having 60mm height) 15mm spacing between the lines, all black in colour and sink engraved to 2mm depth.	
7.3.4.1.5	Marker Height	400mm (from ground surface)	
7.3.4.1.6	Marker Design build	Rectangular concrete block stem (L=115mm, W=115mm and H=750mm) on a base (L=315mm, W=315mm and H=100mm)	
7.3.4.1.7	Marker wording	KENGEN O.F.C Cable (With Logo) (25mm high) etched/sunk to 2mm depth on the front face of the vertical structure	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.3.4.1.8	Marker Position	Fixed along the cable route, 1.0m off the OFC position and to the side nearer the edge of the road reserve.  <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.3.4.1.9	Marker Points	<ul style="list-style-type: none"> <li>• Location of splice points/joints.</li> <li>• OFC route change - where the cable route cuts across the road as it changes from one side of the road to the other.</li> <li>• Crossings of roads, waterways and railways – where the OFC path cuts across existing roads/railway/water ways.</li> <li>• Points where the cable is placed close to other existing structures</li> <li>• Every 30 meters</li> </ul> <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.3.5	<b>Manholes</b>		
7.3.5.1	<b>Minimum specifications</b>		
7.3.5.1.1	Manhole size of Chambers	<ul style="list-style-type: none"> <li>• 900mmX900mmX900mm</li> <li>• 1200mmX2200mmX1200mm</li> </ul>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
7.3.5.1.2	Manhole Cover	Mechanically lockable with special key and fully water and weatherproof.	
7.3.5.1.3	Manhole Chamber materials	High strength with reinforced concrete	
7.3.5.1.4	Manhole cover materials	Glass Reinforced Polymer (GRP) such as Sheet Moulded Compound (SMC)	
7.3.5.1.5	Manhole chamber cover Load rating	≥135KN (SANS 558 Medium Duty)	
7.3.5.1.6	Manhole Slack Management brackets	<ul style="list-style-type: none"> <li>• Inside the chamber</li> <li>• Position to secure the splicing boxes</li> <li>• ≥ 8 x 50mm split cable entry holes</li> </ul>	
7.3.5.1.7	Manhole Chamber Drainage	Knock out drain at the bottom.	
7.3.5.1.8	Manholes labelling for polymer hardened cover Wording	“KENGEN O.F.C” (With Logo) 100mm below the top <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.3.6</b>	<b>Splice box</b>		
7.3.6.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 7.3.6.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.3.6.2</b>	<b>Minimum specifications</b>		
7.3.6.2.1	Splice Type	Dome shaped	
7.3.6.2.2	Enclosure IP Rating	IP-68 environmental protection level (water and fine dust proof)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
7.3.6.2.3	Locking Design	Boltless locking design (no tools needed for open and close).	
7.3.6.2.4	Splice box Material	Ruggedized	
7.3.6.2.5	Splice box Strength	≥100N Impact and Pull Force	
7.3.6.2.6	Splice box Metallic parts	Stainless (anti-rusting)	
7.3.6.2.7	Splice box	Should be suitable for fusion	
7.3.6.2.8	Mechanical sealing	Thermoplastic rubber protection tube	
7.3.6.2.9	Splice box position characteristics	<ul style="list-style-type: none"> <li>• aerial</li> <li>• direct buried</li> <li>• pipelined</li> <li>• wall mounting</li> <li>• manhole installations</li> </ul>	
	Splice box design build	<ul style="list-style-type: none"> <li>• ≥ 4x entry ports of Max 23mm diameter.</li> <li>• Sealable counterparts.</li> </ul>	
7.3.6.2.10	Splice box weight	≤2.5Kg	
7.3.6.2.11	Continuous operating ambient temperature	0° C to +55°C	
<b>7.4</b>	<b>CIVIL WORKS</b>		
<b>7.4.1</b>	<b>Standard Trenching for Normal soil.</b>		
7.4.1.1	General Requirements	Standard trenching shall comply to the general requirements as per the specifications in clause 7.4.1.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.4.1.2</b>	<b>Minimum specifications</b>		
7.4.1.2.1	Trenching Depth	≥1000mm	
7.4.1.2.2	Trench width at 1000mm (bottom)	300mm	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
7.4.1.2.3	Trench width at 0 depth (Top)	400mm	
7.4.1.2.4	Compacted treated Bedding at bottom of trench	150mm	
7.4.1.2.5	Warning Tape depth	750mm	
7.4.1.2.6	Depth of compacted treated backfill at top of trench	450mm	
7.4.1.2.7	Width of compacted treated backfill and erosion protection at top of trench	2400mm	
<b>7.4.2</b>	<b>Special Trenching with Gabion protection</b>		
7.4.2.1	General Requirements	Special trenching with gabion protection shall comply to the general requirements as per the specifications in clause 7.4.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.4.2.2</b>	<b>Minimum specifications</b>		
7.4.2.2.1	Gabion mesh-wire	<ul style="list-style-type: none"> <li>• <math>\geq 2.8\text{mm}</math> galvanized wire with double twist.</li> <li>• The Wire should be Hot Deep Galvanized class 1 at 366g/m<sup>2</sup> of zinc coating</li> </ul>	
7.4.2.2.2	Gabion rocks	100mm - 150mm (natural solid non-porous hard-rock.)	
7.4.2.2.3	Inside the gabion	<ul style="list-style-type: none"> <li>• The ducts should be GI 65mm internal diameter, 76mm external</li> </ul>	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		diameter galvanized steel pipe. • Protrude 1m on both ends of the gabion to interface with the regular HDPE duct.	
7.4.2.2.4	Trenching Depth	1500mm	
7.4.2.2.5	Trench width at 1500mm (bottom)	300mm	
7.4.2.2.6	Trench width at 0 depth (Top)	400mm	
7.4.2.2.7	Compacted treated Bedding at bottom of trench	150mm	
7.4.2.2.8	Depth of compacted treated backfill at top of trench	600mm	
7.4.2.2.9	Width of compacted treated backfill and erosion protection at top of trench	1000mm	
<b>7.4.3</b>	<b>Reinforced Concrete Covering</b>		
7.4.3.1	General Requirements	Reinforced concrete shall comply to the general requirements as per the specifications in clause 7.4.3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.4.3.2</b>	<b>Concrete Reinforcement Rebar minimum specifications</b>		
7.4.3.2.1	Metal rebar rods	Use three (x3) of 10mm D along the whole length of the specified length of the trench to be reinforced.	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.4.3.2.2	Rebar of diameter	<ul style="list-style-type: none"> <li>• 8mm are used at 200mm separation over the 10mm D rebar (over the whole length of the trench).</li> <li>• Binding wire will be used to fasten the 8mm rebar to the 10mm D rebar.</li> </ul> <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.4.3.2.3	Rebar mesh	For Separation between the 10mm D rebar rods is 150mm—totalling to a 300mm wide. <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
7.4.3.2.4	Rebar Reinforcement	To be placed at 100mm from the surface of the concrete slab and 50mm from the edges of the concrete slab and along the full length of the trench that is to be covered in reinforced concrete. <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.4.4</b>	<b>Road Crossing</b>		
7.4.4.1	General Requirements	Bidder shall comply to the general requirements as per the specifications in clause 7.4.4.1 of procuring entity requirements	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>7.4.4.2</b>	<b>Minimum specifications</b>		
7.4.4.2.1	Bores depth	<ul style="list-style-type: none"> <li>• <math>\geq 1.5\text{m}</math> across spur subsidiary roads</li> <li>• <math>\geq 2\text{m}</math> across the main highway from the tarmac level</li> </ul>	
7.4.4.2.2	Bores exit at a depth	$\geq 1.5\text{m}$ ; same level as the trench.	
7.4.4.2.3	Bores span lengths	<p>15m-20m but could span to a maximum of 30m if need be. The equipment must be able to drill bores spanning to a maximum of up to 30m long</p> <p><i>(Bidder to state compliance to these requirements and indicate any deviations)</i></p>	
7.4.4.2.4	Bore drilling equipment	drill bores spanning to a maximum of up to 30m long	
7.4.4.2.5	Bore drilling head	accommodate rock drilling bits: for rocky ground	
7.4.4.2.6	Post Boring	<p>Two galvanised iron conduit 100mm internal diameter, 114mm external diameter <i>(one to act as spare for future use)</i> are to be inserted through the bore</p> <p><i>(Bidder to state compliance to these requirements and indicate any deviations)</i></p>	
7.4.4.2.7	Bores marking	both ends with marked reinforced concrete pillars	
7.4.4.2.8	Bore Conduits	inside a bore must be equipped with draw-wires	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
7.4.4.2.9	The operation pits	must be backfilled, unless there is need to install a Hand-hole on the pit location  <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	

## 8. PARTICULAR TECHNICAL SPECIFICATIONS ~ TOOLS & ACCESSORIES

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
8.1	<b>RUGGED ENGINEERING LAPTOPS</b>		
8.1.1	General Requirements	Offered equipment shall meet the general requirements as per the specifications in clause 8.1.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
8.1.2	<b>Minimum Specifications</b>		
8.1.2.1	Ruggedness	Tested as per MIL-STD-810G	
8.1.2.2	Processor type	≥11th Generation Intel® Core™ i9	
8.1.2.3	No of processor cores	≥8 cores/ 16 threads	
8.1.2.4	Processor base frequency	≥2.6 GHz	
8.1.2.5	Processor L3 cache	≥24 MB	
8.1.2.6	Memory bus speed	≥3200Mhz	
8.1.2.7	Installed RAM type	≥DDR4-3200	
8.1.2.8	Installed RAM size	≥32GB	
8.1.2.9	GPU Cores	≥5888 CUDA cores or equivalent	
8.1.2.10	GPU Memory	≥8GB VRAM	
8.1.2.11	GPU Base Clock	≥1.5 GHz	
8.1.2.12	Solid state drive	≥1 TB, M.2 NVMe MLC Solid State Drive <i>(No hard disk allowed)</i>	
8.1.2.13	Optical Drive	DVD+/-RW Super Multi DL - external drive via USB 3.1	
8.1.2.14	OEM pre-installed Operating Systems	Latest 64bit Windows (windows10 or higher) professional edition with perpetual licence and any other specified application software	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
8.1.2.15	Display Type LED	Full High Definition	
8.1.2.16	Display size	17.3inch diagonal	
8.1.2.17	Display Resolution	≥1920x1080	
8.1.2.18	Camera and Microphone	≥720p HD with Temporal Noise Reduction webcam with IR	
8.1.2.19	Integrated Communications	Integrated Gigabit ethernet Network Controller	
8.1.2.20	Integrated Wireless	802.11 AC/a/b/g/n (2x2) WiFi + Bluetooth® 5.2	
8.1.2.21	Integrated Security	Security Lock Slot plus steel cable (5.5mm thick) with a combination lock	
8.1.2.22	USB Interfaces	≥ One (1) USB 3.1 Gen 1 charging port ≥ Two (2) USB Type-C Thunderbolt 4	
8.1.2.23	Video ports	One (1) HDMI 2.0 port One (1) Display port 1.4	
8.1.2.24	Audio	stereo microphone in 1 stereo headphone/line-out	
8.1.2.25	Gigabit Ethernet port	≥One (1) RJ-45	
8.1.2.26	Connectors	docking connector power & secondary battery connector	
8.1.2.27	Pointing Devices	Touchpad with on/off button, two-way scroll, gestures, two pick buttons	
8.1.2.28	Keyboard	Full-size, spill resistant backlit keyboard with drains	
8.1.2.29	Mouse optical	wireless mouse	
8.1.2.30	Battery	≥ 90 WHr Li-Ion	
8.1.2.31	Power Supply	200 W External AC Power Adapter 240V AC, 50Hz with a C13 to 3pin British type connector cord	
8.1.2.32	Carrying Case	Genuine Leather Carrying Case	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
8.1.2.33	Manufacturer Warranty	≥ 3years	
8.1.3	Product certifications and tests	Offered equipment shall comply to the requirements as per the specifications in clause 8.1.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>8.2</b>	<b>OPTICAL TIME DOMAIN REFLECTOMETER OTDR</b>		
8.2.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 8.2.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>8.2.2</b>	<b>Minimum Specifications</b>		
8.2.2.1	Form Factor	Handheld	
8.2.2.2	Cable Type	Single mode and multi-mode	
8.2.2.3	Wavelengths	850 nm +/- 10 nm 1310 nm +/- 25 nm 1550 nm +/- 20 nm 1625 nm +/- 20 nm	
8.2.2.4	Compatible fiber types	<ul style="list-style-type: none"> <li>• 50/125 μm</li> <li>• 62.5/125 μm</li> <li>• Single Mode</li> </ul>	
8.2.2.5	Event dead zone	<ul style="list-style-type: none"> <li>• 850 nm: 0.5 m</li> <li>• 1300 nm: 0.7 m</li> <li>• 1310 nm: 0.6 m</li> <li>• 1550 nm: 0.6 m</li> </ul>	
8.2.2.6	Attenuation dead zone	<ul style="list-style-type: none"> <li>• 850 nm: 2.5 m</li> <li>• 1300 nm: 4.5 m</li> </ul>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		<ul style="list-style-type: none"> <li>1310 nm: 3.6 m</li> <li>1550 nm: 3.7 m</li> </ul>	
8.2.2.7	Dynamic range	<ul style="list-style-type: none"> <li>850 nm: 28 dB</li> <li>1300 nm: 30 dB</li> <li>1310 nm: 32 dB</li> <li>1550 nm: 30 dB</li> </ul>	
8.2.2.8	Max distance range setting	<ul style="list-style-type: none"> <li>MM: up to 40 km</li> <li>SM: up to 130 km</li> </ul>	
8.2.2.9	Distance measurement range	<ul style="list-style-type: none"> <li>850 nm: 9 km</li> <li>1300 nm: 35 km</li> <li>1310 nm: 80 km</li> <li>1550 nm: 130 km</li> </ul>	
8.2.2.10	Reflectance range	<ul style="list-style-type: none"> <li>850 nm: -14 dB to -57 dB</li> <li>1300 nm: -14 dB to -62 dB</li> <li>1310 nm: -14 dB to -65 dB</li> <li>1550 nm: -14 dB to -65 dB</li> </ul>	
8.2.2.11	Sample resolution	3 cm to 400 cm	
8.2.2.12	Pulse widths(nominal)	<ul style="list-style-type: none"> <li>850 nm: 3, 5, 20, 40, 200 ns,</li> <li>1300 nm: 3, 5, 20, 40, 200, 1000ns</li> <li>1310/1550 nm: 3, 10, 30, 100, 300, 1000, 3000, 10000, 20000 ns</li> </ul>	
8.2.2.13	Test time (per wavelength)	Auto setting: <ul style="list-style-type: none"> <li>MM - 5 sec</li> <li>SM - 10 sec</li> </ul>	
		Quick test setting: <ul style="list-style-type: none"> <li>MM - 2 sec</li> <li>SM - 5 sec</li> </ul>	
		Best resolution setting: <ul style="list-style-type: none"> <li>MM - 2 to 180 sec M</li> <li>SM - 5 to 180 sec</li> </ul>	



Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
		Fault Map setting: <ul style="list-style-type: none"> <li>• MM - 2 sec (typical)</li> <li>• MM - 180 sec (max)</li> <li>• SM - 10 sec (typical)</li> <li>• SM - 180 sec (max)</li> </ul>	
		Data Center OTDR setting: <ul style="list-style-type: none"> <li>• MM - 1 sec (typical at 850 nm)</li> <li>• MM - 7 sec (max)</li> <li>• SM - 20 sec (typical)</li> <li>• SM - 40 sec (max)</li> </ul>	
		Manual setting: <ul style="list-style-type: none"> <li>• MM-3, 5, 10, 20, 40, 60, 90, 120, 180 sec</li> <li>• SM - 3, 5, 10, 20, 40, 60, 90, 120, 180 sec</li> </ul>	
<b>Fibre Inspector probe specifications</b>			
8.2.2.14	Magnification	-200X	
8.2.2.15	Light source	Blue LED	
8.2.2.16	Power source	TFS mainframe	
8.2.2.17	Field of View (FOV)	<ul style="list-style-type: none"> <li>• Horizontal: 425 <math>\mu</math>m</li> <li>• Vertical: 320 <math>\mu</math>m</li> </ul>	
8.2.2.18	Minimum detectable particle size	0.5 $\mu$ m	
8.2.2.19	Operating temperature	0° C to 50° C	
<b>VFL specifications</b>			
8.2.2.20	On/Off control	Mechanical switch and a button on the touch screen	
8.2.2.21	Operating wavelength	650 nm	
8.2.2.22	Spectral width (RMS)	$\pm$ 3 nm	
8.2.2.23	Output modes	Continuous wave Pulsed mode (2 Hz to 3 Hz blink frequency)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
8.2.2.24	Connector adapter	2.5 mm universal	
8.2.2.25	Laser safety (classification)	Class II CDRH Complies to EN 60825-2	
<b>General specifications and accessories</b>			
8.2.2.26	Fibre Test Reference Cords (TRCs)	<ul style="list-style-type: none"> <li>• ≥Two (2), 50 µm Multimode SC/SC</li> <li>• ≥Two (2), 50 µm Multimode SC/LC</li> <li>• ≥Two (2), 50 µm Multimode LC/LC</li> <li>• ≥Two (2), 9 µm Single Mode SC/SC</li> <li>• ≥Two (2), 9 µm Single Mode SC/LC</li> <li>• ≥Two (2), 9 µm Single Mode LC/LC</li> <li>• ≥Two (2), 9 µm Single Mode FC/FC</li> <li>• ≥Two (2), 9 µm Single Mode FC/LC</li> <li>• ≥Two (2), Single Mode 9 µm SC/E200 APC</li> </ul>	
8.2.2.27	TIP-KIT	<ul style="list-style-type: none"> <li>• LC, SC and FC bulkhead adapter tip</li> <li>• 1.25 mm universal tip</li> <li>• 2.5 mm universal tip</li> </ul>	
8.2.2.26	Calibration	Period 1 year	
8.2.2.27	Battery	≥ Lithium-ion battery pack, 7.2 volts	
8.2.2.28	Battery life	≥ 8 hr Auto OTDR operation, dual wavelength no video probe connected, 150 m of fiber	
8.2.2.29	Integrated Wi-Fi	IEEE 802.11 a/b/g/n; dual band (2.4 GHz and 5 GHz)	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
8.2.2.30	EMC	EN 61326-1	
8.2.2.31	Certifications	CE - Conformance Europeene. Conforms to the requirements of the European Union and the European Free Trade Association (EFTA).	
8.2.2.32	Power Supply	240V AC, 50Hz, 3pin British type connector cord	
8.2.2.33	Carrying Case	To be provided	
8.2.2.34	Manufacturer Warranty	≥ 1 year	
8.2.3	Product certifications	Offered equipment shall comply to the requirements as per the specifications in clause 8.2.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>8.3</b>	<b>FIBRE OPTIC FIELD FUSION SPLICING EQUIPMENT</b>		
8.3.1	General Requirements	Offered equipment shall comply to the general requirements as per the specifications in clause 8.3.1 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	
<b>8.3.2</b>	<b>Minimum Specifications</b>		
8.3.2.1	Type	Fibre Fusion Splicing Kit (Fully ruggedized for shock, dust, and moisture)	
8.3.2.2	Applicable Fibres	<ul style="list-style-type: none"> <li>• Single-Mode (G .652 and G .657)</li> <li>• Multi-Mode (G .651), DS (G .653), NZDS (G .655) to conform ITU-T standards</li> </ul>	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
8.3.2.3	Fibre Count	Single Count	
8.3.2.4	Cladding Diameter	80 - 150 $\mu$ m	
8.3.2.5	Coating Diameter	100 $\mu$ m - 1,000 $\mu$ m	
8.3.2.6	Fiber Cleave Length	5 - 16 mm	
8.3.2.7	Typical Average Splice Loss	<ul style="list-style-type: none"> <li>• 0.02 dB with SM,                             <ul style="list-style-type: none"> <li>○ dB with MM,</li> </ul> </li> <li>• 0.04 dB with DS,</li> <li>• 0.04 dB with NZDS, measured by cut-back method relevant to ITU-T standards</li> </ul>	
8.3.2.8	Splicing Time	<ul style="list-style-type: none"> <li>• ULTRA FAST mode — 6 seconds;</li> <li>• SM FAST mode : Avg. 7 to 9sec;</li> <li>• SM AUTO mode : Avg. 14 to 16sec.</li> </ul>	
8.3.2.9	Arc Calibration Method	Automatic, real-time and by using results of previous splice when in AUTO mode, manual arc calibration function available	
8.3.2.10	Splicing Modes	$\geq$ 100 pre-set and user programmable modes	
8.3.2.11	Splicing Method	Automated Core Alignment	
8.3.2.12	Splice Loss Estimate	Based upon dual camera core axis alignment data	
8.3.2.13	Storage of Splice Result	$\geq$ 10,000 results stored in the internal memory in FIFO	
8.3.2.14	Fibre Display	X or Y, or both X and Y simultaneously. Front or rear monitor display options with automated image orientation	
8.3.2.15	Magnification	320X for single X or Y view, or 200X for X and Y view	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
8.3.2.16	Viewing Method	Dual Cameras	
8.3.2.17	Display Screen	≥4.7-inch TFT colour LCD monitor	
8.3.2.18	Operating Condition	0 - 5,000 m above sea level, 0 to 95%RH and -10 to 50°C respectively	
8.3.2.19	Mechanical Proof Test	1.96 to 2.25N	
8.3.2.20	Tube Heater	Built-in tube heater with 30 heating modes; auto-start function	
8.3.2.21	Tube Heating Time	<ul style="list-style-type: none"> <li>• ≤23 seconds with FP-03 sleeve</li> <li>• ≤17 seconds with FP3 (40)</li> <li>• ≤15 seconds with slim 60 mm and 40 mm sleeves</li> </ul>	
8.3.2.22	Protection Sleeve Length	60 mm, 40 mm, micro sleeves	
8.3.2.23	Splice/Heat Cycles with Battery	Typical 200 cycles with power save functions activated	
8.3.2.24	Electrode Life	≥5,000 Arc Discharges	
8.3.2.25	Fusion Splicer Electrodes	Capability to replace; include a pair of spare electrodes, replaceable without tool	
8.3.2.26	Power Supply	Auto voltage selection from 100 to 240 V AC and detachable BTR-09 Li-ion battery & Charger Cord	
8.3.2.27	Terminals	USB 1.1 (USB-B type) for PC communication. Mini-DIN (6-pin) for HJS-02/03	
8.3.2.28	Wind Protection	Maximum wind velocity of 15 m/s. (34 mph)	
8.3.2.29	Carrying Case	At least 1	
8.3.2.30	Work Tray	At least 1	
8.3.2.31	Power Supply connectors	British type plug	
	<b>Splicing Kit to include all necessary Accessories</b>		
	<b>Optical Fibre Cleaver with casing</b>		

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
8.3.2.32	Application Single fibres	<ul style="list-style-type: none"> <li>• 250-900 µm coating</li> <li>• 125 µm cladding</li> </ul>	
8.3.2.33	Cleave Length	<ul style="list-style-type: none"> <li>• 900 µm: 10-20 mm,</li> <li>• 250 µm: 6-20 mm</li> </ul>	
8.3.2.34	Blade lifetime	≥60,000 fibres cleaves	
8.3.2.35	Includes	<ul style="list-style-type: none"> <li>• Adapter Plate</li> <li>• Scrap Collector</li> </ul>	
<b>Splicer V-groove Cleaning Kit</b>			
8.3.2.36	Eye Loupe with 3X to 12X magnification	At least 1	
8.3.2.37	LED Pen Light with momentary or constant on switching	At least 1	
8.3.2.38	Instruction Sheet with illustrations	To be provided	
8.3.2.39	Canvas Carrying Case	To be provided	
8.3.2.40	Splicer V-groove Cleaning Refill Kit includes	<ul style="list-style-type: none"> <li>• At least 1 Can FPF1 Cleaning Fluid</li> <li>• At least 1 Scrubber Brush</li> <li>• At least 1 Sweeper Brush</li> <li>• At least 10 packs Cotton Swabs (250 swabs) for precision cleaning</li> </ul>	
<b>Splice Protection Micro Sleeves (Heat shrink sleeves)</b>			
8.3.2.41	Outer Tube	Polythene	
8.3.2.42	Strength member	Stainless Steel	
8.3.2.43	Sleeve 60mm	At least 1 Pack of 1000 pcs	
8.3.2.44	Sleeve 40mm	At least 1 Pack of 1000 pcs	
8.3.2.45	Sheath Clamp	At least 1	
8.3.2.46	Electrodes (spare)	At least 1	
8.3.2.47	Sleeve Loader	At least 1	
8.3.2.48	USB Cable	At least 1	
8.3.2.49	Alcohol Dispenser	At least 1	

Tender Clause	Particulars	Employer Minimum Requirements	Bidders Guaranteed offer
8.3.2.50	Splicer Carrying Strap	At least 1	
8.3.2.51	Quick Reference Guide	To be provided	
8.3.2.52	Software & Hardware Warranty	Two (2) years (includes Software Upgrades)	
8.3.3	Product certifications	Offered equipment shall comply to the requirements as per the specifications in clause 8.3.3 of procuring entity requirements <i>(Bidder to state compliance to these requirements and indicate any deviations)</i>	

# **PRELIMINARY BILL OF MATERIALS**



## PRELIMINARY BILL OF MATERIALS

### DETAILED SCOPE OF SUPPLY FOR PLANT AND MANDATORY SPARE PARTS

Contractor shall supply, Install, and commission a minimum of the equipment/systems below. The list is not exhaustive, all components necessary to achieve the functionality and performance requirements given in the technical specifications shall be supplied irrespective of whether such equipment are listed below or not. Quantities of minor components (components not indicated in the schedule of prices) shall be the minimum quantities that **must** be supplied, the actual requirements at site may vary during implementation.

#### A MASINGA

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
A1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications	1	units		
A2	Aggregation Router 1000BASE-EX SFP transceiver module for SMF, extended operating temperature range, up to 40km	1	units		
A3	Aggregation Router 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	2	units		
A4	Aggregation Router 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	units		
A5	Aggregation Router 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	8	units		
A6	<b>Hybrid IP PBX</b>	1	sets		
A6.1	Hybrid IP PBX, SIP server, at least 30 concurrent calls and 50 users,16 FXS ports,48 VDC power supply	1	sets		
A6.2	GSM gateway with at least two SIM cards and external antenna port	1	unit		
A6.3	Outdoor GSM antenna with mounting accessories, coaxial cable, and surge/Lightning protection	1	sets		
A6.4	Telephone punch down terminal block for at least 25 pairs	1	sets		
A6.5	Data Surge Protection Device (SPD) for analogue phones FXS connections	25	pcs		
A6.6	All other accessories and components and as detailed in specifications	Lot	—		
A7	<b>Control Room Network cabinet</b>	—	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
A7.1	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
A7.2	Power supply components	—	—		
A7.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
A7.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
A7.2.3	Redundant panel cooling fans with filters,700m3/hr throughput with filter, outlet filter unit	2	sets		
A7.2.4	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	7	pcs		
A7.2.5	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	5	pcs		
A7.2.6	Power distribution unit,240V AC,32A,16 outlets	1	pcs		
A7.2.7	Terminal blocks for auxiliary supplies wiring	lot	—		
A7.2.8	Terminal blocks for control wiring	lot	—		
A7.2.9	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
A7.2.10	Socket strip, British type (BS 1363), rack mount	1	pcs		
A7.2.11	Socket strip, British type (BS 1363), DIN mount	2	pcs		
A7.2.12	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
A7.2.13	Panel LED lighting lamps	2	pcs		
A7.2.14	Door operated switches	2	pcs		
A7.2.15	Panel heater	1	pcs		
A7.2.16	Panel Thermostats	2	pcs		
A7.2.17	Panel Hygrostat	1	pcs		
A7.2.18	All other necessary electrical components as per technical specifications	lot	—		
A7.3	Structured cabling components	—	—		
A7.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	4	pcs		
A7.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
A7.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	35	pcs		
A7.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	5	pcs		
A7.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	5	pcs		
A7.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
A8	<b>Powerhouse Network cabinet</b>	—	—		
A8.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
A8.2	Power supply components	—	—		
A8.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
A8.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
A8.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
A8.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
A8.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
A8.2.6	Terminal blocks for control wiring	lot	—		
A8.2.7	Electrical copper wires for internal panel wiring, 2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
A8.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
A8.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
A8.2.10	Panel LED lighting lamps	1	pcs		
A8.2.11	Door operated switches	1	pcs		
A8.2.12	Panel heater	1	pcs		
A8.2.13	Panel Thermostats	2	pcs		
A8.2.14	Panel Hygrostat	1	pcs		
A8.2.15	All other necessary electrical components as per technical specifications	lot	—		
A8.3	Structured cabling components	—	—		
A8.3.1	Fibre optic patch panel, 1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
A8.3.2	STP patch Panel, 24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors, 1U Rack-Mount steel enclosure.	1	pcs		
A8.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors, 2-5m Category 7 S/FTP cable	10	pcs		
A8.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors, 2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
A8.3.5	Cable management panel with brush strip, 1U rack mount/panel mount, for guiding the networking cables	2	pcs		
A8.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
A9	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	2	units		
A10	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	1	units		
A11	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	units		
A12	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	1	sets		
A12.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	1	units		
A12.2	Outdoor unit, ODU, POE, 3x1G SFP/RJ45, with cable connectors and mounting accessories	1	units		
A12.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	1	units		
A12.4	Lightning protection unit and Grounding Kit	1	set		
A12.5	Coaxial Cable with grounding kit for antenna	Lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
A12.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight and abrasion resistant	200	meters		
A12.7	Bend insensitive multimode fibre optic cable with LC-LC connectors	100	meters		
A12.8	Flexible Conduit Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	100	meters		
A12.9	SFP module,1000BASE-SX	1	units		
A12.10	All other accessories and components and as detailed in specifications	Lot	—		
A13	IP DECT Multi cell Manager station	1	units		
A14	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	4	units		
A15	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	5	units		
A16	Ruggedized Corded IP telephone set, stainless steel enclosure	3	units		
A17	Analogue corded telephone set	10	units		
A18	<b>Existing SCADA Local Control Centre Cabinet Structured cabling components</b>	—	—		
A18.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
A18.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
A18.3	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	1	pcs		
A19	<b>Existing Corporate network Cabinet Structured cabling components</b>	—	—		
A19.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
A19.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
A19.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	2	pcs		
A19.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
A19.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	1	pcs		
A20	<b>KPLC Network interface Structured cabling components</b>	—	—		
A20.1	Fiber optic Patch Panel, wall mount steel enclosure,6 single mode OS2 LC connectors	1	pcs		
A20.2	Fibre optic patch cords, Single mode duplex FC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	PCS		
A20.3	Fibre optic patch cords, Single mode duplex FC-FC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	PCS		
A21	<b>General Structured cabling components</b>	—	—		
A21.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	100	meters		
A21.2	Flexible Conduit Coated Galvanised Steel core, 10-20mm internal diameter	200	meters		
A21.3	Flexible Conduit Metallic Fittings	lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
A21.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	100	meters		
A21.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
A21.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	15	pcs		
A21.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	1	roll		
A21.8	STP Cat6A RJ45 male connectors	lot	—		
A21.9	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
A21.10	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	100	meters		
A21.11	Telephone twisted pair cable, Galvanized Steel Wire Armour,10 pairs,20AWG/0.8mm copper conductors (20X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	200	meters		
A21.12	Telephone twisted pair cable, Galvanized Steel Wire Armour,2 pairs,20AWG/0.8mm copper conductors (4X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	500	meters		
A21.13	Telephone twisted pair cable, 2 Pairs, with RJ11 connectors,2-20m, outdoor use	20	pcs		
A21.14	Telephone junction box,10 pairs, stainless steel/fibre glass/heavy duty PVC enclosure, outdoor use i.e., UV and moisture resistant	8	pcs		
A22	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		

## B KAMBURU

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
B1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, 2X10GBASE-T SFP+ module, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications	2	Units		
B2	Aggregation Router 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	10	Units		
B3	Aggregation Router 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	6	Units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
B4	Aggregation Router 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	24	Units		
B5	Backbone Ethernet switch, 20X1G SFP/RJ45 & 4x 1-10G SFP+, 2X10GBASE-T SFP+ modules, 10GBASE-ER SFP+ module, Carrier Ethernet, Layer 3, VRF, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis	1	Units		
B6	Backbone Ethernet switch 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	3	Units		
B7	Backbone Ethernet switch 1000BASE-ZX SFP transceiver module for SMF, extended operating temperature range, up to 70km	2	Units		
B8	Backbone Ethernet switch 1000BASE-EX SFP transceiver module for SMF, extended operating temperature range, up to 40km	4	Units		
B9	Industrial grade media converter or Multiplexer, Multimode Fibre to single mode Fibre ethernet, 160km range, 2 x1G, LC ports	1	Units		
B10	<b>Hybrid IP PBX</b>	1	sets		
B10.1	Hybrid IP PBX, SIP server, at least 50 concurrent calls and 100 users, 16 FXS ports, 48 VDC power supply	1	sets		
B10.2	GSM gateway with at least two SIM cards and external antenna port	1	unit		
B10.3	Outdoor GSM antenna with mounting accessories, coaxial cable and surge/Lightning protection	1	sets		
B10.4	Telephone punch down terminal block for at least 25 pairs	1	sets		
B10.5	Data Surge Protection Device (SPD) for analogue phones FXS connections	25	pcs		
B10.6	All other accessories and components and as detailed in specifications	Lot	—		
B11	<b>Control Room Network cabinet</b>	1	Units		
B11.1	Industrial grade network cabinet, 42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
B11.2	Power supply components	—	—		
B11.2.1	Switched power supply unit, 110VDC-240VAC input, 48VDC/20A output, 960W	4	pcs		
B11.2.2	Redundancy diode modules, 48VDC, 2X20A/40A	2	pcs		
B11.2.3	Redundant panel cooling fans with filters, 700m <sup>3</sup> /hr throughput with filter, outlet filter unit	2	pcs		
B11.2.4	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	9	pcs		
B11.2.5	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	6	pcs		
B11.2.6	Power distribution unit, 240V AC, 32A, 16 outlets	1	pcs		
B11.2.7	Terminal blocks for auxiliary supplies wiring	—	—		
B11.2.8	Terminal blocks for control wiring	lot	—		
B11.2.9	Electrical copper wires for internal panel wiring, 2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
B11.2.10	Socket strip, British type (BS 1363), rack mount	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
B11.2.11	Socket strip, British type (BS 1363), DIN mount	2	pcs		
B11.2.12	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
B11.2.13	Panel LED lighting lamps	2	pcs		
B11.2.14	Door operated switches	2	pcs		
B11.2.15	Panel heater	1	pcs		
B11.2.16	Panel Thermostats	2	pcs		
B11.2.17	Panel Hygrostat	1	pcs		
B11.2.18	All other necessary electrical components as per technical specifications	lot	—		
B11.3	Structured cabling components	—	—		
B11.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	6	pcs		
B11.3.2	Fibre optic patch panel,1U/2U rack mount steel enclosure, 48/96 ports size,48 LC modules, single mode OS2, with at least four 12 pair splice cassettes	1	pcs		
B11.3.3	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	3	pcs		
B11.3.4	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	120	pcs		
B11.3.5	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	20	pcs		
B11.3.6	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m multimode mode OM3/OM2 LSZH cable	5	pcs		
B11.3.7	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	10	pcs		
B11.3.8	All other necessary structured cabling components as per technical specifications	lot	—		
B12	<b>Powerhouse Network cabinet</b>	1	Units		
B12.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
B12.2	Power supply components	—	—		
B12.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
B12.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
B12.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
B12.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
B12.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
B12.2.6	Terminal blocks for control wiring	lot	—		
B12.2.7	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
B12.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
B12.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
B12.2.10	Panel LED lighting lamps	1	pcs		
B12.2.11	Door operated switches	1	pcs		
B12.2.12	Panel heater	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
B12.2.13	Panel Thermostats	2	pcs		
B12.2.14	Panel Hygrostat	1	pcs		
B12.2.15	All other necessary electrical components as per technical specifications	lot	—		
B12.3	Structured cabling components	—	—		
B12.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
B12.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
B12.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
B12.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
B12.3.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	2	pcs		
B12.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
B13	<b>Substation Network cabinet</b>	1	Units		
B13.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, wall mount, Ground mounting supports with roof, all panel parts as detailed in specifications	1	units		
B13.2	Power supply components	—	—		
B13.2.1	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
B13.2.2	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
B13.2.3	Terminal blocks for auxiliary supplies wiring	lot	—		
B13.2.4	Terminal blocks for control wiring	lot	—		
B13.2.5	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
B13.2.6	Socket strip, British type (BS 1363), DIN mount	2	pcs		
B13.2.7	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
B13.2.8	Panel LED lighting lamps	1	pcs		
B13.2.9	Door operated switches	1	pcs		
B13.2.10	Panel heater	1	pcs		
B13.2.11	Panel Thermostats	2	pcs		
B13.2.12	Panel Hygrostat	1	pcs		
B13.2.13	All other necessary electrical components as per technical specifications	lot	—		
B13.3	Structured cabling components	lot	—		
B13.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
B13.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
B13.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
B13.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		



BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
B13.3.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	2	pcs		
B13.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
B14	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	1	Units		
B15	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	3	Units		
B16	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	4	Units		
B17	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	2	Units		
B18	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	1	sets		
B18.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	1	units		
B18.2	Outdoor unit, ODU, POE,3x1G SFP/RJ45, with cable connectors and mounting accessories	1	units		
B18.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	1	units		
B18.4	Lightning protection unit and Grounding Kit	1	set		
B18.5	Coaxial Cable with grounding kit for antenna	Lot	—		
B18.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight and abrasion resistant	200	meters		
B18.7	Bend insensitive multimode fibre optic cable with LC-LC connectors	100	meters		
B18.8	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	100	meters		
B18.9	SFP module,1000BASE-SX	1	units		
B18.10	All other accessories and components and as detailed in specifications	Lot	—		
B19	IP DECT Multi cell Manager station	1	Units		
B20	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	7	Units		
B21	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	5	Units		
B22	Ruggedized Corded IP telephone set, stainless steel enclosure	10	Units		
B23	Analogue corded telephone set	10	Units		
B24	<b>Existing SCADA LCC, RCC operations &amp; RCC DMZ Cabinets Structured cabling components</b>	—	—		
B24.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	3	pcs		
B24.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	6	pcs		
B24.3	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	3	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
B25	<b>Existing Corporate network Cabinet Structured cabling components</b>	—	—		
B25.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	2	pcs		
B25.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
B25.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	2	pcs		
B25.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	16	pcs		
B25.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	4	pcs		
B26	<b>KPLC Network interface Structured cabling components</b>	—	—		
B26.1	Fiber optic Patch Panel, wall mount steel enclosure,12 single mode OS2 LC connectors	1	pcs		
B25.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	2	pcs		
B26.2	Fibre optic patch cords, Single mode duplex <b>FC-LC</b> UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	8	pcs		
B26.3	Fibre optic patch cords, Single mode duplex <b>FC-FC</b> UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	4	pcs		
B27	<b>General Structured cabling components</b>	—	—		
B27.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	400	meters		
B27.2	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	500	meters		
B27.3	Flexible Conduit Metallic Fittings	lot	—		
B27.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	300	meters		
B27.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
B27.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	60	pcs		
B27.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	3	rolls		
B27.8	STP Cat6A RJ45 male connectors	lot	—		
B27.9	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
B27.10	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	300	meters		
B27.11	Telephone twisted pair cable, Galvanized Steel Wire Armour,10 pairs,20AWG/0.8mm copper conductors (20X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	200	meters		
B27.12	Telephone twisted pair cable, Galvanized Steel Wire Armour,2 pairs,20AWG/0.8mm copper conductors (4X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	500	meters		
B27.13	Telephone twisted pair cable, 2 Pairs, with RJ11 connectors,2-20m, outdoor use	20	pcs		
B27.14	Telephone junction box,10 pairs, stainless steel/fibre glass/heavy duty PVC enclosure, outdoor use i.e., UV and moisture resistant	8	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
B28	Cisco Catalyst 9300 8 x 10GE Network Module, C9300-NM-8X=, for the existing SCADA DMZ Cisco 9300U Ethernet Switches (module only, switch is existing and not in scope)	2	units		
B29	Cisco 10GBASE-ER SFP+ transceiver module for SMF, extended temperature range, up to 40km for the existing SCADA DMZ Cisco 9300U Ethernet Switches connection to Gitaru	2	units		
B30	Cisco 10GBASE-T SFP+ module with RJ-45 connector extended temperature range, for the existing SCADA DMZ Cisco 9300U Ethernet Switches, BCC DMZ cabinet	14	Units		
B31	<b>Rack mount VM Management Host Server complete with licensed pre-installed software as detailed in specifications</b>	2	sets		
B31.1	Rack mount server,8C/16T,3.2GHZ,16MB L3,64GB 3200MT/s RAM,2X960GB 3 DWPD SAS SSD,4X10Gb Base-T, 4X1Gb Base-T,2X600W power supply	2	Units		
B31.2	Windows 2019/2022 server standard edition perpetual volume licenses for at least sixteen (16) cores (if bidder supplies servers with 16 cores or less higher if not)	6	Units		
B31.3	Windows Server® 2019/2022 perpetual volume Client Access Licenses (CAL)	10	Units		
B31.4	Windows Server® 2019/2022 perpetual volume remote desktop service Client Access Licenses (RDS CALS)	10	Units		
B31.5	VMware vSphere essential plus kit with perpetual licenses for virtualisation of management servers	1	set		
B32	Quad (4) Port 10GbE BASE-T Adapter, PCIe for Dell PowerEdge R740 Servers, for existing DMZ servers	6	Units		
B33	Inverter power supply, 110V DC/240V AC, 3kVA for existing SCADA server cabinets	4	Units		
B34	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		

### C GITARU

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
	<b>Network &amp; Communication Equipment</b>	—	—		
C1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, 10GBASE-T SFP+ module, 10GBASE-ER SFP+ module, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications	2	units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
C2	Aggregation Router 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	10	units		
C3	Aggregation Router 1000BASE-EX SFP transceiver module for SMF, extended operating temperature range, up to 40km	4	units		
C4	Aggregation Router 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	4	units		
C5	Aggregation Router 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	24	units		
C6	Industrial grade cyber security appliance, all features & licenses as detailed in specifications, 10 X1G RJ45, 2 X 1000BASE-LX SFP	1	units		
C7	<b>Hybrid IP PBX</b>	1	sets		
C7.1	Hybrid IP PBX, SIP server, at least 50 concurrent calls and 100 users,16 FXS ports,48 VDC power supply	1	sets		
C7.2	GSM gateway with at least two SIM cards and external antenna port	1	unit		
C7.3	Outdoor GSM antenna with mounting accessories, coaxial cable, and surge/Lightning protection	1	sets		
C7.4	Telephone punch down terminal block for at least 25 pairs	1	sets		
C7.5	Data Surge Protection Device (SPD) for analogue phones FXS connections	25	pcs		
C7.6	All other accessories and components and as detailed in specifications	Lot	—		
C8	<b>Control Room Network cabinet</b>	1	units		
C8.1	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
C8.2	Power supply components	—	—		
C8.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
C8.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
C8.2.3	Redundant panel cooling fans with filters,700m3/hr throughput with filter, outlet filter unit	2	pcs		
C8.2.4	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	7	pcs		
C8.2.5	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	5	pcs		
C8.2.6	Power distribution unit,240V AC,32A,16 outlets	1	pcs		
C8.2.7	Terminal blocks for auxiliary supplies wiring	lot	—		
C8.2.8	Terminal blocks for control wiring	lot	—		
C8.2.9	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
C8.2.10	Socket strip, British type (BS 1363), rack mount	1	pcs		
C8.2.11	Socket strip, British type (BS 1363), DIN mount	2	pcs		
C8.2.12	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
C8.2.13	Panel LED lighting lamps	2	pcs		
C8.2.14	Door operated switches	2	pcs		
C8.2.15	Panel heater	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
C8.2.16	Panel Thermostats	2	pcs		
C8.2.17	Panel Hygrostat	1	pcs		
C8.2.18	All other necessary electrical components as per technical specifications	lot	—		
C8.3	Structured cabling components	—	—		
C8.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	7	pcs		
C8.3.2	Fibre optic patch panel,1U/2U rack mount steel enclosure, 48/96 ports size,48 LC modules, single mode OS2, with at least four 12 pair splice cassettes	1	pcs		
C8.3.3	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	5	pcs		
C8.3.4	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	100	pcs		
C8.3.5	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	20	pcs		
C8.3.6	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	12	pcs		
C8.3.7	All other necessary structured cabling components as per technical specifications	lot	—		
C9	<b>Powerhouse Network cabinet</b>	1	units		
C9.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
C9.2	Power supply components	—	—		
C9.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
C9.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
C9.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
C9.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
C9.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
C9.2.6	Terminal blocks for control wiring	lot	—		
C9.2.7	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
C9.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
C9.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
C9.2.10	Panel LED lighting lamps	1	pcs		
C9.2.11	Door operated switches	1	pcs		
C9.2.12	Panel heater	1	pcs		
C9.2.13	Panel Thermostats	2	pcs		
C9.2.14	Panel Hygrostat	1	pcs		
C9.2.15	All other necessary electrical components as per technical specifications	lot	—		
C9.3	Structured cabling components	lot	—		
C9.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
C9.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
C9.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
C9.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
C9.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
C9.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
C10	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	2	units		
C11	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	1	units		
C12	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	units		
C13	IP DECT Multi cell Manager station	1	units		
C14	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	6	units		
C15	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	5	units		
C16	Ruggedized Corded IP telephone set, stainless steel enclosure	5	units		
C17	Analogue corded telephone set	10	units		
C18	<b>Existing SCADA LCC &amp; BCC DMZ Cabinets components</b>	—	—		
C18.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	2	pcs		
C18.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	4	pcs		
C18.3	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	5	pcs		
C18.4	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	120	pcs		
C18.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	7	pcs		
C18.6	Power distribution unit,240V AC,32A,16 outlets	2	pcs		
C18.7	Inverter power supply, 110V DC/240V AC, 3kVA	1	Units		
C19	<b>Existing DR network Cabinet Structured cabling components</b>	—	—		
C19.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
C19.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	6	pcs		
C19.3	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	1	pcs		
C20	Existing DR Cisco nexus switches1000BASE-LX SFP transceiver module for SMF, extended operating temperature range up to 10km	4	Units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
C21	<b>Existing Corporate network Cabinet Structured cabling components</b>	—	—		
C21.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
C21.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
C21.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	2	pcs		
C21.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
C21.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	1	pcs		
C22	<b>KPLC Network interface Structured cabling components</b>	—	—		
C21.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
C22.2	Fibre optic patch cords, Single mode duplex <b>FC-LC</b> UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
C23	<b>General Structured cabling components</b>	—	—		
C23.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	300	meters		
C23.2	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	300	meters		
C23.3	Flexible Conduit Metallic Fittings	Lot	—		
C23.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	300	meters		
C23.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
C23.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	30	pcs		
C23.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	3	rolls		
C23.8	STP Cat6A RJ45 male connectors	lot	—		
C23.9	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
C23.10	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey & blue)	100	meters		
C23.11	Telephone twisted pair cable, Galvanized Steel Wire Armour,10 pairs,20AWG/0.8mm copper conductors (20X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	200	meters		
C23.12	Telephone twisted pair cable, Galvanized Steel Wire Armour,2 pairs,20AWG/0.8mm copper conductors (4X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	500	meters		
C23.13	Telephone twisted pair cable, 2 Pairs, with RJ11 connectors,2-20m, outdoor use	20	pcs		
C23.14	Telephone junction box,10 pairs, stainless steel/fibre glass/heavy duty PVC enclosure, outdoor use i.e. UV and moisture resistant	8	pcs		
C24	<b>Backup Control Centre Server Equipment</b>	—	—		
C24.1	IT server cabinet, 42U 600x2000x1000 mm, all panel parts as detailed in specifications	1	Units		
C24.2	Power supply components	—	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
C24.2.1	Redundant panel cooling fans with filters,700m3/hr throughput with filter	2	pcs		
C24.2.2	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
C24.2.3	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	6	pcs		
C24.2.4	Power distribution unit,240V AC,32A,16 outlets, Rack mount, with ethernet port, remote monitoring	2	pcs		
C24.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
C24.2.6	Terminal blocks for control wiring	lot	—		
C24.2.7	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
C24.2.8	Socket strip, British type (BS 1363), rack mount	1	pcs		
C24.2.9	Socket strip, British type (BS 1363), DIN mount	2	pcs		
C24.2.10	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
C24.2.11	Panel LED lighting lamps	2	pcs		
C24.2.12	Door operated switches	2	pcs		
C24.2.13	Panel heater	1	pcs		
C24.2.14	Panel Thermostats	2	pcs		
C24.2.15	Panel Hygrostat	1	pcs		
C24.2.16	All other necessary electrical components as per technical specifications	lot	—		
C24.3	Structured cabling components	—	—		
C24.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
C24.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	5	pcs		
C24.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	150	pcs		
C24.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	5	pcs		
C24.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	6	pcs		
C24.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
C25	<b>Rack mount VM Production Host Servers complete with licensed pre-installed software as detailed in specifications for Gitaru BCC operations</b>	2	sets		
C25.1	Rack mount server,18C/36T,3.0GHZ,39MB L3,256GB 3200MT/s RAM,2X960GB 3 DWPD SAS SSD,8X10Gb Base-T, 4X1Gb Base-T,2X1100W power supply	2	units		
C25.2	Microsoft SQL server standard edition perpetual volume licenses with ten (10) user CALS.	4	units		
C25.3	Windows Server® 2019/2022 perpetual volume Client Access Licenses (CAL)	40	units		
C25.4	Windows Server® 2019/2022 data centre edition perpetual volume licenses for at least Eighty (80) cores (if bidder supplies 18 core servers higher if not) <i>total 160 core data centre license</i>	2	units		



BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
C25.5	Solar winds Orion platform Server and applications monitor for 700 elements (AL700) to increase existing license to 1000 elements	1	units		
C25.6	Solar winds Orion platform Virtualisation monitor for at least sixty-four sockets (VMS64)	1	units		
C25.7	Solar winds Orion platform Log analyser for at least 250 nodes (LA250)	1	units		
C25.8	Solar winds Orion platform additional web server	1	units		
C25.9	Solar winds Orion platform additional polling engine	1	units		
C25.10	Storage Backup application as detailed in technical specification	lot	—		
C26	<b>Rack mount VM Management Host Server complete with licensed pre-installed software as detailed in specifications</b>	2	sets		
C26.1	Rack mount server,8C/16T,3.2GHZ,16MB L3,64GB 3200MT/s RAM,2X960GB 3 DWPD SAS SSD,4X10Gb Base-T, 4X1Gb Base-T,2X600W power supply	2	Units		
C26.2	Windows Server® 2019/2022 standard edition perpetual volume licenses for at least sixteen (16) cores (if bidder supplies servers with 16 cores or less higher if not)	6	Units		
C26.3	Windows Server® 2019/2022 perpetual volume Client Access Licenses (CAL)	10	Units		
C26.4	Windows Server® 2019/2022 perpetual volume remote desktop service Client Access Licenses (RDS CALS)	10	Units		
C26.5	VMware vSphere essential plus kit with perpetual licenses for virtualisation of new servers	1	set		
C27	Rack mount enterprise security appliance with licensed pre-installed software	2	Units		
C28	Rack mount Integrated console LCD monitor, keyboard & 8 port KVM switch	1	Units		
C29	<b>Rack mount Network Attached Storage complete with licensed pre-installed software as detailed in technical specifications, for existing BCC DMZ cabinet</b>	2	Sets		
C29.1	Rack mount server,10C/20T,2.2GHZ,13.75MB L3,64GB 2400MT/s RAM,2X400GB 1 DWPD SAS SSD,12X2.4TB 10K RPM SAS HDD,8X10Gb Base-T, 4X1Gb Base-T,2X700W power supply	2	Units		
C29.2	OEM Windows storage server 2019/22	2	Units		
C29.3	Windows storage Server 2019/22 perpetual volume Client Access Licenses (CAL)	20	Units		
C30	External LTO Tape-Based Storage with accessories and consumables as detailed in specifications	2	Units		
C31	KVM Extenders (Receiver & Transmitter pair) and Two-port dual display KVM Switch	3	sets		
C32	Thin Client computers	7	Units		
C33	Inverter power supply, 110V DC/240V AC, 3kVA	2	Units		
C34	Server RAM modules,32GB RDIMM, 3200MT/s, Dual Rank, for the existing DMZ servers (PowerEdge R740 Servers)	8	Units		
C35	Quad (4) Port 10GbE BASE-T Adapter, PCIe for Dell PowerEdge R740 Servers, for existing DMZ servers	2	Units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
C36	Cisco 10GBASE-ER SFP+ transceiver module for SMF, up to 40km, for the existing SCADA DMZ Cisco 9300U Ethernet Switches connection to Kamburu, BCC DMZ cabinet	2	Units		
C37	Cisco 10GBASE-T SFP+ module with RJ-45 connector extended temperature range, for the existing SCADA DMZ Cisco 9300U Ethernet Switches, BCC DMZ cabinet	14	Units		
	<b>Gitaru Central Office tower site Network &amp; Communication Equipment</b>	—	—		
C38	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	1	sets		
C38.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	1	units		
C38.2	Outdoor unit, ODU, POE,3x1G SFP/RJ45, with cable connectors and mounting accessories	1	units		
C38.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	1	units		
C38.4	Lightning protection unit and Grounding Kit	1	set		
C38.5	Coaxial Cable with grounding kit for antenna	Lot	—		
C38.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight, and abrasion resistant	100	meters		
C38.7	Bend insensitive single mode fibre optic cable ITU-T G657 with LC-LC connectors	50	meters		
C38.8	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	50	meters		
C38.9	SFP module,1000BASE-LX	1	units		
C38.10	All other accessories and components and as detailed in specifications	lot	—		
C39	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	1	Units		
C40	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	1	Units		
C41	Ruggedized Corded IP telephone set, stainless steel enclosure with 48V DC power supply input	1	Units		
C42	<b>Network cabinet</b>	1	Units		
C42.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
C42.2	Power supply components	—	—		
C42.2.1	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	2	pcs		
C42.2.2	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	1	pcs		
C42.2.3	Terminal blocks for auxiliary supplies wiring	lot	—		
C42.2.4	Terminal blocks for control wiring	lot	—		
C42.2.5	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
C42.2.6	Socket strip, British type (BS 1363), DIN mount	2	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
C42.2.7	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
C42.2.8	Panel LED lighting lamps	1	pcs		
C42.2.9	Door operated switches	1	pcs		
C42.2.10	Panel heater	1	pcs		
C42.2.11	Panel Thermostats	2	pcs		
C42.2.12	Panel Hygrostat	1	pcs		
C42.2.13	All other necessary electrical components as per technical specifications	lot	—		
C42.3	Structured cabling components	lot	—		
C42.3.2	Fibre optic patch panel,1U/2U rack mount steel enclosure, 48/96 ports size,8 LC modules, single mode OS2, with at least four 12 pair splice cassettes	1	pcs		
C42.3.3	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
C42.3.4	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
C42.3.5	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	3	pcs		
C42.3.6	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
C42.3.7	All other necessary structured cabling components as per technical specifications	lot	—		
	<b>Gitaru Central Office tower site Power supply Equipment</b>	—	—		
C43	Solar Hybrid Inverter charger,7KVA, ethernet communication gateway	1	Units		
C44	Batteries, solar deep cycle,200AH, 12V, 1.2KWH (50%DoD)	4	Units		
C45	<b>Power supply/Battery cabinet</b>				
C45.1	Power supply cabinet, Perforated,600X2100X800mm, all panel parts as per specifications	1	Units		
C45.2	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	1	pcs		
C45.3	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
C45.4	Redundant panel cooling fans with filters,700m3/hr throughput with filter	2	pcs		
C45.5	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
C45.6	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	5	pcs		
C45.7	Terminal blocks for auxiliary supplies wiring	lot	—		
C45.8	Terminal blocks for control wiring	lot	—		
C45.9	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
C45.10	Battery cable and connectors sized as per design	lot	—		
C45.11	Battery Fused isolator or MCCB sized as per design	2	pcs		
C45.12	Battery draw out trays with locking mechanism	lot	—		
C45.13	Socket strip, British type (BS 1363), DIN mount	2	pcs		
C45.14	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
C45.15	Panel LED lighting lamps	1	pcs		
C45.16	Door operated switches	1	pcs		
C45.17	Panel heater	1	pcs		
C45.18	Panel Thermostats	2	pcs		
C45.19	Panel Hygrostat	1	pcs		
C45.20	All other necessary electrical components to meet technical specifications	lot	—		
C46	<b>Power supply wiring and installation materials / accessories</b>	—	—		
C46.1	AC power supply cable, Steel wire armour, 4X10 mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	20	meters		
C46.2	Miniature circuit breakers for AC supplies external connections, 500V AC rated, three pole, current rating as per design	1	pcs		
C46.3	All other materials required to undertake power installation works to meet technical specifications	Lot	—		
C48	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Bidder to Itemize)	Lot	—		

## D KINDARUMA

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
D1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications	1	units		
D2	Aggregation Router 1000BASE-EX SFP transceiver module for SMF, extended operating temperature range, up to 40km	1	units		
D3	Aggregation Router 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	units		
D4	Aggregation Router 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	2	units		
D5	Aggregation Router 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	8	units		
D6	<b>Hybrid IP PBX</b>	1	sets		
D6.1	Hybrid IP PBX, SIP server, at least 30 concurrent calls and 50 users, 16 FXS ports, 48 VDC power supply	1	sets		
D6.2	GSM gateway with at least two SIM cards and external antenna port	1	unit		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
D6.3	Outdoor GSM antenna with mounting accessories, coaxial cable and surge/Lightning protection	1	sets		
D6.4	Telephone punch down terminal block for at least 25 pairs	1	sets		
D6.5	Data Surge Protection Device (SPD) for analogue phones FXS connections	25	pcs		
D6.6	All other accessories and components and as detailed in specifications	Lot	—		
D7	<b>Control Room Network cabinet</b>	1	units		
D7.1	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
D7.2	Power supply components	—	—		
D7.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
D7.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
D7.2.3	Redundant panel cooling fans with filters,700m3/hr throughput with filter, outlet filter unit	2	pcs		
D7.2.4	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	7	pcs		
D7.2.5	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	5	pcs		
D7.2.6	Power distribution unit,240V AC,32A,16 outlets	1	pcs		
D7.2.7	Terminal blocks for auxiliary supplies wiring	lot	—		
D7.2.8	Terminal blocks for control wiring	lot	—		
D7.2.9	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
D7.2.10	Socket strip, British type (BS 1363), rack mount	1	pcs		
D7.2.11	Socket strip, British type (BS 1363), DIN mount	2	pcs		
D7.2.12	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
D7.2.13	Panel LED lighting lamps	2	pcs		
D7.2.14	Door operated switches	2	pcs		
D7.2.15	Panel heater	1	pcs		
D7.2.16	Panel Thermostats	2	pcs		
D7.2.17	Panel Hygrostat	1	pcs		
D7.2.18	All other necessary electrical components as per technical specifications	lot	—		
D7.3	Structured cabling components	—	—		
D7.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	4	pcs		
D7.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
D7.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	40	pcs		
D7.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	5	pcs		
D7.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	6	pcs		
D7.3.6	All other necessary structured cabling components as per technical specifications	lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
D8	<b>Powerhouse Network cabinet</b>	1	units		
D8.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
D8.2	Power supply components	—	—		
D8.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
D8.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
D8.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
D8.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
D8.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
D8.2.6	Terminal blocks for control wiring	lot	—		
D8.2.7	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
D8.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
D8.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
D8.2.10	Panel LED lighting lamps	1	pcs		
D8.2.11	Door operated switches	1	pcs		
D8.2.12	Panel heater	1	pcs		
D8.2.13	Panel Thermostats	2	pcs		
D8.2.14	Panel Hygrostat	1	pcs		
D8.2.15	All other necessary electrical components as per technical specifications	lot	—		
D8.3	Structured cabling components	lot	—		
D8.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
D8.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
D8.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
D8.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
D8.3.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	2	pcs		
D8.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
D9	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	2	units		
D10	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	1	units		
D11	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	units		
D12	IP DECT Multi cell Manager station	1	units		
D13	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	6	units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
D14	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	5	units		
D15	Ruggedized Corded IP telephone set, stainless steel enclosure	4	units		
D16	Analogue corded telephone set	10	units		
D17	<b>Existing SCADA Local Control Centre Cabinet Structured cabling components</b>	—	—		
D17.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
D17.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
D17.3	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	1	pcs		
D18	<b>Existing Corporate network Cabinet Structured cabling components</b>	—	—		
D18.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
D18.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
D18.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	2	pcs		
D18.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
D18.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	1	pcs		
D19	<b>KPLC Network interface Structured cabling components</b>	—	—		
D19.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
D19.2	Fibre optic patch cords, Single mode duplex <b>FC-LC</b> UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
D19.3	Fibre optic patch cords, Single mode duplex <b>FC-FC</b> UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
D20	<b>General Structured cabling components</b>	—	—		
D20.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	400	meters		
D20.2	Flexible Conduit Coated Galvanised Steel core, 10-20mm internal diameter	300	meters		
D20.3	Flexible Conduit Metallic Fittings	lot	—		
D20.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	300	meters		
D20.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
D20.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	20	pcs		
D20.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	2	rolls		
D20.8	STP Cat6A RJ45 male connectors	lot	—		
D20.9	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
D20.10	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	100	meters		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
D20.11	Telephone twisted pair cable, Galvanized Steel Wire Armour,10 pairs,20AWG/0.8mm copper conductors (20X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	200	meters		
D20.12	Telephone twisted pair cable, Galvanized Steel Wire Armour,2 pairs,20AWG/0.8mm copper conductors (4X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	500	meters		
D20.13	Telephone twisted pair cable, 2 Pairs, with RJ11 connectors,2-20m, outdoor use	20	pcs		
D20.14	Telephone junction box,10 pairs, stainless steel/fibre glass/heavy duty PVC enclosure, outdoor use i.e., UV and moisture resistant	8	pcs		
	<b>Kindaruma Radio tower site</b>	—	—		
D21	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	1	sets		
D21.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	1	units		
D21.2	Outdoor unit, ODU, POE,3x1G SFP/RJ45, with cable connectors and mounting accessories	1	units		
D21.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	1	units		
D21.4	Lightning protection unit and Grounding Kit	1	set		
D21.5	Coaxial Cable with grounding kit for antenna	Lot	—		
D21.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight, and abrasion resistant	200	meters		
D21.7	Bend insensitive multimode fibre optic cable with LC-LC connectors	100	meters		
D21.8	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	100	meters		
D21.9	SFP module,1000BASE-SX	1	units		
D21.10	All other accessories and components and as detailed in specifications	Lot	—		
D22	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	1	units		
D23	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	units		
D24	<b>Network cabinet</b>	1	units		
D24.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
D24.2	Power supply components	—	—		
D24.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
D24.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
D24.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	4	pcs		
D24.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	4	pcs		
D24.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		



BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
D24.2.6	Terminal blocks for control wiring	lot	—		
D24.2.7	Electrical copper wires for internal panel wiring, 2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
D24.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
D24.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
D24.2.10	Panel LED lighting lamps	1	pcs		
D24.2.11	Door operated switches	1	pcs		
D24.2.12	Panel heater	1	pcs		
D24.2.13	Panel Thermostats	2	pcs		
D24.2.14	Panel Hygrostat	1	pcs		
D24.2.15	All other necessary electrical components as per technical specifications	lot	—		
D24.3	Structured cabling components	lot	—		
D24.3.1	Fibre optic patch panel, 1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
D24.3.2	STP patch Panel, 24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors, 1U Rack-Mount steel enclosure.	1	pcs		
D24.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors, 2-5m Category 7 S/FTP cable	10	pcs		
D24.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors, 2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
D24.3.5	Cable management panel with brush strip, 1U rack mount/panel mount, for guiding the networking cables	2	pcs		
D24.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
D25	Power supply wiring and installation materials / accessories	lot	—		
D25.1	AC power supply cable, Steel wire armour, 4X10 mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey & blue)	250	meters		
D25.2	DC power supply cable, Steel wire armour, 2X10 mm <sup>2</sup> , stranded copper conductors (class 2), Red and white coloured cores	150	meters		
D25.3	Galvanized Iron Pipes for road crossing, 100mm internal diameter, 114mm external diameter with couplers, end plugs and all other accessories necessary for GI conduit work	100	meters		
D25.4	All other necessary electrical components for connecting to DC supply at the intake and UPS AC supply at the control building	Lot	—		
D26	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	lot	—		

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BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
E1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications	1	Units		
E2	Aggregation Router 1000BASE-ZX SFP transceiver module for SMF, extended operating temperature range, up to 70km	1	Units		
E3	Aggregation Router 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	Units		
E4	Aggregation Router 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	2	Units		
E5	Aggregation Router 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	10	Units		
E6	<b>Hybrid IP PBX</b>	1	sets		
E6.1	Hybrid IP PBX, SIP server, at least 30 concurrent calls and 50 users,16 FXS ports,48 VDC power supply	1	sets		
E6.2	GSM gateway with at least two SIM cards and external antenna port	1	unit		
E6.3	Outdoor GSM antenna with mounting accessories, coaxial cable, and surge/Lightning protection	1	sets		
E6.4	Telephone punch down terminal block for at least 25 pairs	1	sets		
E6.5	Data Surge Protection Device (SPD) for analogue phones FXS connections	25	pcs		
E6.6	All other accessories and components and as detailed in specifications	Lot	—		
E7	<b>Control Room Network cabinet</b>	1	Units		
E7.1	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
E7.2	Power supply components	—	—		
E7.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
E7.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
E7.2.3	Redundant panel cooling fans with filters,700m3/hr throughput with filter, outlet filter unit	2	pcs		
E7.2.4	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	7	pcs		
E7.2.5	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	5	pcs		
E7.2.6	Power distribution unit,240V AC,32A,16 outlets	1	pcs		
E7.2.7	Terminal blocks for auxiliary supplies wiring	lot	—		
E7.2.8	Terminal blocks for control wiring	lot	—		
E7.2.9	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
E7.2.10	Socket strip, British type (BS 1363), rack mount	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
E7.2.11	Socket strip, British type (BS 1363), DIN mount	2	pcs		
E7.2.12	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
E7.2.13	Panel LED lighting lamps	2	pcs		
E7.2.14	Door operated switches	2	pcs		
E7.2.15	Panel heater	1	pcs		
E7.2.16	Panel Thermostats	2	pcs		
E7.2.17	Panel Hygrostat	1	pcs		
E7.2.18	All other necessary electrical components as per technical specifications	lot	—		
E7.3	Structured cabling components	—	—		
E7.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	5	pcs		
E7.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
E7.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	50	pcs		
E7.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	5	pcs		
E7.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	5	pcs		
E7.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
E8	<b>Powerhouse Network cabinet</b>	1	Units		
E8.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
E8.2	Power supply components	—	—		
E8.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
E8.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
E8.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
E8.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
E8.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
E8.2.6	Terminal blocks for control wiring	lot	—		
E8.2.7	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
E8.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
E8.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
E8.2.10	Panel LED lighting lamps	1	pcs		
E8.2.11	Door operated switches	1	pcs		
E8.2.12	Panel heater	1	pcs		
E8.2.13	Panel Thermostats	2	pcs		
E8.2.14	Panel Hygrostat	1	pcs		
E8.2.15	All other necessary electrical components as per technical specifications	lot	—		
E8.3	Structured cabling components	lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
E8.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
E8.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
E8.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
E8.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
E8.3.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	2	pcs		
E8.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
E9	<b>Substation Network cabinet</b>	1	Units		
E9.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, wall mount, Ground mounting supports with roof, all panel parts as detailed in specifications	1	units		
E9.2	Power supply components	—	—		
E9.2.1	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
E9.2.2	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
E9.2.3	Terminal blocks for auxiliary supplies wiring	lot	—		
E9.2.4	Terminal blocks for control wiring	lot	—		
E9.2.5	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
E9.2.6	Socket strip, British type (BS 1363), DIN mount	2	pcs		
E9.2.7	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
E9.2.8	Panel LED lighting lamps	1	pcs		
E9.2.9	Door operated switches	1	pcs		
E9.2.10	Panel heater	1	pcs		
E9.2.11	Panel Thermostats	2	pcs		
E9.2.12	Panel Hygrostat	1	pcs		
E9.2.13	All other necessary electrical components as per technical specifications	lot	—		
E9.3	Structured cabling components	lot	—		
E9.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
E9.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
E9.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
E9.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
E9.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
E9.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
E10	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	1	sets		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
E10.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	1	units		
E10.2	Outdoor unit, ODU, POE,3x1G SFP/RJ45, with cable connectors and mounting accessories	1	units		
E10.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	1	units		
E10.4	Lightning protection unit and Grounding Kit	1	set		
E10.5	Coaxial Cable with grounding kit for antenna	Lot	—		
E10.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight, and abrasion resistant	100	meters		
E10.7	Bend insensitive multimode fibre optic cable with LC-LC connectors	50	meters		
E10.8	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	50	meters		
E10.9	SFP module,1000BASE-SX	1	units		
E10.10	All other accessories and components and as detailed in specifications	Lot	—		
E11	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	1	Units		
E12	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	3	Units		
E13	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	4	Units		
E14	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	2	Units		
E15	IP DECT Multi cell Manager station	1	Units		
E16	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	7	Units		
E17	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	5	Units		
E18	Ruggedized Corded IP telephone set, stainless steel enclosure	4	Units		
E19	Analogue corded telephone set	10	Units		
E20	<b>Existing SCADA Local Control Centre Cabinet Structured cabling components</b>	—	—		
E20.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
E20.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
E20.3	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	1	pcs		
E21	<b>Existing Corporate network Cabinet Structured cabling components</b>	—	—		
E21.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
E21.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
E21.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	2	pcs		
E21.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
E21.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	1	pcs		
E22	<b>KPLC Network interface Structured cabling components</b>	—	—		
E22.1	Fiber optic Patch Panel, wall mount steel enclosure,6 single mode OS2 LC connectors	1	pcs		
E22.2	Fibre optic patch cords, Single mode duplex <b>FC-LC</b> UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
E23	<b>General Structured cabling components</b>	—	—		
E23.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	400	meters		
E23.2	Flexible Conduit Coated Galvanised Steel core, 10-20mm internal diameter	300	meters		
E23.3	Flexible Conduit Metallic Fittings	lot	—		
E23.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	200	meters		
E23.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
E23.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	15	pcs		
E23.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	2	rolls		
E23.8	STP Cat6A RJ45 male connectors	lot	—		
E23.9	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
E23.10	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	300	meters		
E23.11	Telephone twisted pair cable, Galvanized Steel Wire Armour,10 pairs,20AWG/0.8mm copper conductors (20X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	200	meters		
E23.12	Telephone twisted pair cable, Galvanized Steel Wire Armour,2 pairs,20AWG/0.8mm copper conductors (4X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	500	meters		
E23.13	Telephone twisted pair cable, 2 Pairs, with RJ11 connectors,2-20m, outdoor use	20	pcs		
E23.14	Telephone junction box,10 pairs, stainless steel/fibre glass/heavy duty PVC enclosure, outdoor use i.e., UV and moisture resistant	8	pcs		
E24	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	lot	—		

## F HYDRO PLAZA

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
	<b>BCC Operator workstations equipment</b>	—	—		
F1	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	2	units		
F2	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	2	units		
F3	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	units		
F4	Industrial grade Access Ethernet Switch 1000BASE-EX SFP transceiver module for SMF, industrial operating temperature, range up to 40km	2	units		
F5	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	2	units		
F6	Ruggedized Corded IP telephone set, stainless steel enclosure	8	Units		
F7	Thin Client computers	8	Units		
F8	LED/LCD monitor,27.0 Inch	8	Units		
F9	LED/LCD monitor,65.0 Inch	2	Units		
F10	Operator workstation accessories and, Two-port dual display KVM Switch	4	units		
F11	<b>Workstations Network cabinet</b>	1	units		
F11.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
F11.2	Power supply components	—	—		
F11.2.1	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
F11.2.2	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	4	pcs		
F11.2.3	Terminal blocks for auxiliary supplies wiring	lot	—		
F11.2.4	Terminal blocks for control wiring	lot	—		
F11.2.5	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
F11.2.6	Socket strip, British type (BS 1363), DIN mount	2	pcs		
F11.2.7	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
F11.2.8	Panel LED lighting lamps	1	pcs		
F11.2.9	Door operated switches	1	pcs		
F11.2.10	Panel heater	1	pcs		
F11.2.11	Panel Thermostats	2	pcs		
F11.2.12	Panel Hygrostat	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
F11.2.13	All other necessary electrical components as per technical specifications	lot	—		
F11.3	Structured cabling components	lot	—		
F11.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
F11.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
F11.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	40	pcs		
F11.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	6	pcs		
F11.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	3	pcs		
F11.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
	<b>Network &amp; Communication Equipment</b>	—	—		
F12	Existing Corporate network Cabinet Structured cabling components	Lot	—		
F12.1	Fibre optic patch panel,1U/2U rack mount steel enclosure, 48/96 ports size,48 LC modules, single mode OS2, with at least four 12 pair splice cassettes	1	pcs		
F12.2	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
F12.3	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	6	pcs		
F12.4	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
F13	<b>General Structured cabling components</b>	—	—		
F13.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	100	meters		
F13.2	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	200	meters		
F13.3	Flexible Conduit Metallic Fittings	lot	—		
F13.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	25	pcs		
F13.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	1	roll		
F13.8	STP Cat6A RJ45 male connectors	lot	—		
	<b>Power supply Equipment</b>	—	—		
F14	Solar Hybrid Inverter charger,7KVA, ethernet communication gateway	2	units		
F15	Batteries, solar deep cycle,200AH, 12V, 1.2KWH (50%DoD)	8	units		
F16	<b>Power supply/Battery cabinet</b>				
F16.1	Power supply cabinet, Perforated,600X2100X800mm, all panel parts as per specifications	1	Units		
F16.2	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	1	pcs		
F16.3	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
F16.4	Redundant panel cooling fans with filters,700m3/hr throughput with filter	2	pcs		



BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
F16.5	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	4	pcs		
F16.6	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	7	pcs		
F16.7	Terminal blocks for auxiliary supplies wiring	lot	—		
F16.8	Terminal blocks for control wiring	lot	—		
F16.9	Electrical copper wires for internal panel wiring, 2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
F16.10	Battery cable and connectors sized as per design	lot	—		
F16.11	Battery Fused isolator or MCCB sized as per design	2	pcs		
F16.12	Battery draw out trays with locking mechanism	lot	—		
F16.13	Solar Fused isolator or MCCB sized as per design	2	pcs		
F16.14	Socket strip, British type (BS 1363), DIN mount	2	pcs		
F16.15	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
F16.16	Panel LED lighting lamps	1	pcs		
F16.17	Door operated switches	1	pcs		
F16.18	Panel heater	1	pcs		
F16.19	Panel Thermostats	2	pcs		
F16.20	Panel Hygrostat	1	pcs		
F16.21	All other necessary electrical components to meet technical specifications	lot	—		
F17	<b>Power supply wiring and installation materials / accessories</b>	—	—		
F17.1	AC power supply cable, Steel wire armour, 4X10 mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey & blue)	20	meters		
F17.2	DC power supply cable, Steel wire armour, 2X10 mm <sup>2</sup> , stranded copper conductors (class 2), Red and white coloured cores	150	meters		
F17.3	Miniature circuit breakers for AC supplies external connections, 500V AC rated, double pole, current rating as per design	1	pcs		
F17.4	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey & blue)	150	meters		
F17.5	All other materials required to undertake power installation works to meet technical specifications	Lot	—		
F18	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		

## G MATENDENI

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
	<b>Network &amp; Communication Equipment</b>	—	—		
G1	Backbone Ethernet switch, 20X1G SFP/RJ45 & 4x 1-10G SFP+, Carrier Ethernet, Layer 3, VRF, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis	1	Units		
G2	Backbone Ethernet switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature range up to 10km	4	Units		
G3	Backbone Ethernet switch 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	4	Units		
G4	<b>Network cabinet</b>	1	Units		
G4.1	Industrial grade network cabinet, 42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
G4.2	Power supply components	—	—		
G4.2.1	Redundant panel cooling fans with filters, 700m <sup>3</sup> /hr throughput with filter, outlet filter unit	2	pcs		
G4.2.2	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
G4.2.3	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	3	pcs		
G4.2.4	Power distribution unit, 240V AC, 32A, 16 outlets	1	pcs		
G4.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
G4.2.6	Terminal blocks for control wiring	lot	—		
G4.2.7	Electrical copper wires for internal panel wiring, 2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
G4.2.8	Socket strip, British type (BS 1363), rack mount	1	pcs		
G4.2.9	Socket strip, British type (BS 1363), DIN mount	2	pcs		
G4.2.10	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
G4.2.11	Panel LED lighting lamps	2	pcs		
G4.2.12	Door operated switches	2	pcs		
G4.2.13	Panel heater	1	pcs		
G4.2.14	Panel Thermostats	2	pcs		
G4.2.15	Panel Hygrostat	1	pcs		
G4.2.16	All other necessary electrical components as per technical specifications	lot	—		
G4.3	Structured cabling components	—	—		
G4.3.1	Fibre optic patch panel, 1U/2U rack mount steel enclosure, 48/96 ports size, 48 LC modules, single mode OS2, with at least four 12 pair splice cassettes	2	pcs		
G4.3.2	STP patch Panel, 24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors, 1U Rack-Mount steel enclosure.	2	pcs		
G4.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors, 2-5m Category 7 S/FTP cable	30	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
G4.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	30	pcs		
G4.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	5	pcs		
G4.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
G5	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	2	sets		
G5.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	2	units		
G5.2	Outdoor unit, ODU, POE,3x1G SFP/RJ45, with cable connectors and mounting accessories	2	units		
G5.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	2	units		
G5.4	Lightning protection unit and Grounding Kit	2	sets		
G5.5	Coaxial Cable with grounding kit for antenna	Lot	—		
G5.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight, and abrasion resistant	350	meters		
G5.7	Bend insensitive multimode fibre optic cable with LC-LC connectors (two pieces)	200	meters		
G5.8	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	200	meters		
G5.9	SFP module,1000BASE-SX	2	units		
G5.10	All other accessories and components and as detailed in specifications	Lot	—		
G6	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	1	Units		
G7	Ruggedized Corded IP telephone set, stainless steel enclosure	2	Units		
G13	<b>General Structured cabling components</b>	—	—		
G13.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	50	meters		
G13.2	Flexible Conduit Coated Galvanised Steel core, 10-20mm internal diameter	50	meters		
G13.3	Flexible Conduit Metallic Fittings	lot	—		
G13.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	50	meters		
G13.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
G13.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	5	pcs		
G13.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	1	roll		
G13.8	STP Cat6A RJ45 male connectors	lot	—		
	<b>Power supply Equipment</b>	—	—		
G8	Solar Hybrid Inverter charger,7KVA, ethernet communication gateway	2	Units		
G9	Batteries, solar deep cycle,200AH, 12V, 1.2KWH (50%DoD)	8	Units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
G10	<b>Power supply/Battery cabinet</b>	—	—		
G10.1	Power supply cabinet, Perforated,600X2100X800mm, all panel parts as per specifications	1	Units		
G10.2	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	1	pcs		
G10.3	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
G10.4	Redundant panel cooling fans with filters,700m3/hr throughput with filter	2	pcs		
G10.5	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	4	pcs		
G10.6	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	7	pcs		
G10.7	Terminal blocks for auxiliary supplies wiring	lot	—		
G10.8	Terminal blocks for control wiring	lot	—		
G10.9	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
G10.10	Battery cable and connectors sized as per design	lot	—		
G10.11	Battery Fused isolator or MCCB sized as per design	2	pcs		
G10.12	Battery draw out trays with locking mechanism	lot	—		
G10.13	Solar Fused isolator or MCCB sized as per design	2	pcs		
G10.14	Socket strip, British type (BS 1363), DIN mount	2	pcs		
G10.15	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
G10.16	Panel LED lighting lamps	1	pcs		
G10.17	Door operated switches	1	pcs		
G10.18	Panel heater	1	pcs		
G10.19	Panel Thermostats	2	pcs		
G10.20	Panel Hygrostat	1	pcs		
G10.21	All other necessary electrical components to meet technical specifications	lot	—		
G11	<b>Power supply wiring and installation materials / accessories</b>	—	—		
G11.1	AC power supply cable, Steel wire armour, 4X10 mm2, stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	20	meters		
G11.2	DC power supply cable, Steel wire armour, 2X10 mm2, stranded copper conductors (class 2), Red and white coloured cores	20	meters		
G11.3	Miniature circuit breakers for AC supplies external connections, 500V AC rated, double pole, current rating as per design	1	pcs		
G11.4	Auxiliary power supply cable, Steel wire armour, 4X4mm2, stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	20	meters		
G11.5	All other materials required to undertake power installation works to meet technical specifications	Lot	—		
	<b>Underground fibre installation Materials</b>	—	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
G12	Steel wire armoured fibre optic cable, 48 cores, ITU-T G652.C OS2, for underground installation from Gitaru to Matendeni to Hydro Plaza and Kamburu	15000	meters		
G13	High-Density Polyethylene (HDPE) conduit, 32mm external diameter, 26mm internal diameter, including couplers, end plugs and all other accessories necessary for conduit work	30000	meters		
G14	Cable route markers, concrete Slabs engraved with FOC marking, to be installed at intervals of at least 30 meters and all road crossings	600	pieces		
G15	Underground detectable optical fibre cable plastic PE warning tape, 100mm in Width and 0.1mm in thickness	15000	meters		
G16	Reinforced concrete precast small manhole with hardened polymer cover and lock mechanics, measuring at least 900mmX900mmX900mm	100	Units		
G17	Reinforced concrete precast large manhole with hardened polymer cover and lock mechanics, measuring at least 1200mmX2200mmX1200mm (LXHXW) for road crossings	12	Units		
G18	Galvanized Iron Pipes for road crossing, 100mm internal diameter, 114mm external diameter with couplers, end plugs and all other accessories necessary for GI conduit work	250	meters		
G19	Weatherproof hardened PVC splice box/ enclosure complete with accessories	30	units		
G20	Optic Fibre termination and jointing accessories.	Lot	—		
G21	Concrete materials for rocky areas	Lot	—		
G22	Gabions, concrete envelope, screen bags, soil stabilization materials for water ways installation	Lot	—		
G23	Galvanized Iron Pipes for rocky areas and wet areas crossings, 65mm internal diameter, 76mm external diameter with couplers, end plugs and all other accessories necessary for GI conduit work	Lot	—		
G24	All other materials required to undertake underground fibre installation works as specified in technical specifications	Lot	—		
G25	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		

## H KIANJIRU

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
	<b>Network &amp; Communication Equipment</b>	—	—		
H1	Backbone Ethernet switch, 20X1G SFP/RJ45 & 4x 1-10G SFP+, Carrier Ethernet, Layer 3, VRF, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis	1	units		
H2	Backbone Ethernet switch 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	4	units		
H3	<b>Network cabinet</b>	1	units		
H3.1	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
H3.2	Power supply components	—	—		
H3.2.1	Redundant panel cooling fans with filters,700m <sup>3</sup> /hr throughput with filter, outlet filter unit	2	sets		
H3.2.2	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
H3.2.3	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	3	pcs		
H3.2.4	Power distribution unit,240V AC,32A,16 outlets	1	pcs		
H3.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
H3.2.6	Terminal blocks for control wiring	lot	—		
H3.2.7	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
H3.2.8	Socket strip, British type (BS 1363), rack mount	1	pcs		
H3.2.9	Socket strip, British type (BS 1363), DIN mount	2	pcs		
H3.2.10	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
H3.2.11	Panel LED lighting lamps	2	pcs		
H3.2.12	Door operated switches	2	pcs		
H3.2.13	Panel heater	1	pcs		
H3.2.14	Panel Thermostats	2	pcs		
H3.2.15	Panel Hygrostat	1	pcs		
H3.2.16	All other necessary electrical components as per technical specifications	lot	—		
H3.3	Structured cabling components	—	—		
H3.3.1	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
H3.3.2	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	30	pcs		
H3.3.3	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
H3.3.4	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	50	meters		
H3.3.5	Flexible Conduit Metallic Fittings	lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
H3.3.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	5	pcs		
H3.3.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	1	roll		
H3.3.8	STP Cat6A RJ45 male connectors	lot	—		
H3.3.9	All other necessary structured cabling components as per technical specifications	lot	—		
H4	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	4	sets		
H4.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	4	units		
H4.2	Outdoor unit, ODU, POE,3x1G SFP/RJ45, with cable connectors and mounting accessories	4	units		
H4.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	4	units		
H4.4	Lightning protection unit and Grounding Kit	4	set		
H4.5	Coaxial Cable with grounding kit for antenna	Lot	—		
H4.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight, and abrasion resistant	700	meters		
H4.7	Bend insensitive multimode fibre optic cable with LC-LC connectors (four pieces)	350	meters		
H4.8	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	350	meters		
H4.9	SFP module,1000BASE-SX	4	units		
H4.10	All other accessories and components and as detailed in specifications	lot	—		
H5	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	1	units		
H6	Ruggedized Corded IP telephone set, stainless steel enclosure	2	units		
H7	Building management controller for monitoring of Radio tower site,1X100M-RJ45,	1	units		
	<b>Power supply Equipment</b>	—	—		
H8	Solar Hybrid Inverter charger,7KVA, ethernet communication gateway	2	units		
H9	Batteries, solar deep cycle,200AH, 12V, 1.2KWH (50%DoD)	8	units		
H10	Solar panels,330Wp	16	units		
H11	Solar panels Galvanised iron ground mounting structure as detailed in technical specifications	Lot	—		
H12	<b>Power supply/Battery cabinet</b>	—	—		
H12.1	Power supply cabinet, Perforated,600X2100X800mm, all panel parts as per specifications	1	Units		
H12.2	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
H12.3	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
H12.4	Redundant panel cooling fans with filters,700m3/hr throughput with filter	2	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
H12.5	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	4	pcs		
H12.6	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	7	pcs		
H12.7	Terminal blocks for auxiliary supplies wiring	lot	—		
H12.8	Terminal blocks for control wiring	lot	—		
H12.9	Electrical copper wires for internal panel wiring, 2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
H12.10	Battery cable and connectors sized as per design	lot	—		
H12.11	Battery Fused isolator or MCCB sized as per design	2	pcs		
H12.12	Battery draw out trays with locking mechanism	lot	—		
H12.13	Solar Fused isolator or MCCB sized as per design	2	pcs		
H12.14	Socket strip, British type (BS 1363), DIN mount	2	pcs		
H12.15	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
H12.16	Panel LED lighting lamps	1	pcs		
H12.17	Door operated switches	1	pcs		
H12.18	Panel heater	1	pcs		
H12.19	Panel Thermostats	2	pcs		
H12.20	Panel Hygrostat	1	pcs		
H12.21	All other necessary electrical components to meet technical specifications	lot	—		
H13	<b>Power supply wiring and installation materials / accessories</b>	—	—		
H13.1	AC power supply cable, Steel wire armour, 4X10 mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey & blue)	20	meters		
H13.2	DC power supply cable, Steel wire armour, 2X10 mm <sup>2</sup> , stranded copper conductors (class 2), Red and white coloured cores	100	meters		
H13.3	Miniature circuit breakers for AC supplies external connections, 500V AC rated, double pole, current rating as per design	1	pcs		
H13.4	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey & blue)	20	meters		
H13.5	High-Density Polyethylene (HDPE) conduit, 50-75mm internal diameter	100	meters		
H13.6	HDPE conduit fittings/connectors (couplers, end plugs, tee, 4-way, clamps, supports etc)	lot	—		
H14	All other materials required to undertake power installation works to meet technical specifications	Lot	—		
H15	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		



## I TURKWEL

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
I1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications	1	units		
I2	Aggregation Router 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	units		
I3	Aggregation Router 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	2	units		
I4	Aggregation Router 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	4	units		
I5	<b>Hybrid IP PBX</b>	1	sets		
I5.1	Hybrid IP PBX, SIP server, at least 30 concurrent calls and 50 users,16 FXS ports,48 VDC power supply	1	sets		
I5.2	GSM gateway with at least two SIM cards and external antenna port	1	unit		
I5.3	Outdoor GSM antenna with mounting accessories, coaxial cable, and surge/Lightning protection	1	sets		
I5.4	Telephone punch down terminal block for at least 25 pairs	1	sets		
I5.5	Data Surge Protection Device (SPD) for analogue phones FXS connections	25	pcs		
I5.6	All other accessories and components and as detailed in specifications	lot	—		
I6	<b>Control Room Network cabinet</b>	1	units		
I6.1	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
I6.2	Power supply components	—	—		
I6.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
I6.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
I6.2.3	Redundant panel cooling fans with filters,700m <sup>3</sup> /hr throughput with filter, outlet filter unit	2	sets		
I6.2.4	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	7	pcs		
I6.2.5	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	5	pcs		
I6.2.6	Terminal blocks for auxiliary supplies wiring	lot	—		
I6.2.7	Terminal blocks for control wiring	lot	—		
I6.2.8	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
I6.2.9	Socket strip, British type (BS 1363), rack mount	1	pcs		
I6.2.10	Socket strip, British type (BS 1363), DIN mount	2	pcs		
I6.2.11	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
I6.2.12	Power distribution unit,240V AC,32A,16 outlets	1	pcs		
I6.2.13	Panel LED lighting lamps	2	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
I6.2.14	Door operated switches	2	pcs		
I6.2.15	Panel heater	1	pcs		
I6.2.16	Panel Thermostats	2	pcs		
I6.2.17	Panel Hygrostat	1	pcs		
I6.2.18	All other necessary electrical components as per technical specifications	lot	—		
I6.3	Structured cabling components	—	—		
I6.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	4	pcs		
I6.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
I6.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	50	pcs		
I6.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	5	pcs		
I6.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	6	pcs		
I6.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
I7	Powerhouse Network cabinet	1	units		
I7.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
I7.2	Power supply components	—	—		
I7.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
I7.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
I7.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
I7.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
I7.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
I7.2.6	Terminal blocks for control wiring	lot	—		
I7.2.7	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
I7.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
I7.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
I7.2.10	Panel LED lighting lamps	1	pcs		
I7.2.11	Door operated switches	1	pcs		
I7.2.12	Panel heater	1	pcs		
I7.2.13	Panel Thermostats	2	pcs		
I7.2.14	Panel Hygrostat	1	pcs		
I7.2.15	All other necessary electrical components as per technical specifications	lot	—		
I7.3	Structured cabling components	lot	—		
I7.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
I7.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
I7.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	8	pcs		
I7.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
I7.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
I7.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
I8	<b>Substation Network cabinet</b>	1	units		
I8.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, wall mount, Ground mounting supports with roof, all panel parts as detailed in specifications	1	units		
I8.2	Power supply components	—	—		
I8.2.1	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	2	pcs		
I8.2.2	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
I8.2.3	Terminal blocks for auxiliary supplies wiring	lot	—		
I8.2.4	Terminal blocks for control wiring	lot	—		
I8.2.5	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
I8.2.6	Socket strip, British type (BS 1363), DIN mount	2	pcs		
I8.2.7	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
I8.2.8	Panel LED lighting lamps	1	pcs		
I8.2.9	Door operated switches	1	pcs		
I8.2.10	Panel heater	1	pcs		
I8.2.11	Panel Thermostats	2	pcs		
I8.2.12	Panel Hygrostat	1	pcs		
I8.2.13	All other necessary electrical components as per technical specifications	lot	—		
I8.3	Structured cabling components	lot	—		
I8.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
I8.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
I8.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	8	pcs		
I8.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
I8.3.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	2	pcs		
I8.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
I9	<b>Dam Network cabinet</b>	1	units		
I9.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, wall mount, Ground mounting supports with roof, all panel parts as detailed in specifications	1	units		
I9.2	Power supply components	—	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
I9.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	1	pcs		
I9.2.2	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	2	pcs		
I9.2.3	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
I9.2.4	Terminal blocks for auxiliary supplies wiring	lot	—		
I9.2.5	Terminal blocks for control wiring	lot	—		
I9.2.6	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
I9.2.7	Socket strip, British type (BS 1363), DIN mount	2	pcs		
I9.2.8	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
I9.2.9	Panel LED lighting lamps	1	pcs		
I9.2.10	Door operated switches	1	pcs		
I9.2.11	Panel heater	1	pcs		
I9.2.12	Panel Thermostats	2	pcs		
I9.2.13	Panel Hygrostat	1	pcs		
I9.2.14	All other necessary electrical components as per technical specifications	lot	—		
I9.3	Structured cabling components	lot	—		
I9.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	2	pcs		
I9.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
I9.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	8	pcs		
I9.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
I9.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
I9.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
I10	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	1	units		
I11	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	4	units		
I12	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transeiver module for SMF, industrial operating temperature, range up to 10km	6	units		
I13	Industrial grade Access Ethernet Switch 1000BASE-T SFP transeiver module for copper RJ-45, industrial operating temperature	2	units		
I14	IP DECT Multi cell Manager station	1	units		
I15	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	8	units		
I16	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	7	units		
I17	Ruggedized Corded IP telephone set, stainless steel enclosure	4	units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
I18	Analogue corded telephone set	10	units		
I19	<b>Existing SCADA Local Control Centre Cabinet Structured cabling components</b>	—	—		
I19.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
I19.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
I19.3	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	1	pcs		
I20	<b>Existing Corporate network Cabinet (including interface to KPLC &amp; SP cabinets) Structured cabling components</b>	—	—		
I20.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	2	pcs		
I20.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
I20.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	5	pcs		
I20.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	5	pcs		
I20.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	4	pcs		
I21	<b>General Structured cabling components</b>	—	—		
I21.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	200	meters		
I21.2	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	300	meters		
I21.3	Flexible Conduit Metallic Fittings	lot	—		
I21.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	200	meters		
I21.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
I21.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	20	pcs		
I21.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	2	rolls		
I21.8	STP Cat6A RJ45 male connectors	lot	—		
I21.9	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
I21.10	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	200	meters		
I21.11	Telephone twisted pair cable, Galvanized Steel Wire Armour,10 pairs,20AWG/0.8mm copper conductors (20X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	200	meters		
I21.12	Telephone twisted pair cable, Galvanized Steel Wire Armour,2 pairs,20AWG/0.8mm copper conductors (4X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	500	meters		
I21.13	Telephone twisted pair cable, 2 Pairs, with RJ11 connectors,2-20m, outdoor use	20	pcs		
I21.14	Telephone junction box,10 pairs, stainless steel/fibre glass/heavy duty PVC enclosure, outdoor use i.e., UV and moisture resistant	8	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
I22	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	lot	—		

## J SONDU

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
J1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications	1	Units		
J2	Aggregation Router 1000BASE-EX SFP transceiver module for SMF, extended operating temperature range, up to 40km	1	Units		
J3	Aggregation Router 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	Units		
J4	Aggregation Router 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	4	Units		
J5	<b>Hybrid IP PBX</b>	1	sets		
J5.1	Hybrid IP PBX, SIP server, at least 30 concurrent calls and 50 users,16 FXS ports,48 VDC power supply	1	sets		
J5.2	GSM gateway with at least two SIM cards and external antenna port	1	unit		
J5.3	Outdoor GSM antenna with mounting accessories, coaxial cable and surge/Lightning protection	1	sets		
J5.4	Telephone punch down terminal block for at least 25 pairs	1	sets		
J5.5	Data Surge Protection Device (SPD) for analogue phones FXS connections	25	pcs		
J5.6	All other accessories and components and as detailed in specifications	Lot	—		
J6	Industrial grade cyber security appliance, all features & licenses as detailed in specifications, 10 X1G RJ45	2	Units		
J7	<b>Control Room Network cabinet</b>	1	Units		
J7.1	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
J7.2	Power supply components	—	—		
J7.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
J7.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
J7.2.3	Redundant panel cooling fans with filters,700m3/hr throughput with filter, outlet filter unit	2	pcs		
J7.2.4	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	8	pcs		
J7.2.5	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	5	pcs		
J7.2.6	Terminal blocks for auxiliary supplies wiring	lot	—		
J7.2.7	Terminal blocks for control wiring	lot	—		
J7.2.8	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
J7.2.9	Socket strip, British type (BS 1363), rack mount	1	pcs		
J7.2.10	Socket strip, British type (BS 1363), DIN mount	2	pcs		
J7.2.11	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
J7.2.12	Power distribution unit,240V AC,32A,16 outlets	1	pcs		
J7.2.13	Panel LED lighting lamps	2	pcs		
J7.2.14	Door operated switches	2	pcs		
J7.2.15	Panel heater	1	pcs		
J7.2.16	Panel Thermostats	2	pcs		
J7.2.17	Panel Hygrostat	1	pcs		
J7.2.18	All other necessary electrical components as per technical specifications	lot	—		
J7.3	Structured cabling components	—	—		
J7.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	3	pcs		
J7.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
J7.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	60	pcs		
J7.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	5	pcs		
J7.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	5	pcs		
J7.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
J8	<b>Powerhouse Network cabinet</b>	1	units		
J8.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, wall mount, all panel parts as detailed in specifications	1	units		
J8.2	Power supply components	—	—		
J8.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
J8.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
J8.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
J8.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
J8.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
J8.2.6	Terminal blocks for control wiring	lot	—		
J8.2.7	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
J8.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
J8.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
J8.2.10	Panel LED lighting lamps	1	pcs		
J8.2.11	Door operated switches	1	pcs		
J8.2.12	Panel heater	1	pcs		
J8.2.13	Panel Thermostats	2	pcs		
J8.2.14	Panel Hygrostat	1	pcs		
J8.2.15	All other necessary electrical components as per technical specifications	lot	—		
J8.3	Structured cabling components	lot	—		
J8.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
J8.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
J8.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	8	pcs		
J8.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
J8.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
J8.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
J9	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	2	Units		
J10	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	Units		
J11	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	1	Units		
J12	IP DECT Multi cell Manager station	1	Units		
J13	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	5	Units		
J14	Ruggedized Corded IP telephone set, stainless steel enclosure	4	Units		
J15	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	5	Units		
J16	<b>Existing SCADA Local Control Centre Cabinet Structured cabling components</b>	—	—		
J16.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
J16.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		



BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
J16.3	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	1	pcs		
J17	<b>Existing Corporate network Cabinet (including interface to KPLC &amp; SP cabinets) Structured cabling components</b>	—	—		
J17.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	2	pcs		
J17.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
J17.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	5	pcs		
J17.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	5	pcs		
J17.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	4	pcs		
J18	<b>General Structured cabling components</b>	—	—		
J18.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	100	meters		
J18.2	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	200	meters		
J18.3	Flexible Conduit Metallic Fittings	lot	—		
J18.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	200	meters		
J18.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
J18.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	15	pcs		
J18.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	1	rolls		
J18.8	STP Cat6A RJ45 male connectors	lot	—		
J18.9	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
J18.10	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	100	meters		
J18.11	Telephone twisted pair cable, Galvanized Steel Wire Armour,10 pairs,20AWG/0.8mm copper conductors (20X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	100	meters		
J18.12	Telephone twisted pair cable, Galvanized Steel Wire Armour,2 pairs,20AWG/0.8mm copper conductors (4X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	200	meters		
J18.13	Telephone twisted pair cable, 2 Pairs, with RJ11 connectors,2-20m, outdoor use	5	pcs		
J18.14	Telephone junction box,10 pairs, stainless steel/fibre glass/heavy duty PVC enclosure, outdoor use i.e., UV and moisture resistant	5	pcs		
J19	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	lot	—		

**K SANG'ORO**

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
K1	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	1	units		
K2	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	2	units		
K3	Industrial grade Access Ethernet Switch 1000BASE-EX SFP transceiver module for SMF, industrial operating temperature, range up to 40km	1	units		
K4	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	units		
K5	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	1	units		
K6	<b>Powerhouse Network cabinet</b>	1	units		
K6.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
K6.2	Power supply components	—	—		
K6.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
K6.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
K6.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
K6.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
K6.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
K6.2.6	Terminal blocks for control wiring	lot	—		
K6.2.7	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
K6.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
K6.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
K6.2.10	Panel LED lighting lamps	1	pcs		
K6.2.11	Door operated switches	1	pcs		
K6.2.12	Panel heater	1	pcs		
K6.2.13	Panel Thermostats	2	pcs		
K6.2.14	Panel Hygrostat	1	pcs		
K6.2.15	All other necessary electrical components as per technical specifications	lot	—		
K6.3	Structured cabling components	lot	—		
K6.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
K6.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
K6.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
K6.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
K6.3.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	2	pcs		
K6.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
K7	IP DECT Multi cell Manager station	1	units		
K8	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	5	units		
K9	Ruggedized Corded IP telephone set, stainless steel enclosure	4	units		
K10	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	3	units		
K11	<b>Existing SCADA Local Control Centre Cabinet Structured cabling components</b>	—	—		
K11.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
K11.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
K11.3	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	1	pcs		
K12	<b>Existing SCADA Telecom/corporate network Cabinet Structured cabling components</b>	—	—		
K12.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
K12.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
K12.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
K12.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
K12.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	1	pcs		
K13	<b>General Structured cabling components</b>	—	—		
K13.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	100	meters		
K13.2	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	200	meters		
K13.3	Flexible Conduit Metallic Fittings	lot	—		
K13.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	100	meters		
K13.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
K13.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	10	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
K13.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	1	roll		
K13.8	STP Cat6A RJ45 male connectors	lot	—		
K13.9	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
K13.10	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	100	meters		
K14	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		

## L STIMA PLAZA

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
	<b>Network &amp; Communication Equipment</b>	—	—		
L1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications	2	units		
L2	Aggregation Router 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	8	units		
L3	Aggregation Router 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	4	units		
L4	Aggregation Router 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	8	units		
L5	<b>Main Network cabinet</b>	—	—		
L5.1	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
L5.2	Power supply components	—	—		
L5.2.1	Redundant panel cooling fans with filters,700m <sup>3</sup> /hr throughput with filter, outlet filter unit	2	pcs		
L5.2.2	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	4	pcs		
L5.2.3	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	3	pcs		
L5.2.4	Power distribution unit,240V AC,32A,16 outlets	1	pcs		
L5.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
L5.2.6	Terminal blocks for control wiring	lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
L5.2.7	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
L5.2.8	Socket strip, British type (BS 1363), rack mount	1	pcs		
L5.2.9	Socket strip, British type (BS 1363), DIN mount	2	pcs		
L5.2.10	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
L5.2.11	Panel LED lighting lamps	2	pcs		
L5.2.12	Door operated switches	2	pcs		
L5.2.13	Panel heater	1	pcs		
L5.2.14	Panel Thermostats	2	pcs		
L5.2.15	Panel Hygrostat	1	pcs		
L5.2.16	All other necessary electrical components as per technical specifications	lot	—		
L5.3	Structured cabling components	—	—		
L5.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	4	pcs		
L5.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	3	pcs		
L5.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	60	pcs		
L5.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	15	pcs		
L5.3.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	5	pcs		
L5.3.6	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	300	meters		
L5.3.7	All other necessary structured cabling components as per technical specifications	lot	—		
L6	Industrial grade cyber security appliance, all features & licenses as detailed in specifications, 10 X1G RJ45, 2 X 1000BASE-LX SFP	1	units		
	<b>Power supply Equipment</b>	—	—		
L7	Solar Hybrid Inverter charger,7KVA, ethernet communication gateway	2	Units		
L8	Batteries, solar deep cycle,200AH, 12V, 1.2KWH (50%DoD)	8	Units		
L9	Inverter power supply, 48V DC/240V AC, 3kVA	2	Units		
L10	<b>Power supply/Battery cabinet</b>	—	—		
L10.1	Power supply cabinet, Perforated,600X2100X800mm, all panel parts as per specifications	1	Units		
L10.2	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	1	pcs		
L10.3	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
L10.4	Redundant panel cooling fans with filters,700m3/hr throughput with filter	2	pcs		
L10.5	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	8	pcs		
L10.6	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	9	pcs		
L10.7	Terminal blocks for auxiliary supplies wiring	lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
L10.8	Terminal blocks for control wiring	lot	—		
L10.9	Electrical copper wires for internal panel wiring, 2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
L10.10	Battery cable and connectors sized as per design	lot	—		
L10.11	Battery Fused isolator or MCCB sized as per design	2	pcs		
L10.12	Battery draw out trays with locking mechanism	lot	—		
L10.13	Solar Fused isolator or MCCB sized as per design	2	pcs		
L10.14	Socket strip, British type (BS 1363), DIN mount	2	pcs		
L10.15	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
L10.16	Panel LED lighting lamps	1	pcs		
L10.17	Door operated switches	1	pcs		
L10.18	Panel heater	1	pcs		
L10.19	Panel Thermostats	2	pcs		
L10.20	Panel Hygrostat	1	pcs		
L10.21	All other necessary electrical components to meet technical specifications	lot	—		
L11	<b>Power supply wiring and installation materials / accessories</b>	—	—		
L11.1	AC power supply cable, Steel wire armour, 4X10 mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey & blue)	100	meters		
L11.2	DC power supply cable, Steel wire armour, 2X10 mm <sup>2</sup> , stranded copper conductors (class 2), Red and white coloured cores	100	meters		
L11.3	Miniature circuit breakers for AC supplies external connections, 500V AC rated, double pole, current rating as per design	1	pcs		
L11.4	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey & blue)	200	meters		
L11.5	All other materials required to undertake power installation works to meet technical specifications	Lot	—		
	<b>Central Dispatch Centre Server Equipment</b>	—	—		
L12	<b>Server Cabinet</b>	—	—		
L12.1	IT server cabinet, 42U 600x2000x1000 mm, all panel parts as detailed in specifications	1	Units		
L12.2	Power supply components	—	—		
L12.2.1	Redundant panel cooling fans with filters, 700m <sup>3</sup> /hr throughput with filter	2	pcs		
L12.2.2	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	4	pcs		
L12.2.3	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	4	pcs		
L12.2.4	Power distribution unit, 240V AC, 32A, 16 outlets, Rack mount, with ethernet port, remote monitoring	2	pcs		
L12.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
L12.2.6	Terminal blocks for control wiring	lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
L12.2.7	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
L12.2.8	Socket strip, British type (BS 1363), rack mount	1	pcs		
L12.2.9	Socket strip, British type (BS 1363), DIN mount	2	pcs		
L12.2.10	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
L12.2.11	Panel LED lighting lamps	2	pcs		
L12.2.12	Door operated switches	2	pcs		
L12.2.13	Panel heater	1	pcs		
L12.2.14	Panel Thermostats	2	pcs		
L12.2.15	Panel Hygrostat	1	pcs		
L12.2.16	All other necessary electrical components as per technical specifications	lot	—		
L12.3	Structured cabling components	—	—		
L12.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	2	pcs		
L12.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	3	pcs		
L12.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	50	pcs		
L12.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	10	pcs		
L12.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	6	pcs		
L12.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
L13	<b>Rack mount VM Production Host Servers complete with licensed pre-installed software as detailed in specifications for CDC operations</b>	2	Units		
L13.1	Rack mount server,8C/16T,3.2GHZ,16MB L3,64GB 3200MT/s RAM,2X960GB 3 DWPD SAS SSD,4X10Gb Base-T, 4X1Gb Base-T,2X600W power supply	2	Units		
L13.2	Windows 2019/2022 server standard edition perpetual volume licenses for at least sixteen (16) cores (if bidder supplies servers with 16 cores or less higher if not)	6	Units		
L13.3	Windows Server® 2019/2022 perpetual volume Client Access Licenses (CAL)	20	Units		
L13.4	Windows Server® 2019/2022 perpetual volume remote desktop service Client Access Licenses (RDS CALS)	10	Units		
L13.5	Hypervisor perpetual software license, VMware or windows	1	set		
L14	Rack mount Integrated console LCD monitor, keyboard & 8 port KVM switch	1	Units		
L15	Industrial grade cyber security appliance, all features & licenses as detailed in specifications, 10 X1G RJ45, 2 X 1000BASE-LX SFP	2	Units		
L16	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	3	Units		
L17	KVM Extenders (Receiver & Transmitter pair) and Two-port dual display KVM Switch	3	sets		
L18	Thin Client computers	6	Units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
	<b>Central Dispatch Centre Workstation Equipment (Dispatch office),</b>	—	—		
L19	<b>Workstations Network cabinet</b>	1	Units		
L19.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
L19.2	Power supply components	—	—		
L19.2.1	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	4	pcs		
L19.2.2	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	5	pcs		
L19.2.3	Terminal blocks for auxiliary supplies wiring	lot	—		
L19.2.4	Terminal blocks for control wiring	lot	—		
L19.2.5	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
L19.2.6	Socket strip, British type (BS 1363), DIN mount	2	pcs		
L19.2.7	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
L19.2.8	Panel LED lighting lamps	1	pcs		
L19.2.9	Door operated switches	1	pcs		
L19.2.10	Panel heater	1	pcs		
L19.2.11	Panel Thermostats	2	pcs		
L19.2.12	Panel Hygrostat	1	pcs		
L19.2.13	All other necessary electrical components as per technical specifications	lot	—		
L19.3	Structured cabling components	lot	—		
L19.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
L19.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
L19.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	40	pcs		
L19.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	6	pcs		
L19.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	3	pcs		
L19.3.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	30	pcs		
L19.3.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	2	rolls		
L19.3.8	STP Cat6A RJ45 male connectors	lot	—		
L19.3.9	All other necessary structured cabling components as per technical specifications	lot	—		
L20	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	2	Units		
L21	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	1	Units		



BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
L22	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	Units		
L23	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	4	Units		
L24	Thin Client computers	14	Units		
L25	LED/LCD monitor,27.0 Inch	8	Units		
L26	Operator workstation accessories and, Two-port dual display KVM Switch	4	Units		
L27	LED/LCD monitor,65.0 Inch	6	Units		
L28	Ruggedized Corded IP telephone set, stainless steel enclosure	8	Units		
L29	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		

**M TANA**

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
M1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications	1	units		
M2	Aggregation Router 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	4	units		
M3	Aggregation Router 1000BASE-EX SFP transceiver module for SMF, extended operating temperature range, up to 40km	1	units		
M4	Aggregation Router 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	4	units		
M5	Aggregation Router 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	8	units		
M6	<b>Hybrid IP PBX</b>	1	sets		
M6.1	Hybrid IP PBX, SIP server, at least 30 concurrent calls and 50 users,16 FXS ports,48 VDC power supply	1	sets		
M6.2	GSM gateway with at least two SIM cards and external antenna port	1	unit		
M6.3	Outdoor GSM antenna with mounting accessories, coaxial cable and surge/Lightning protection	1	sets		
M6.4	Telephone punch down terminal block for at least 25 pairs	1	sets		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
M6.5	Data Surge Protection Device (SPD) for analogue phones FXS connections	25	pcs		
M6.6	All other accessories and components and as detailed in specifications	Lot	—		
M7	<b>Control Room Network cabinet</b>	1	units		
M7.1	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications	1	Units		
M7.2	Power supply components	—	—		
M7.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
M7.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
M7.2.3	Redundant panel cooling fans with filters,700m3/hr throughput with filter, outlet filter unit	2	pcs		
M7.2.4	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	8	pcs		
M7.2.5	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	5	pcs		
M7.2.6	Terminal blocks for auxiliary supplies wiring	lot	—		
M7.2.7	Terminal blocks for control wiring	lot	—		
M7.2.8	Electrical copper wires for internal panel wiring,2.5mm2 and 4mm2	lot	—		
M7.2.9	Socket strip, British type (BS 1363), rack mount	1	pcs		
M7.2.10	Socket strip, British type (BS 1363), DIN mount	2	pcs		
M7.2.11	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
M7.2.12	Power distribution unit,240V AC,32A,16 outlets	1	pcs		
M7.2.13	Panel LED lighting lamps	2	pcs		
M7.2.14	Door operated switches	2	pcs		
M7.2.15	Panel heater	1	pcs		
M7.2.16	Panel Thermostats	2	pcs		
M7.2.17	Panel Hygrostat	1	pcs		
M7.2.18	All other necessary electrical components as per technical specifications	lot	—		
M7.3	Structured cabling components	—	—		
M7.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	3	pcs		
M7.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	2	pcs		
M7.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	70	pcs		
M7.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	5	pcs		
M7.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	5	pcs		
M7.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
M8	Industrial grade media converter or Multiplexer, Multimode Fibre to single mode Fibre ethernet, 160km range,2 x1G, LC ports	1	units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
M9	Industrial grade cyber security appliance, all features & licenses as detailed in specifications, 10 X1G RJ45	2	units		
M10	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	1	units		
M11	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	1	units		
M12	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	2	units		
M13	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	4	units		
M14	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	1	units		
M15	<b>Powerhouse Network cabinet</b>	—	—		
M15.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
M15.2	Power supply components	—	—		
M15.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
M15.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
M15.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
M15.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
M15.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
M15.2.6	Terminal blocks for control wiring	lot	—		
M15.2.7	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
M15.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
M15.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
M15.2.10	Panel LED lighting lamps	1	pcs		
M15.2.11	Door operated switches	1	pcs		
M15.2.12	Panel heater	1	pcs		
M15.2.13	Panel Thermostats	2	pcs		
M15.2.14	Panel Hygrostat	1	pcs		
M15.2.15	All other necessary electrical components as per technical specifications	lot	—		
M15.3	Structured cabling components	lot	—		
M15.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
M15.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
M15.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FIP cable	10	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
M15.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
M15.3.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	2	pcs		
M15.3.6	All other necessary structured cabling components as per technical specifications	lot	—		
M16	IP DECT Multi cell Manager station	1	units		
M17	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	5	units		
M18	Ruggedized Corded IP telephone set, stainless steel enclosure	3	units		
M19	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	3	units		
M20	Analogue corded telephone set	10	units		
M21	<b>Existing SCADA Local Control Centre Cabinet Structured cabling components</b>	—	—		
M21.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
M21.2	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
M21.3	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	2	pcs		
M21.4	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
M21.5	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	4	pcs		
M22	<b>Existing Corporate network Cabinet Structured cabling components</b>	—	—		
M22.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
M22.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
M22.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	2	pcs		
M22.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
M22.5	Cable management panel with brush strip,1u rack mount/panel mount, for guiding the networking cables	1	pcs		
M23	<b>KPLC Network interface Structured cabling components</b>	—	—		
M23.1	Fiber optic Patch Panel, wall mount steel enclosure,6 single mode OS2 LC connectors	1	pcs		
M23.2	Fibre optic patch cords, Single mode duplex <b>SC-LC</b> UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
M23.3	Fibre optic patch cords, Single mode duplex <b>SC-SC</b> UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
M24	<b>General Structured cabling components</b>	—	—		
M24.1	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	200	meters		
M24.2	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	200	meters		
M24.3	Flexible Conduit Metallic Fittings	lot	—		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
M24.4	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	200	meters		
M24.5	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
M24.6	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	15	pcs		
M24.7	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	1	roll		
M24.8	STP Cat6A RJ45 male connectors	lot	—		
M24.9	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
M24.10	Auxiliary power supply cable, Steel wire armour, 4X4mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	100	meters		
M24.11	Telephone twisted pair cable, Galvanized Steel Wire Armour,10 pairs,20AWG/0.8mm copper conductors (20X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	100	meters		
M24.12	Telephone twisted pair cable, Galvanized Steel Wire Armour,2 pairs,20AWG/0.8mm copper conductors (4X0.5mm <sup>2</sup> ), UV and moisture resistant, coloured pairs	200	meters		
M24.13	Telephone twisted pair cable, 2 Pairs, with RJ11 connectors,2-20m, outdoor use	10	pcs		
M24.14	Telephone junction box,10 pairs, stainless steel/fibre glass/heavy duty PVC enclosure, outdoor use i.e., UV and moisture resistant	4	pcs		
	<b>Tana Radio tower site</b>	—	—		
M25	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	2	sets		
M25.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	2	units		
M25.2	Outdoor unit, ODU, POE,3x1G SFP/RJ45, with cable connectors and mounting accessories	2	units		
M25.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	2	units		
M25.4	Lightning protection unit and Grounding Kit	2	sets		
M25.5	Coaxial Cable with grounding kit for antenna	2	sets		
M25.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight, and abrasion resistant	200	meters		
M25.7	Bend insensitive multimode fibre optic cable with LC-LC connectors	100	meters		
M25.8	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	100	meters		
M25.9	SFP module,1000BASE-SX	1	units		
M25.10	All other accessories and components and as detailed in specifications	Lot	—		
M26	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	2	Units		
M27	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	Units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
M28	Industrial grade Access Ethernet Switch 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, range up to 300km	2	Units		
M29	<b>Network cabinet</b>	1	Units		
M29.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
M29.2	Power supply components	lot	—		
M29.2.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	1	pcs		
M29.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
M29.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
M29.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
M29.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
M29.2.6	Terminal blocks for control wiring	lot	—		
M29.2.7	Electrical copper wires for internal panel wiring,2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
M29.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
M29.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
M29.2.10	Panel LED lighting lamps	1	pcs		
M29.2.11	Door operated switches	1	pcs		
M29.2.12	Panel heater	1	pcs		
M29.2.13	Panel Thermostats	2	pcs		
M29.2.14	Panel Hygrostat	1	pcs		
M29.2.15	All other necessary electrical components as per technical specifications	lot	—		
M29.3	Structured cabling components	—	—		
M29.3.1	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
M29.3.2	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
M29.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	20	pcs		
M29.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
M29.3.5	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
M29.3.6	AC power supply cable, Steel wire armour, 4X25 mm <sup>2</sup> , stranded copper conductors (class 2), IEC coloured cores (brown, black, grey& blue)	400	meters		
M29.3.7	High-Density Polyethylene (HDPE) conduit, 50-75mm internal diameter	400	meters		
M29.3.8	All other necessary structured cabling components as per technical specifications	lot	—		
M30	Ruggedized Corded IP telephone set, stainless steel enclosure with 48V DC power supply	1	Units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
M31	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		

**N WANJII**

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
N1	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	1	Units		
N2	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	2	Units		
N3	Industrial grade Access Ethernet Switch 1000BASE-EX SFP transceiver module for SMF, industrial operating temperature, range up to 40km	1	Units		
N4	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	2	Units		
N5	Industrial grade Access Ethernet Switch 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, range up to 300km	2	Units		
N6	Industrial grade cyber security appliance, all features & licenses as detailed in specifications, 10 X1G RJ45, 3G/4G inbuilt modem, antenna coaxial cable and outdoor GSM antenna	1	Units		
N7	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	1	sets		
N7.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	1	units		
N7.2	Outdoor unit, ODU, POE,3x1G SFP/RJ45, with cable connectors and mounting accessories	1	units		
N7.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	1	units		
N7.4	Lightning protection unit and Grounding Kit	1	set		
N7.5	Coaxial Cable with grounding kit for antenna	1	set		
N7.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight, and abrasion resistant	100	meters		
N7.7	Bend insensitive multimode fibre optic cable with LC-LC connectors	50	meters		
N7.8	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	50	meters		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
N7.9	SFP module,1000BASE-SX	1	units		
N7.10	All other accessories and components and as detailed in specifications	Lot	—		
N8	IP DECT Multi cell Manager station	1	Units		
N9	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	3	Units		
N10	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	3	Units		
N11	Ruggedized Corded IP telephone set, stainless steel enclosure	4	Units		
N12	<b>Existing communication (Gateway) Cabinet Structured cabling &amp; power supply components</b>	—	—		
N12.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
N12.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
N12.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
N12.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	1	pcs		
N12.5	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	3	pcs		
N12.6	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
N12.7	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	20	pcs		
N12.8	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
N12.9	Fibre optic patch cords, Single mode duplex SC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
N12.10	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	200	meters		
N12.11	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	4	pcs		
N12.12	All other necessary structured cabling components as per technical specifications	lot	—		
N13	<b>Existing Powerhouse SCADA Cabinet Structured cabling &amp; power supply components and General structured cabling components</b>	—	—		
N13.1	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
N13.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		
N13.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
N13.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	1	pcs		
N13.5	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
N13.6	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	1	pcs		
N13.7	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	10	pcs		
N13.8	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pcs		



BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
N13.9	Cable management panel with brush strip,1U rack mount/panel mount, for guiding the networking cables	2	pcs		
N13.10	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	100	meters		
N13.11	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	100	meters		
N13.12	Flexible Conduit Metallic Fittings	lot	—		
N13.13	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	100	meters		
N13.14	HDPE conduit fittings/connectors (couplers, end plugs, tee,4-way, clamps etc)	lot	—		
N13.15	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	10	pcs		
N13.16	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	1	roll		
N13.17	STP Cat6A RJ45 male connectors	lot	—		
N13.18	DECT base station mounting steel channel and brackets with surface treatment for outdoor use	lot	—		
N13.19	All other necessary structured cabling components as per technical specifications	lot	—		
N14	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		

**O MESCO**

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
O1	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	1	Units		
O2	Industrial grade cyber security appliance, all features & licenses as detailed in specifications, 10 X1G RJ45, 3G/4G inbuilt modem, antenna coaxial cable and outdoor GSM antenna	1	Units		
O3	<b>Powerhouse Network cabinet</b>	1	Units		
O3.1	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, all panel parts as detailed in specifications	1	units		
O3.2	Power supply components	—	—		
O3.2.1	Switched power supply unit, 110VDC-240VAC input,48VDC/20A output,960W	2	pcs		
O3.2.2	Redundancy diode modules,48VDC,2X20A/40A	1	pcs		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
O3.2.3	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	3	pcs		
O3.2.4	Miniature circuit breakers for AC supplies, 500V AC rated, Double pole, current rating as per design	2	pcs		
O3.2.5	Terminal blocks for auxiliary supplies wiring	lot	—		
O3.2.6	Terminal blocks for control wiring	lot	—		
O3.2.7	Electrical copper wires for internal panel wiring, 2.5mm <sup>2</sup> and 4mm <sup>2</sup>	lot	—		
O3.2.8	Socket strip, British type (BS 1363), DIN mount	2	pcs		
O3.2.9	Socket strip, Euro type (CEE 7/3), DIN mount	1	pcs		
O3.2.10	Panel LED lighting lamps	1	pcs		
O3.2.11	Door operated switches	1	pcs		
O3.2.12	Panel heater	1	pcs		
O3.2.13	Panel Thermostats	2	pcs		
O3.2.14	Panel Hygrostat	1	pcs		
O3.2.15	All other necessary electrical components as per technical specifications	lot	—		
O3.3	Structured cabling components	lot	—		
O3.3.1	Fibre optic patch panel, 1U rack mount steel enclosure, 24 LC ports, single mode OS2	1	pcs		
O3.3.2	STP patch Panel, 24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors, 1U Rack-Mount steel enclosure.	1	pcs		
O3.3.3	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors, 2-5m Category 7 S/FTP cable	20	pcs		
O3.3.4	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors, 2-5m single mode OS2 G657A2 LSZH cable	2	pcs		
O3.3.5	Cable management panel with brush strip, 1u rack mount/panel mount, for guiding the networking cables	2	pcs		
O3.3.6	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	50	meters		
O3.3.7	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter	50	meters		
O3.3.8	Flexible Conduit Metallic Fittings	lot	—		
O3.3.9	High-Density Polyethylene (HDPE) conduit, 32-50mm internal diameter	50	meters		
O3.3.10	HDPE conduit fittings/connectors (couplers, end plugs, tee, 4-way, clamps etc)	lot	—		
O3.3.11	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors, 10-20m Category 7 S/FTP or SSTP cable	10	pcs		
O3.3.12	STP Ethernet Cable, S/FTP, CAT 7, 23AWG/0.5mm copper conductors, outdoor use, 305m roll	1	roll		
O3.3.13	STP Cat6A RJ45 male connectors	lot	—		
O3.3.14	All other necessary structured cabling components as per technical specifications	lot	—		
O4	Ruggedized Corded IP telephone set, stainless steel enclosure	2	Units		
O5	All other materials, equipment and components required to carry out implementation to meet scope of works and technical specification. (Itemize)	Lot	—		

## P TOOLS

Delivered to Gitaru power Station Store

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
P1	Smart handheld Optical Time Domain Reflectometer OTDR, Quad module (multimode & single mode) all accessories and consumables as detailed in specifications	2	sets		
P2	Fibre optic field Fusion splicing equipment all accessories and consumables as detailed in specifications	1	sets		
P3	<b>Network cable repair maintenance toolkit</b>	2	sets		
P3.1	Crimper, All-in-One Ratcheting Modular Data Cable Crimper / Wire Stripper / Wire Cutter, for RJ45, CAT5e, CAT6, CAT6A, VDV226-011-SEN	6	sets		
P3.2	Ratcheting Modular Data Cable Crimper / Wire Stripper / Wire Cutter for RJ11/RJ12 Standard, RJ45 Pass-Thru Connectors, VDV226-110	6	sets		
P3.3	Twisted Pair Radial Stripper VDV110-261	6	sets		
P3.4	Impact Punch down Tool, 66/110 Blade, VDV427-300	6	sets		
P3.5	Impact Punch down Tool Extended Reach 110 MIM Replacement Blade with Bayonet-Style, Twist-and-Lock Socket, VDV427-110	6	sets		
P3.6	Cable Tester Kit with Scout Pro 3 for Ethernet / Data, Coax / Video and Phone Cables, 5 Locator Remotes, VDV501-851	4	sets		
P3.7	RJ45 Pass-Thru Crimper, VDV226-005	6	units		
P3.8	Cable tester with single button testing of terminated voice and data cables, VDV526-100	4	units		
P3.9	Shielded RJ45 Cat 6A Pass Through Connector for CAT6A Shielded Cable and Larger Diameter CAT6 Indoor or Outdoor Ethernet Cable, 50-Pack, VDV826-705	10	packs		
P3.10	RJ45 Connectors, Cat6 Modular Data Plugs with 3-pronged Contact for Solid or Stranded Conductors 25 pack, VDV826-603	20	packs		
P3.11	Screwdriver Set with Magnetizer / Demagnetizer for Magnetic Tips, Flathead and Phillips, Non-Slip Cushion Grip, 8-Piece, (Klein Tools 85148 or equivalent)	4	sets		
P3.12	Wire Cutter and Wire Stripper, Stranded Wire Cutter, Solid Wire Cutter, Cuts Copper Wire (Klein Tools 11055)	4	sets		
P3.13	Insulated Screwdriver Tool Set with #2 Phillips and 1/4-Inch Cabinet Slim Tips, 2 Pliers and Wire Stripper (Klein Tools 94130 1000V)	4	sets		
P3.14	Crimping tool replacement blades	40	pcs		
P3.15	Stripping Knife	6	sets		
P3.16	Carrying case	6	sets		
P3.17	All other tools and accessories required for network and telephone cable works, maintenance, and repair	Lot	—		
P4	<b>Rugged Engineering Laptops</b>	4	sets		
P4.1	Hardened laptop,8C/16T,2.6GHZ,24MB L3,32GB 3200MT/s RAM,1 TB, M.2 NVMe MLC, High performance graphics 8GB VRAM,17.3 display, 1X1Gb Base-T	2	Units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
P4.2	Windows operating system, latest edition with perpetual license	4	sets		
P4.3	Microsoft office, latest edition with perpetual license	4	sets		
P4.4	Network configuration and management tools as detailed in specifications with perpetual license (if applicable)	4	sets		
P4.5	VMware workstation, latest edition, with perpetual license	4	sets		
P4.6	Kaspersky anti-virus software with two years subscription	4	sets		
P4.7	All other software licenses required for configuration and management of all equipment in scope of supply with perpetual license (if applicable)	4	sets		

### Q Mandatory Spares and Accessories

Delivered to Gitaru power Station Store

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
Q1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features as detailed in specifications	1	Units		
Q2	Backbone Ethernet switch, 20X1G SFP/RJ45 & 4x 1-10G SFP+, Carrier Ethernet, Layer 3, VRF, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis	1	Units		
Q3	Aggregation Router / Backbone Ethernet switch 1000BASE-ZX SFP transceiver module for SMF, extended operating temperature range, up to 70km	2	Units		
Q4	Aggregation Router / Backbone Ethernet switch 1000BASE-EX SFP transceiver module for SMF, extended operating temperature range, up to 40km	2	Units		
Q5	Aggregation Router / Backbone Ethernet switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	10	Units		
Q6	Aggregation Router / Backbone Ethernet switch 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, up to 300m	10	Units		
Q7	Aggregation Router / Backbone Ethernet switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature,	10	Units		
Q8	Industrial grade media converter or Multiplexer, Multimode Fibre to single mode Fibre ethernet, 160km range, 2 x1G, LC ports	2	Units		
Q9	<b>Hybrid IP PBX</b>	1	sets		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
Q9.1	Hybrid IP PBX, SIP server, at least 50 concurrent calls and 100 users, 16 FXS ports, 48 VDC power supply	1	sets		
Q9.2	GSM gateway with at least two SIM cards and external antenna port	1	unit		
Q9.3	Outdoor GSM antenna with mounting accessories, coaxial cable and surge/Lightning protection	1	sets		
Q9.4	Telephone punch down terminal block for at least 25 pairs	1	sets		
Q9.5	Data Surge Protection Device (SPD) for analogue phones FXS connections	25	pcs		
Q9.6	All other accessories and components and as detailed in specifications	Lot	—		
Q10	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply	2	Units		
Q11	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply	5	Units		
Q12	Industrial grade Access Ethernet Switch 1000BASE-EX SFP transceiver module for SMF, industrial operating temperature, range up to 40km	2	Units		
Q13	Industrial grade Access Ethernet Switch 1000BASE-LX SFP transceiver module for SMF, industrial operating temperature, range up to 10km	5	Units		
Q14	Industrial grade Access Ethernet Switch 1000BASE-SX SFP transceiver module for MMF, industrial operating temperature, range up to 300km	2	Units		
Q15	Industrial grade Access Ethernet Switch 1000BASE-T SFP transceiver module for copper RJ-45, industrial operating temperature	5	Units		
Q16	<b>Ethernet radio, point to point, 450Mbps Aggregate capacity</b>	1	sets		
Q16.1	Indoor unit, IDU with 240V AC and 48V DC power Supply, POE	1	units		
Q16.2	Outdoor unit, ODU, POE, 3x1G SFP/RJ45, with cable connectors and mounting accessories	1	units		
Q16.3	Dual-Polarized Parabolic Antenna, High Performance 4.9-6 GHz, at least 1.2M diameter, with 2 x N-type Connector and mounting accessories	1	units		
Q16.4	Lightning protection unit and Grounding Kit	1	set		
Q16.5	Coaxial Cable with grounding kit for antenna	Lot	—		
Q16.6	Outdoor CAT5E/6A cable, Outside plant (OSP) type, copper-clad steel armour, waterproof jacket, sunlight, and abrasion resistant	200	meters		
Q16.7	Bend insensitive multimode fibre optic cable with LC-LC connectors	100	meters		
Q16.8	Flexible Conduit, PVC Coated Galvanised Steel core, 10-20mm internal diameter for fibre optic cable	100	meters		
Q16.9	SFP module, 1000BASE-SX	1	units		
Q16.10	All other accessories and components and as detailed in specifications	Lot	—		
Q17	Ethernet radio 1000BASE-LX SFP transceiver module for SMF	1	Units		
Q18	IP DECT Multi cell Manager station	2	Units		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
Q19	IP DECT base station, IP67, UV & weatherproof, outdoor installation.	10	Units		
Q20	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant	10	Units		
Q21	Ruggedized Corded IP telephone set, stainless steel enclosure	10	Units		
Q22	Network attached storage hard drives, 2.4TB, 10K RPM, SAS 12Gbps 512n, 2.5in Hot-plug SFF Hard Drive	8	Units		
Q23	KVM Extenders (Receiver & Transmitter pair) and Two-port dual display KVM Switch	3	sets		
Q24	Solar Hybrid Inverter charger,7KVA, ethernet communication gateway	2	Units		
Q25	Outdoor GSM antenna with mounting accessories, coaxial cable and surge/Lightning protection	2	Units		
Q26	Inverter power supply, 110V DC/240V AC, 3kVA	2	Units		
Q27	Inverter power supply, 48V DC/240V AC, 3kVA	2	Units		
Q28	Switched power supply unit,110VDC-240VAC input,48VDC/20A output,960W	5	Units		
Q29	Redundancy diode modules,48VDC,2X20A/40A	2	Units		
Q30	Redundant panel cooling fans with filters,700m3/hr throughput with filter, outlet filter unit	4	Units		
Q31	Miniature circuit breakers for DC supplies, DC type, 400V DC rated, Double pole, current rating as per design	5	Units		
Q32	STP patch Panel,24port RJ45-RJ45 Feedthrough Shielded Cat6A connectors,1U Rack-Mount steel enclosure.	5	Units		
Q33	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,2-5m Category 7 S/FTP cable	100	pieces		
Q34	STP patch cords, factory made, Cat6A RJ45-RJ45 connectors,10-20m Category 7 S/FTP or SSTP cable	100	pieces		
Q35	STP Ethernet Cable, S/FTP, CAT 7,23AWG/0.5mm copper conductors, outdoor use,305m roll	5	rolls		
Q36	STP Cat6A RJ45 male connectors	1000	pieces		
Q37	Fibre optic patch panel,1U rack mount steel enclosure, 24 LC ports, single mode OS2	5	Units		
Q38	Fibre optic patch cords, Single mode duplex LC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	50	pairs		
Q39	Fibre optic patch cords, Single mode duplex FC-LC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	10	pairs		
Q40	Fibre optic patch cords, Single mode duplex FC-FC UPC connectors,2-5m single mode OS2 G657A2 LSZH cable	2	pairs		
Q41	Fibre optic cable, single mode OS2, 24 cores, steel wire armour	1000	meters		

## DETAILS OF MAJOR EQUIPMENT IN SCOPE OF SUPPLY

Bidder **MUST** provide details of proposed major equipment in scope of supply listed below

Item	Description	Manufacturer	Model/Order Number/Configuration/Catalogue no.	country of origin/Manufacture
1	Aggregation Router, 16 x1G SFP/RJ45 & 8x1-10G SFP+, 10GBASE-T SFP+ module, 10GBASE-ER SFP+ module, MPLS, Carrier Ethernet, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis, all features & licenses as detailed in specifications			
2	Backbone Ethernet switch, 20X1G SFP/RJ45 & 4x 1-10G SFP+, 2X10GBASE-T SFP+modules,10GBASE-ER SFP+ module, Carrier Ethernet, Layer 3, VRF, Dual-DC power supplies, industrial temperature rating & Conformal-Coated Chassis			
3	Ethernet radio, point to point, 450Mbps Aggregate capacity, High Performance 4.9-6 GHz antenna,48V DC supply, POE,3x1G SFP/RJ45,1G-SX SFP plus all accessories detailed in specifications			
4	External LTO Tape-Based Storage with accessories and consumables as detailed in specifications			
5	Fibre optic field Fusion splicing equipment all accessories and consumables as detailed in specifications			
6	Rugged Engineering Laptops 8C/16T,2.6GHZ,24MB L3,32GB 3200MT/s RAM,1 TB, M.2 NVMe MLC, High performance graphics 8GB VRAM,17.3 display, 1X1Gb Base-T			
7	Hybrid IP PBX, SIP server, at least 30/50 concurrent calls and 50/100 users,16 FXS ports, GSM gateway (2 lines), external outdoor GSM antenna,48 VDC power supply plus all accessories detailed in specifications			
8	Industrial grade Access Ethernet Switch 2X1G SFP/RJ45 & 8X100M-RJ45, POE, fully managed layer 2, DIN mount, DC supply			



Item	Description	Manufacturer	Model/Order Number/Configuration/Catalogue no.	country of origin/Manufacture
9	Industrial grade Access Ethernet Switch 4X1G SFP & 6X1G RJ45, Rugged, fully managed layer 2, DIN mount, DC supply			
10	Industrial grade cyber security appliance, all features & licenses as detailed in specifications, 10 X1G RJ45, 2 X 1000BASE-LX SFP, 3G/4G inbuilt modem, antenna coaxial cable and outdoor GSM antenna			
11	Industrial grade media converter or Multiplexer, Multimode Fibre to single mode Fibre ethernet, 160km range,2 x1G, LC ports			
12	Industrial grade network cabinet,42U, 800x2000x800mm, IP54, all panel parts as detailed in specifications			
13	Industrial grade network cabinet,9U, 600x480mmx470mm, IP55, wall mount, Ground mounting supports with roof, all panel parts as detailed in specifications			
14	Inverter power supply, 110V DC/240V AC, 3kVA			
15	Inverter power supply, 48V DC/240V AC, 3kVA			
16	IP DECT base station, IP67, UV & weatherproof, outdoor installation.			
17	IP DECT Multi cell Manager station			
18	IT server cabinet, 42U 600x2000x1000 mm, all panel parts as detailed in specifications			
19	KVM Extenders (Receiver & Transmitter pair) and Two-port dual display KVM Switch			
20	LED/LCD monitor,27.0 Inch			
21	LED/LCD monitor,65.0 Inch			
22	Power supply cabinet, Perforated,600X2100X800mm, all panel parts as per specifications			
23	Rack mount enterprise security appliance with licensed pre-installed software			
24	Rack mount Network Attached Storage server,10C/20T,2.2GHZ,13.75MB L3,64GB 2400MT/s RAM,2X400GB 1 DWPD SAS SSD,12X2.4TB 10K RPM SAS HDD,8X10Gb Base-T, 4X1Gb Base-T,2X700W power supply			



Tender for Supply, Installation and Commissioning of SCADA Wide Area Network  
& Backup Control Centre Hardware for KenGen Hydroelectric Power Plants



Item	Description	Manufacturer	Model/Order Number/Configuration/Catalogue no.	country of origin/Manufacture
25	Rack mount server,18C/36T,3.0GHZ,39MB L3,256GB 3200MT/s RAM,2X960GB 3 DWPD SAS SSD,8X10Gb Base-T, 4X1Gb Base-T,2X1100W power supply			
26	Rack mount server,8C/16T,3.2GHZ,16MB L3,64GB 3200MT/s RAM,2X960GB 3 DWPD SAS SSD,4X10Gb Base-T, 4X1Gb Base-T,2X600W power supply			
27	Ruggedized Corded IP telephone set, stainless steel enclosure			
28	Ruggedized DECT Handset, IP67, Shock, dust, and water resistant			
29	Smart handheld Optical Time Domain Reflectometer OTDR, Quad module (multimode & single mode) all accessories and consumables as detailed in specifications			
30	Solar Hybrid Inverter charger,7KVA, ethernet communication gateway			
31	Thin Client computers			

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Bidders seal or stamp

## SCOPE OF SUPPLY OF DESIGN SERVICES

Contractor shall supply all design services required for implementation of the project as detailed in the technical specifications. The list below does not provide details of the services but the summary. Bidder may attach a detailed bidder's scope of supply if they need to provide more details of their offering

<b>BQ Item</b>	<b>Description</b>	<b>Qty</b>	<b>UOM</b>	<b>Offered by bidder (YES/NO)</b>	<b>Bidders' comments or Deviations</b>
A	Panel design	lot	—		
A.1	Electrical designs,	lot	—		
A.2	Civil works designs,	lot	—		
A.3	All other design services necessary to meet technical specifications	lot	—		
B	Preparation of bill of materials	lot	—		
C	Complete Network architecture design	lot	—		
C.1	Network architecture designs	lot	—		
C.2	Server functions/architectural design	lot	—		
C.3	All other design services necessary to meet technical specifications	lot	—		
D	SCADA Network Cyber Security design	lot	—		

## SCOPE OF SUPPLY OF INSTALLATION AND OTHER SERVICES

Contractor shall supply all services required for implementation of the project as detailed in the technical specifications. The list below does not provide details but the summary. Services applicable to each site are listed in the schedule of prices. The list below is a summary for all sites. Bidder may attach a detailed bidder's scope of supply if they need to provide more details of their offering

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
	<b>Installation and commissioning services</b>				
A-O	Network cabinets and equipment including removal of existing radios and installation of the new Ethernet Radios & Telephone system Site works; installation and commissioning	lot	—		
A-O	Server cabinet installation and commissioning	lot	—		
A-O	Structured cabling installation and commissioning	lot	—		
A-O	Network and communication configuration/deployment and commissioning	lot	—		
A-O	Server configuration/deployment and commissioning	lot	—		
A-O	Power supplies installation and commissioning	lot	—		
	<b>Underground fibre optic cable Installation and commissioning services</b>				
G9	Trenching (1.0m deep* 0.3m width) including backfilling, 2 X HDPE conduit installation, Warning tape installation, Manhole's installation at 200m intervals, Cable route Markers at 30m intervals, splice boxes/enclosures installation.	15000	meters		
G10	Road crossings directional/thrust boring, 2 Meters deep and 15 meters across the road, fibre optic micro-tunnel and installation of two manholes and two 100mm GI conduits (one spare) across the road	6	AU		
G11	Wet area crossings installations, Gabions, concrete envelope, screen bags, soil stabilization and GI pipe installation	—	lot		
G12	Rocky areas installation, Trenching (0.4m deep* 0.3m width), GI pipes installation, concrete envelope	—	lot		
G13	Fibre optic cable installation, blowing, splicing and termination	15000	meters		
G14	All other installation and commissioning services	—	lot		
H5	Solar panels including ground mounting structure, installation, and commissioning	—	lot		
A-O	All other installation and commissioning services	lot	—		
	<b>Software Services EXCLUDING software with perpetual licences to be pre-installed into the hardware</b>	—	—		
A-O	VMware Essential plus Software basic support, two licenses (six servers)	3	Years		

BQ Item	Description	Qty	UOM	Offered by bidder (YES/NO)	Bidders' comments or Deviations
A-O	Enterprise security Appliances with all specified features Software basic support and specified subscription licenses, two appliances	3	Years		
A-O	Industrial grade security Appliances with all specified features Software basic support and specified subscription licenses, ten appliances	3	Years		
A-O	Network management Software (Solar winds and all other network configuration software to be provided) basic support	3	Years		
A-O	Cisco Smart NET licenses for all Cisco devices (if applicable)	3	Years		
A-O	Software support services for equipment detailed in scope of supply (where applicable)	3	Years		
	<b>GENERAL SERVICES</b>				
P1	Factory Acceptance testing and training as detailed in specifications	Lot	—		
P2	Training as detailed in specifications	Lot	—		
P2.1	Beginners Training (Networking foundation course)	5	days		
P2.2	Advanced Network training	10	days		
P2.3	Radio setup and link planning	3	days		
P2.4	Fibre splicing and testing	3	days		
P2.5	Equipment specific trainings (Switches, routers, radio, PBX, DECT, servers etc.). 15 days if non-Cisco routers are proposed	5/15	days		
P2.6	Network management	5	days		
P2.7	ICS/OT cybersecurity	5	days		
P3	Reliability run / commissioning for ninety (90) days as detailed in specifications	Lot	—		
P4	Provision of two-year supplier warranty as detailed in specifications	Lot	—		
P5	Technical support as detailed in specifications	Lot	—		

**ACKNOWLEDGEMENT OF ADDENDUM NO.5**

We, the undersigned hereby certify that the addendum is an integral part of the document and has been incorporated in the tender proposal.

Signed.....

Tenderer.....

Date.....