

‘Package-C1: DWDM Equipment Package’ under ‘Augmentation of Telecom Backbone Network and associated infrastructure’	
TECHNICAL SPECIFICATIONS	
1	Introduction
1.1	PowerTel is implementing DWDM System (C+L Band) with new generation optical networking systems (SDN Based). The desired network should accommodate the growing demand for bandwidth, while maintaining compatibility and enhanced flexibility to transport and route all traffic types using Dense Wave Division Multiplexer (DWDM).
1.2	The Proposed Transponder/Muxponder solution shall also be supported over existing DWDM System by using Alien wavelength. The system must be programmable and highly intelligent, robust and based on open architecture.
1.3	DWDM system shall support ‘C+L band’ as per ITU-T grid.
1.4	Contractor shall supply Equipment equipped with necessary common modules and accessories to meet the requirement specified in Appendix-C BoQ .
1.5	The bidder is requested to design the DWDM system (C+L Band) with minimum line rate of 400Gbps (single carrier) or more per channel .
1.6	System shall support alien wavelength for 3 rd party OEM and must support provisioning/ monitoring of optical channel, wherever applicable.
1.7	Requirement is summarized as mentioned below:
i	BackBone Network (for Details ref Appendix C (BoQ) Table C1 and C2 for Backbone)
ii	Metro Network (for Details ref Appendix C (BoQ) Table C3 and C4 for Metro)
2	Overview of the scope of Work
2.1	The scope of work would be System Design, Supply of Equipment at various sites/ locations, installation, testing, commissioning & including integration with the existing NOC/OSS system by providing standard northbound APIs from supplied NMS/controller for management of devices. The scope of work shall include, but not be limited to the following:
2.2	Project Management, Supply of all related goods and providing all related services including custom clearance if required, transportation, installation, testing, commissioning & acceptance of the telecom system and training of PowerTel personnel.
2.3	The requirement specified at BoQ at Appendix-C . The offered DWDM Equipment (C+L Band) shall be used to augment the Network and/ or Bandwidth Capacity of the existing DWDM Network as per business & network requirement as per the provisions of the contract. The DWDM Solution may be used anywhere in Metro or NLD Network as per requirement.
3	Compliance Requirements
3.1	The Equipment & Modules shall comply with ‘Trusted Products’ from ‘Trusted Sources’ in line with the ‘National Security Directive on Telecommunication Sector (NSDTS)’ under subject package. Trusted Products are products whose critical components and the products themselves are sourced from Trusted Sources. The National Cyber Security Coordinator (NCSC) is the Designated Authority (DA) for the determination of inclusion of a vendor as a Trusted Source, of a Telecom product as a Trusted Product and the methodology for the said inclusion. Contractors are advised to submit the necessary certificate(s) along with bid. Contractors are advised to do their due diligence while selecting an OEM and offering the model/ type equipment. The Taking over Certificate (TOC) of Network shall be provided to the contractor only after clearance of the Telecom Equipment as ‘Trusted Products’ from ‘Trusted Sources’ as per NCSC and submission of MTCTE certificates. These are mandatory compliances
3.2	The main Equipment shall comply with ‘Mandatory Testing and Certification of Telecom Equipment (MTCTE)’ under the provision of Indian Telegraph (Amendment) Rules 2007. Contractor must supply only certified equipment as per MTCTE. Please refer the weblink https://www.mtcte.tec.gov.in for more details.
3.3	Contractor to sign NDAs (Non-Disclosure Agreement) with employer as per the format attached at Appendix-D and undertakes commitment to provide malware free software and patches for Software upgrades. Contractors must sign NDA with respective OEM(s) wherever applicable to ensure the security of assents of PowerTel.
3.4	Contractor shall comply with Indian Telecom Security Assurance Requirements (ITSAR), notified by NCCS for the product(s) to be supplied under the package. The ITSAR compliance shall only be applicable, if notified before the last date of bid submission. It’s a mandatory compliance, if notified for the product.
3.5	The contractor shall be required to report any cyber security incident in its own organization or in its sub-vendor/OEM’s organization to the Employer, which may have potential to impact deployment in employer’s network infrastructure.
3.6	Bidder shall comply with Minimum Local Content notified in Table-A of Department of Telecommunications (DoT), Ministry of Communications order dated 21st October 2024 on ‘Public Procurement (Preference to Make in India) Order 2017 –Notification of Telecom products, Services or Works-regarding’ for items to be supplied." DoT notification is enclosed at Appendix-E.
4	General Responsibilities and Obligations

4.1	The Bidder's technical proposal shall include a project implementation plan and schedule that is consistent with the implementation plan. The Implementation plan shall include the activities of both the Contractor and the Employer, showing all key milestones and clearly identifying the nature of all information and project support expected from the Employer.
4.2	Contractor's Responsibilities and Obligations
i	Design & build a Telecom Network that meets the functional and performance requirements of this specification.
ii	Define source power requirement for each cabinet/ rack of equipment provided at each location.
iii	Survey of locations and submission of survey report as per agreed formats if required.
iv	Appointment of Project Manager, Design Engineer from OEM & other resources for successful & timely completion of project.
v	Supply, installation, testing and commissioning of all hardware, software and firmware required to satisfy this specification.
vi	All cabling wiring including supply, laying and termination of cables (signal, power supply & earthing), DC/AC distribution boards required for the Equipment. Bidder has to consider 16 Square mm cable, 10 meter cable with each Rack/Cabinet for earthing of DWDM equipment
vii	Factory and site acceptance testing of all hardware & software.
viii	Integration of with existing Telecommunications Management Network (TMN) system software, hardware and firmware with equipment supplied in this package.
ix	Compliance of all security related requirements as per latest DoT/ MoP/ GoI guidelines with subsequent amendments.
x	Defect liability period (DLP) of 01 year after TOC.
xi	AMC of the Equipment/ system for at minimum 9 years
4.3	The Employer Responsibilities and Obligations
i	Overall project management of the project.
ii	Source power at (nominal) -48 volts DC and/or AC power at (nominal) 220 volts, 50 Hz as required by the equipment to be supplied.
iii	Providing support and access to facilities at the sites.
iv	Implement the major civil works such as expansion or construction of rooms, trenches necessary for installation of proposed equipment.
v	Provide to the extent possible drawings for existing sites and facilities for which equipment installations are planned.
vi	Obtaining statutory clearances from regulatory bodies, if required.
vii	Approval of key personnel for the project.
5	General Bidding Requirements
	The Bidder shall be responsive to the Employer's technical requirements as set forth in this specification. The Bidder's proposal shall include the following:
5.1	The Project plan shall include the activities of both the Contractor and Employer, show all key milestones, and clearly identify the nature of all information and project support to be provided by Employer. Manpower resources proposed to be deployed by the Contractor during the execution phase shall be clearly indicated.
5.2	Type Test Certificates/ Reports for offered Equipment/ Sub-systems as per specification requirement.
5.3	Data Requirement Sheets
5.4	Network design document including link budgeting, detailed BoQ as per specification requirements.
5.5	Detailed Project Implementation Plan
5.6	Trusted Source & Trusted Product Certificates
5.7	MTCTE Certificates
6	Technical Requirement
	Introduction & General Network Characteristics and Equipment Requirements
6.1	This section describes the communication network configuration and characteristics of the DWDM System, amplifiers and associated subsystems. The requirements described herein are applicable to and in support of network configurations depicted in Appendix-C along with BoQ. A Network Management System (Telecommunications Management Network, TMN) is required for management of all equipment to be supplied under the project. The DWDM System platform shall be based on a single platform architecture functional model and should be manageable from the TMN as single network element. Functional and performance requirements of the TMN are defined in Clause 7 . Minimum subsystem monitoring and control requirements to be provided are specified as part of the subsystem's equipment characteristics.

6.2	The Contractor is encouraged to propose any hardware configurations better suited to the characteristics of the Contractor's standard products if the equipment characteristic requirements of this specification are met.
6.3	The DWDM Network shall be built among cities (Refer Table C-1 and C-3 at Appendix-C) connecting all major & critical business centers. The Network is required to be augmented by installing new DWDM links on separate pairs of fibre under this project. The exact link details (Loss & length) are provided in Table C-1 and C-3 of Appendix-C respectively. The traffic matrix for Backbone and metro have been provided in Table C-2 and C-4 respectively of Appendix-C
6.4	Bidder offered DWDM shall support 'C+L band' as per ITU-T grid. The offered DWDM Solution shall support minimum capacity of over a pair of fibre as mentioned below: a). Backbone: 32Tbps b). Metro Network : 38Tbps
6.5	Contractor shall supply Equipment equipped with necessary common modules and accessories to meet the requirement specified in BoQ. However, all such Equipment, shall be upgradable/ configurable to the ultimate capacity (DWDM Channels), if required in future, by adding additional Sub-racks & necessary modules without changing the design solution. The addition of new Channels (till its design capacity of 32Tbps/ 38Tbps) shall be hitless. Each subsystem supplied shall be sized (to be equipped as specified) to support full subsystem expansion.
6.6	DWDM offered system must support C+L band DWDM ITU-T grid, flexi-grid ROADM architecture and offered ROADM module must include a twin flexible grid WSS for route and select wavelength switching.
6.7	The bidder is requested to design the DWDM system 'C+L band' with minimum line rate of 400Gbps or more per channel (single carrier). Transponder module Single wave can support minimum 400G or higher capacity.
6.8	The Transponder/ Muxponder (or coherent pluggable) shall be able to support flexible line rates i.e. line rates higher than the rates in offered solution. Example: Example: If the Transponder is configured @ 400G line rate in the solution, the same can also be configured @ 400G to 1200G with step value of 100G. Further, bidders need to specify the used baud rate for each line rate. The bidder must quote the license cost on a per-100G basis for line rate configuration. For example: A single port has a line rate of 400G. To enable this, four 100G licenses are required (4 × 100G). Thus: Port capacity: 400G License unit: 100G Licenses needed: 4 PowerTel can scale the line rate in increments of 100G by purchasing additional licenses. Using the per-100G license cost, the line rate can be extended to 500G, 600G, 700G, 800G, 900G, 1000G, 1100G, and 1200G.
6.9	Any addition and deletion of channels shall not affect the traffic in the offered DWDM system. Also, addition and deletion shall not degrade the OSNR of the exiting channels.
6.10	System shall support Integrated ASE (Amplified Spontaneous Emission) for smooth channel addition with predictable performance from day 1 for both C-Band and L-Band.
6.11	Nominal power supply is -48 V DC. The equipment shall work in the range -40 V DC to -60 V DC and AC equipment shall work on 220v AC power supply.
6.12	The equipment shall be protected in case of voltage variation beyond the range specified and against reverse input polarity.
6.13	The derived DC voltages in the equipment shall have protection against over- voltage, short circuit and overload.
6.14	The equipment shall have the option of operating from two independent sources of input power supply.
6.15	Sub-rack/Chassis for Electrical layer & Optical Layer
i	Sub-rack/ Chassis shall support redundant power modules, fan modules and shelf controller modules
ii	AC as well as DC powered Chassis shall be provided as indicated in at Appendix-C .
iii	The system should have field-replaceable modules with flexible slotting rules.
iv	Backbone: Maximum permissible size Equipment shall fit in ETSI Rack 2200mm (Height) x 600mm (Width) x 600mm (Depth)
v	Metro: Maximum permissible size Equipment shall fit in ETSI Rack 2200mm (Height) x 600mm (Width) x 800mm (Depth)
6.16	Transponder/ Muxponder
i	Single channel can support minimum 400G or higher capacity.
ii	All Transponder/ Muxponder shall have minimum 1x400G+4x100G client ports.

iii	Traffic module shall provide full support for Dense Wavelength Division Multiplexing (DWDM) transponding and muxponding functions. It shall be designed to operate independently of the end-use application, ensuring agnostic compatibility across deployment scenarios including, but not limited to, metro networks and backbone infrastructure. Also, Tranponder/Muxponder offered in mtero and backbone network must be interoperable(Line side of both module must able to communicate with each other)
iv	Backbone: Maximum permissible size Equipment shall fit in ETSI Rack 2200mm (Height) x 600mm (Width) x 600mm (Depth)
v	Metro: Maximum permissible size Equipment shall fit in ETSI Rack 2200mm (Height) x 600mm (Width) x 800mm (Depth)
vi	In case, the Transponder/ Muxponder has more than one (01) no of 400G client ports and all of the ports are used to deliver the 400G client services, the Transponder/ Muxponder shall have sufficient 100G client ports equivalent to the capacity delivered using 400G client ports. PowerTel reserve the right to use either client 400G or client 100G against the line capacity offered by the bidder.
vii	The 100G client ports shall support both of the '25Gx4 Lane' and '100Gx1 Lane' based pluggable.
viii	The Transponder module must be based on Digital Coherent Optics (DCO) technology. Tranponder must have a minimum transmit power of 0 dB.
ix	Bidders are required to offer only higher-performance minimum 400G or higher line coherent modules and shall not allowed to use standard or low-power ZR/ZR+ variants, ensuring adequate reach, optical power, and interoperability.
x	Transponder shall support Ethernet client's traffic.
xi	The platform must support GCC0/GCC1 for in-band communication.
xii	In addition to the 400G client pluggable as specified in the BoQ, Contractorshall be required to enable the support of new generation 400G client pluggable in future without any financial implication to PowerTel, however the pluggable will be procured by employer separately.
6.17	Reconfigurable Optical Add-drop Multiplexer (ROADM) & Control Plane
i	ROADM (Twin WSS based) shall support minimum 8-directions.
ii	Reconfigurable Optical Add-drop Multiplexer (ROADM) based on Flexible grid enabled Wavelength Selection Switch (WSS) technology is required to remotely configure wavelength in DWDM system from TMN system. WSS based ROADM shall support Colorless (Tunable), Directionless and Flex-grid Mux/ Demux architecture.
iii	System design must be based on Flex-Grid and shall support a wavelength add/ drop structure conforming to the Nx6.25GHz as per ITU-T G.694.1.
iv	The platform must support Wavelength switched optical network control plan (distributed) based on ITU-T recommendation G.8080 switching.
v	System shall support Integrated ASE (Amplified Spontaneous Emission) for smooth channel addition with predictable performance from day 1 for both C-Band and L-Band.
6.18	Protection Scenerio
i	Switching must be within 50ms using any of the protection mechanisms mentioned below and L0 restoration time shall comply with technical GR by Telecommunication engineering center , Department of Telecom.
ii	1+1 Client-side protection.
iii	1+1 Line-side Optical channel protection
iv	Wavelength restoration via Layer 0 control plane
v	Note: Client-side protection at 400G Interface will be implemented using long reach 400G client pluggable only.
6.19	Amplifiers
i	Amplifiers shall support full C-band (4800GHz) & L-Band (4800GHz) spectrum and provide amplification with features mentioned below. Bidders are allowed to use Raman amplifiers in the network if required.
ii	The amplifier module(s) shall be able to provide C-Band and L-Band
iii	Amplifiers must have integrated OSC
iv	Integrated tilt control(At Node level)
v	Automatic gain control and Automatic Power control
vi	The proposed system shall support Automatic Laser Shut down feature. The ALS feature shall be enabled when an amplifier circuit pack is placed in service. It shall safely shutdown the laser (Amplifier power levels are turned down or turned off) when a fiber break or intermediate connector disconnect occurs between two neighboring sites, where optical radiation is being fed into both ends of the optical fiber and generating a hazard on both ends of a fiber break.
6.20	ADD/DROP Structure : Colorless directionless contentionless
i	Colorless directionless contentionless shall be based on MxN WSS(wavelength selective switching) technology.

ii	The Colorless Channel Mux/ Demux configuration shall support dropping of same channel from minimum 8 directions and provision of dropping of minimum 24 channels.
6.21	Integrated OTDR function
i	Run OTDR traces in-service as needed for proactive monitoring.
ii	Run automatically on fiber cut scenario to pinpoint fiber faults.
iii	Provision to store historical OTDR traces
iv	OTDR solution should localize high loss points or reflection.
6.22	System shall be built in such a manner that it should work with existing DWDM network based on above parameters and supplied SDN Controller should provide latest APIs, which shall further facilitate multivendor interoperability. System shall support configuration management, open APIs, and standards-based SNMP/YANG models. These management features should be available at no cost to PowerTel.
6.23	Equipment shall support any of the following northbound interfaces (NBI):
i	Command Line Interface (CLI)
ii	Network Configuration Protocol (NETCONF)
iii	Remote Procedure Call (gRPC)
iv	Representational State Transfer Application Programming Interface (REST API)
v	Simple Network Management Protocol (SNMP)
6.24	Power Cable and MCB requirement
i	Bidder shall supply the AC/DC power cable and MCB to support minimum 200% of the actual load requirement of the equipment at each site. AC/DC Power to be sourced from two different power sources at each site.
ii	The length of the power cable required to connect equipment from each of the power source is to be considered minimum 50meters for bidding purpose. There will be provision of Two (02) separate Power Sources. Following may be considered to calculate the length of Power Cable: 1. Each of the power source is located 50 meters away from Rack. 2. Bidder shall supply necessary quantity of cable of appropriate ratings (as per TS) to connect each of the source with Rack.
iii	The quantity of MCB (to extend power to sub-racks) in each of the cabinet shall be at least 200% of the actual quantity requirement.
6.25	Alarms: DWDM system shall support alarms in line with the ITU-T recommendations G.798, G.874, G.694, G.7710. for example: The following System related alarm conditions shall be reported by the NMS/Controller.
i	Input power failure of the Transponder/Mux-ponder interface (including Ethernet interfaces).
ii	Fan/s failure.
iii	Hardware failure alarm
iv	Low input power at Transponder
v	Low input OSNR.
vi	High Bit Error
vii	ODU-k related alarms
Vii	Other Equipment/Server related etc.
6.26	Protection switching shall be triggered (maximum switching time shall be less than or equal to 50ms) based on Loss of Signal, signal degrade, Pre-FEC BER Signal Failure, OSNR/Q factor signal degrade etc or other equivalent mechanism(s) meeting the switching time of 50ms .
6.27	The proposed system shall be managed by a single unified system/Controller with DC & DR (active and standby) for all the active components. Bidder shall also propose Open Controller based Management System for managing system with DC & DR (active and standby). All licenses required for Northbound and Southbound interface (API) should be equipped with offered solution at no additional cost to PowerTel.
6.28	The proposed system shall support third-party optics (MSA Compliant) at the client side with no cost to PowerTel. Bidder can propose fully compatible third party optics.
6.29	System shall support alien wavelength for 3 rd party OEM and must support provisioning/ monitoring of optical channel, wherever applicable. The Alien Lambda support shall be available without any additional financial implication to PowerTel.
6.30	Line ports shall provide following performance monitoring to health of circuit.
i	Transmit Power
ii	Receive Power

iii	Wavelength (nm) or Frequency (THz)
iv	Error Second
v	Severe Error Second
vi	Code Violation or Background Block Error
vii	Unavailable Second
viii	Pre-FEC BER
ix	OSNR
x	Other etc.
6.31	Below mentioned Configuration is required from Day 1 as per Network design (Appendix-C). Network element shown in the diagram below shall be configured as ADD/Drop ROADM as per the actual directions.
i	Sub-Racks for optical modules only
	-----Maximum 2 fiber directions in single Sub-rack
ii	Sub-Racks for Traffic modules and Optical protection modules
	-----Traffic modules and Optical Protection Modules shall be in inserted same sub-rack and not in optical)
iii	Flexi-grid WSS modules with minimum 8 direction ports (1x8)
iv	Amplifiers
v	ADD/DROP Structure : Colorless directionless contentionless
	-----Shall be inserted in Separate sub-rack.(Not with optical modules such as ROADM, amplifiers etc and electrical module)
vi	Optical Power monitoring for all directions at Both Tx and Rx
vii	Active Switching module for client & line protection scenario
viii	OSC module (as per design)
ix	Power Module (1+1)
x	Control Card (1+1)
xi	Fan Module Redundancy
xii	Patch Cords
xiii	Attenuators
xiv	Accessories
xv	Any other required Hardware
6.32	Traffic Matrix, Network Topology and Node Configuration is enclosed at Appendix-C
6.33	WSN shall be implemented in the Intra-city network and offered solution shall maintain error free operation of all channels till any of the Fiber path available between Node A and Node B as specified at Appendix-C
6.34	OSNR margin of minimum +2dB shall be maintained for all the link in the traffic matrix of Appendix-C till EOL.
6.35	Link Budget Calculations: The fibre optic link budget calculations shall be calculated based upon the following criteria:
i	OSNR margin of minimum 2dB EOL shall be maintained between Traffic modules for all the link in the traffic matrix of Appendix-C and in addition to the margins specified below:
ii	Fibre attenuation as provided at Appendix-C
iii	Future Fiber Maintenance/ degrade margin of 2dB per span of upto 100 km, and 3dB for more than 100km span length.
iv	Dispersion: The fibre dispersion shall be taken to be the guaranteed maximum dispersion i.e. 20 ps/nm.Km (1550 nm) for G.652 fibre.
v	PMD coefficient shall be taken as 0.5 ps/km ^{1/2} for G.652 fibre.
vi	Bit Error Rate: The link budget calculations shall be done for a BER of 1x10 ⁻¹² for 400G or higher line rate.
vii	All DWDM links shall be designed with minimum 400Gbps bit rates.
viii	In addition to above, bidders are free to consider additional margin(s) for Link design to meet the performance.
ix	Bidders shall submit Link budget details with OSNR value for complete network.
6.36	Bidder shall provide the complete Bill of Material (BoM) and unit prices of the items in the BoM.

6.37	In case additional quantities, over and above the quantities estimated by the Contractor in BOM are required for successful completion of the scope of work as per Technical Specification, the contractor shall execute additional quantities of these items for which no additional payment shall be made over and above the lumpsum bid price (unless the scope of work is changed by the Employer).
6.38	Once a failure or degradation of performance is detected in the communications system, its cause shall be promptly isolated and corrected. To facilitate performance testing, efficient diagnosis and corrective resolution, the system shall permit in-service diagnostic testing to be executed both locally and from remote locations, manually and initiated under TMN control. Such testing shall not affect the functional operation of the system.
6.39	The offered DWDM system must be upgraded by adding adequate modules (Hardware & Software) in Network. The Contractor shall provide In Line Amplifiers (ILA) upgradeable to OADM/ ROADM as offered under this project by addition of necessary modules {Mux/ Demux, Amplifiers, WSS (if required) etc.}, additional chassis and modification of software (if required).
7	Network Management System & SDN Controller
7.1	The Contractor shall provide a Telecommunications Management Network (TMN) System for operational support of the Telecom Network and associated subsystems. The TMN shall be based on multi-layer Software Defined Networking (SDN) design. The centralized TMN System to monitor, configure and control of all the Network Elements supplied under this Package at each location of Network.
7.2	This TMN system shall assist the Employer in the overall management, operations and maintenance of the telecommunication resources including detection of degraded circuits and system performance, diagnosis of problems, implementation of remedial actions and the allocation or reallocation of telecommunications resources.
7.3	Applicable Standard: The multi-layer Software Defined Networking (SDN) design concept, including its functional and informational architecture as well as its physical architecture, shall adhere to the guidelines established in ONF TR-521.
7.4	TMN Architecture
7.4.1	The bidder shall propose single TMN system with SDN controller for the Employer's network such that all the management functions are available seamlessly across all the network elements supplied by the bidder under this package.
7.4.2	The TMN architecture envisaged under the subject package is described below:
i	The main Control Centre (DC) for all the network elements being procured under this package will be located at New Delhi and the backup Control Centre (DR) will be located at Bangalore, however PowerTel reserves the right to change the location of DC and/ or DR as per requirement.
ii	The operation of main and backup Control Centre will be coordinated in such a way that the database in both the Control Centres are in synchronism. The synchronization of database shall be done automatically, and periodicity of synchronization shall not be more than Sixty (60) Minutes under any circumstances.
iii	The management functions of the network elements under this subject procurement encompasses from any to any and the operation & maintenance of all the network elements shall be seamless. In case of failure of main Control centre, the control function shall be fully taken care of by backup Control Centre by automatic mechanism within Sixty (60) minutes. Restoration of main Control Centre shall be done after synchronism of database is achieved and after proper validation, which should be done automatically. Similar methodology shall be adopted for restoration of back up Control centre from a failover situation.
iv	It should be possible to configure at least Twenty (20) Workstations located at across India including DC & DR. The bidders shall propose the scheme in the bid along with all necessary hardware that will be required for this purpose. The TMN with SDN Controller shall provide:
a)	The Management data from all Network Elements (NEs) shall be collected, and the minimum monitoring & control requirements for the communication equipment.
b)	Processing of above management data by using a processor(s) located at Control Centres and/ or additional intermediate station processors, wherever required.
c)	Invoking the TMN functions through local Workstations (DC & DR) and remote workstations.
d)	PowerTel may like to extend the environmental/ auxiliary alarm of associated devices at locations where DWDM equipment to be installed, if required. So necessary provision of Supervisory monitoring of following alarms will be available:
	I. Intrusion Detection Alarms
	II. Power Failure
	III. Fire and Smoke Detection
	IV. Environmental Control (Temperature, Humidity etc.)
e)	The SDN controller shall support any of NETCONF, RESTCONF, YANG model data structure etc. and any other standard architecture accepted/ approved by ONF/ IETF.

f)	TMN shall support North bound/ XML/ SNMP/ Rest API or any other acceptable open standard interface and shall be ready to partake any information required by other vendors for ensuring the integration with other vendors' systems as well as operations support system (OSS). The north bound interface shall be compliant to Tele Management Forum (TMF 814) or any other internationally accepted standard for integration. The interface shall accommodate all required functionalities to implement OSS but not limited to the following:
	1. Real time forwarding and synchronization
	2. Provisioning of circuits
	3. Upload of network topology
	4. Monitoring of events for topology and circuit changes
	5. Alarm handling
g)	Bidder to provide viewing facility of NMS for monitoring the links delivered to customers(end user) and will provide 2 terminal to view the NMS topology and monitoring of online faults status.
h)	The details shall be finalized and discussed during detailed engineering. The supplied TMN with SDN Controller shall be capable of handling all management functions for at least 200% of the network elements as per original scope of work under this package, also the system shall be capable of handling the fully expanded equipment. The cost of license to meet these requirements shall be included in the network element cost. The TMN system shall be equipped to connect at least 10 local workstations at main control centre (DC), at least 10 local workstations at back-up control centre (DR).
i)	Work Station & Craft Terminals Specifications (Minimum Requirements): •Intel® Core™ Ultra 7 •Licensed MS Window with Anti-Virus provisioning & Microsoft office(Life time) •16 GB: 1 x 16 GB, DDR5, up to 5600 MT/s, non-ECC •Storage: 512GB SSD •23.8-inch Full HD LED monitor/ 14inch for Craft terminal •Ethernet 10/100 adapter with RJ-45 connector
7.5	General Operational and Functional Requirements
i	The TMN with SDN Controller shall be multi-user system and based on Graphical User Interface.
ii	It should be possible to have a view of selected sub-networks/rings controlled by the system as per requirement. By zooming-in, it shall be possible to drill down to module-level in each NE for configuration and fault management. The same shall be provided through user-friendly GUI commands.
iii	The management system shall provide the complete view of the network elements and the interconnecting links.
iv	The management system shall have the ability to include the network elements and the links in the visual/graphical map of the domain. The visual maps shall display the elements and the links in different colour depending upon the status of the links. For example, green colour for healthy and amber/yellow colour for degraded condition and red for unhealthy condition may be used.
v	It shall provide the ability to drill down to the individual element, then to subsystem, then to card and then to port level configuration template from the domain-map by clicking on the icon of the network element.
vi	It shall be possible to generate customized reports for various types of faults, performance history, security management etc. It shall be possible to generate reports at various client levels to facilitate monitoring of performance statistics in a pre-defined/ customized format. It shall be possible to generate and define the formats at any time, based on network needs.
vii	The system shall support correlation (filtering and suppression) to avoid multiple alarms from a single source of failure within the sub-network. Single Alarm shall be provided for the events that are correlated and are due to a common cause.
viii	It shall be possible to execute any schedulable administrative command i.e. NE backup, software download, performance, operator log-in/ log-out etc., at any time by attaching a time tag to the command and it shall be executed when the Network real time matches the time tag. It shall be possible to define both time and date. If no date is mentioned, the command shall be executed daily at the time mentioned.
ix	The response time for query/command on any operator terminal, local or remote shall be indicated by the vendor. For update on topological information on the terminals, the response time shall be indicated by the vendor. The response time shall be reviewed depending upon total NE load and topology by Employer during testing.
7.6	Management Function: The TMN with SDN Controller shall support and provide the following Management functions:
i	Configuration Management
ii	Fault Management
iii	Performance Management

iv	Security Management
v	Inventory Management
vi	Software Management
vii	Network planning
	The multi-layer Software Defined Networking (SDN) design concept, including its functional and informational architecture as well as its physical architecture, shall adhere to the guidelines established in ONF TR-521.
7.7	The Software Defined Network (SDN) Controller solution shall support standard Interfaces, such as OpenFlow/ Netconf/ Restconf/ Restful APIs/ YANG etc. The SDN controller shall provide all required interfaces for enabling integration with a third-party Orchestrator. SDN controller must support:
i	The proposed controller should support visualization, capacity planning, failure simulation and optimization along with Proactive alarms for potential degraded services of DWDM/ OADM/ROADM network.
ii	The Transport Controller shall support Multi-Tenants / Multi-User.
iii	It must support Fault, configuration, accounting, performance, and security (all FCAPS) operations along with intelligent software control, which drives automated lifecycle network operations for multi-layer optimization.
iv	System shall provide accurate and centralized view of the network and its resources, as deployed and as planned. It should discover and maintain a comprehensive network information model, including self-network elements, foreign lines and transponders
v	System shall be capable of providing Real-time capacity, utilization, and performance metrics to provide insights into network behavior and to drive optimized decisions for service assurance and capacity planning.
vi	Channel margin indicator by providing instant visibility into network efficiency with ability to turn up capacity on-demand as per requirement.
vii	Photonic performance indicator which can display health of optical restoration paths even when no wavelength is deployed on the path.
viii	System shall support Network Utilizations and trends by discovering capacity exhaustion, underused resources for optimize usage of network assets and visualize PMs to find predictive patterns with GUI and/or generate reports by proactively managing the network performance.
ix	System shall support network capacity view by assessing the remaining network capacity, it should show network trends by calculating network capacity of photonics routes and OMS links.
x	It shall support problem analysis by quickly identifying customer impacts and suppress consequential alarms on nodes/cards that are part of same photonic domain.
7.8	Data Communication Channel Requirement and Integration
i	Communication channel requirements & offered solution for TMN system / SDN Controller shall be in line with BoQ. The Contractor shall provide all required interface cards / devices, LAN, routers/bridges, channel routing, cabling, wiring etc. and interfacing required for TMN data transport for all the supplied equipment and transport of data shall be in protected configuration. Contract solution must have multiple, parallel communication pathways within a network to ensure data transmission continues even if one channel fails.
ii	Contractor DCN solution shall have the hardware and software for all the requested network in Technical Specifications and BoQ.
iii	The data transport network shall be designed with full protected configuration and with 100% hardware redundancy. The Data Communication Network shall be designed to ensure proper and effective use of encryption techniques/devices to protect confidentiality, authenticity and/integrity of information in line with DoT guidelines.
iv	The bidders shall optimise the use of communication channels for TMN. It is preferable that the capacity required for all sorts of communication needs be restricted to a 100 Mbps (or a part of it) throughout the network. The bidders shall use appropriate technology to achieve this. Wherever such communication network is implemented, one user data interface shall be reserved for use by Employer in future, the data rate shall be provided by the bidders in their proposal.
v	The bidders shall describe in the proposal the TMN data transport proposed to be used by the bidder in detail including capacity requirements and various components/equipment proposed to be used. The bidders shall also indicate the response times envisaged.
	Note: Bidder shall provide the complete Bill of Material (BoM) for TMN (Main & Back up and DCN) and unit prices of each of the items in the BoM.
8	Cost Compensation and Penalty
8.1	Equipment Racks

	Equipment Racks: Bidders are requested to offer Equipment with low footprint due to scarcity of space at Network Locations (Customer locations as well as PowerTel's PoP). PowerTel will have to incur additional expenditure in creating additional space Infrastructure at its PoPs or pay colocation charges at third party locations. Therefore, technical solution by bidders proposed with high number of Rack Units shall attract penalty. In order to compare various solutions offered by bidders, a cost compensation on per Rack basis shall be imposed during evaluation purpose. However, if the quantity of Rack is found higher than the quantity proposed in solution, penalty of equivalent amount shall be imposed and deducted from the supply payment of other items.
i	For the purpose of bid evaluation, a cost compensation by an amount of Rs 90,00,000 (Rupees Ninety Lakhs) per Rack shall be considered over and above the least no. of rack space considered in any bid. However, the said amount shall not be the part of the awarded contract value.
ii	If any additional Rack (than indicated in the bid) is required by the contractor during implementation to meet the technical specification, a penalty of Rs 90,00,000 (Rupees Ninty Lakhs) shall be imposed per additional Rack and shall be deducted from the running bills.
8.2	Additional Locations
i	Appendix C_BoQ, Nodes highlighted in yellow represent Add/Drop sites and are the only permissible locations for regeneration and equalization. No other nodes are allowed for these functions. For remaining sites bidder shall consider 2 directions sites as ILA and sites having more than 2 directions as ROADM sites without add-drop structure.
ii	Bidders are not allowed to propose any additional locations for installation of equipment's other than those specified in Appendix-C of TS.Bid shall be rejected in case any Bidder proposes additional locations other than those specified in Appendix-C_BoQ of Technical Specification. In case the Contractor, during implementation, proposes any additional locations (other than those indicated in Appendix-C_BoQ) to meet the technical solution, such additions shall attract a penalty of Rs. 1.50 Crore per location and shall be subject to Employer's acceptance. The applicable penalty shall be recovered from the Contractor's running bills.
8.3	Additional quantities
i	In case additional quantities, over and above the quantities estimated by the Contractor in BOM are required for successful completion of the scope of work as per Technical Specification, the contractor shall execute additional quantities of these items for which no additional payment shall be made over and above the lumpsum bid price (unless the scope of work is changed by the Employer).
9	ENVIRONMENT, EMI, POWER SUPPLY, CABLING AND EARTHING
9.1	The purpose of this section is to describe the minimum general equipment characteristics for telecommunication equipment and specifications for environmental conditions, source power conditioning and backup, equipment construction, and installation.
9.2	Environmental Requirements
	Equipment and its components provided under this specification shall operate reliably under the following environmental conditions.
	All Equipment Temperature and Humidity Requirement:
i	Operation meeting all Specifications : 5 to +40 degree C
ii	Operation without damage: -5 to +45 degree C
iii	Shipping/ storage: -5 to +50 degree C
iv	Relative Humidity, non-condensing: Up to 85%
v	Elevation: Operating to 3,000 m & Non-operating to 10,000 m
	Contractor is required to assess the environmental conditions for the equipment under this specification and offer Equipment/ Solution accordingly. The Contractor is responsible for supply of all necessary enclosure, rack or equipment upgrades to ensure the proper operation of the installed equipment.
9.3	Noise:
i	The offered equipment's Maximum acoustic noise emission levels for telecommunication equipment must be in accordance with ETSI 300 753, Acoustic noise emitted from telecommunication or equivalent Indian or International standard.
ii	Procedures for measuring and reporting the noise emission of offered telecommunications equipment must be as per ISO 7779-2010 or equivalent Indian or International standard.; (Measurement of airborne noise emitted by information technology and telecommunications equipment.
9.4	EMI and Electrostatic Interference
i	The emission, immunity and resistibility requirements for the offered equipment must be as per the latest MTCTE essential requirements.
9.5	Environmental
i	Offered Equipment must support QM-333 March 2010 latest release and amendments if any for environmental requirement or equivalent.
9.6	Mechanical
	The equipment offered must support the above-mentioned standards:

i	Vibration: 60068-2-6
ii	Shock: 60068-2-27
iii	Free Fall: 60068-2-32
iv	Bump Test: 60068-2-2
	Note: Type test for Environment and Mechanical Tests conducted as per equivalent Indian standards/ international standard shall also be acceptable.
10	Functional Tests
i	Functional Tests shall be required to be conducted on all types of Equipment offered under the tender. The comprehensive test plan will be finalized with the successful bidder during detailed engineering. The test plan under Functional Test shall cover all aspects of features and functions described in the tender document and requirement specified in BOQ. The Functional Test procedure for Equipment and TMN shall be finalized during detailed engineering.
11	Factory Acceptance Tests
i	Factory acceptance tests shall be conducted on randomly selected final assemblies of all equipment to be supplied. Factory acceptance testing shall be carried out on Equipment and associated subsystems.
ii	Equipment shall not be shipped to the Employer until required factory tests are completed satisfactorily, all variances are resolved, full test documentation has been delivered to the Employer, and the Employer has issued Material Inspection & Clearance Certificate (MICC). Successful completion of the factory tests and the Employer approval to ship, shall in no way constitute final acceptance of the system or any portion thereof. These tests shall be carried out in the presence of the Employer's authorized representatives.
iii	Telecom Equipment : Factory Acceptance Testing
a.	Physical inspection for conformance to drawings and appearance of equipment including verification of identification
b.	Optical output power
c.	Transmitter light wave spectral analysis
d.	Low receives level threshold
e.	Power module redundancy.
f.	Simulation of failure conditions and failover of each redundant unit.
g.	Random test/ inspections as per requirement
iv	From each Lot of equipment presented by the Contractor for Factory acceptance testing, the Employer shall select random sample(s) to be tested for acceptance. Unless otherwise agreed, all required FAT tests in the approved FAT procedures shall be performed on all samples. The Sampling rate for the Factory acceptance tests shall be 10% of the Lot size (minimum 1) for all items. In case any of the selected samples fail, the failed sample is rejected, an additional 20% sample shall be selected randomly and tested. In case any sample from the additional 20% also fails, the entire Lot may be rejected.
v	Since FAT testing provides a measure of assurance that the Quality Control objectives are being met during all phases of production, the Employer reserves the right to require the Contractor to investigate and report on the cause of FAT failures and to suspend further testing/ approvals until such a report is made and remedial actions taken, as applicable.
vi	In case of TMN of FAT, Physical inspection of the material shall be done and MICC will be issued.
12	Site Acceptance Tests for DWDM Equipment
	The SAT shall be completed in following phases:
12.1	Installation Testing (SAT-I):
	The field installation test shall be performed for all equipment at each location. If any equipment has been damaged or for any reason does not comply with this Specification, the Contractor shall provide and install replacement parts at its own cost and expense. The minimal installation testing requirements for the Equipment are provided below:
i	Physical Inspection for conformance to drawings, rack elevations and appearance of equipment and cabling.
ii	Taping/ connection of Equipment with Power Source
iii	Power ON of all modules
iv	Correct configuration, level setting & adjustments and termination of Input/ output interfaces
v	Proper establishment of Safety and signalling earthing system and resistance to ground to be checked.
vi	SAT-I of TMN will be part of SAT-III.

12.2	Link Commissioning Tests (SAT-II)
i	The commissioning tests verify that communication can be performed over the fiber optic link under test. During this test, BER Test, RFC2544, Y.1564, Switching test etc. shall be made on the fibre optic to verify compliance with designed link performance as per technical specifications mention in the tender. PowerTel reserves the right to include test(s) to check the performance of link(s) in field to its satisfaction or satisfy customer's expectations.
ii	The link shall be tested for 24 hours covering the equipment(s) under test. In case any link does not meet the performance requirements for 24 hours, then the cause of failure shall be investigated, and the test shall be repeated after rectifying the defects. The outages or errors resulting from faults in Fibre Optic Cabling system, or any other equipment not provided by the Contractor, shall not be included in the availability calculations. In case, a link is handed over to customer without conducting 'SAT-II' to meet urgent requirement of customer and the link is accepted by customer (Commercial acceptance by customer), 'SAT-II' for that link shall be deemed completed and no separate testing will be required for that link.
iii	This phase of testing shall be conducted by the Contractor and witnessed by the Employer. Field adjustments shall be made to meet established standards, however, if the field adjustments fail to correct the defects the equipment(s) may be returned to the Contractor for replacement at his own expense. In case any adjustments are required to be made during the interval of the test then the test shall be repeated.
iv	SAT-II not applicable on TMN.
12.3	Integrated Testing (SAT-III)
	The intent of integrated testing is to demonstrate that the equipment is operational end to end under actual conditions, that all variances identified during factory and field installation and communications testing have been corrected, and that the communication equipment is compatible with other equipment at all locations. The Integrated System Test shall include equipment and the network management system. At a minimum the following tests shall be included in the integrated testing:
i	Installation testing for TMN as per technical specifications (SAT-I of TMN).
ii	End to End testing of channel(s) from TMN systems to demonstrate proper operation of channels over the network. Operation shall be checked in terms of monitoring of BER, Packet loss, throughput, latency for Ethernet. End to End testing of services at 400G/100G/10G level.
iii	The number of channels to be tested, shall be decided by Employer.
iv	Testing of TMN to demonstrate proper operation of all functions: Configuration Management, Performance Management, Fault Management, Inventory Management, Software Management and Security management. All the standard features of the TMN including DCN network shall be demonstrated for proper functioning.
v	Demonstration of Protection switching, if any.
	<i>Note: SAT-III may not require to be done for every subsequent Lot, if already performed for earlier Lot.</i>
12.4	VAPT and its mitigation
	Contractor shall conduct network security audit for complete network including NOC elements through 3 rd party CERT-In (the Indian Computer Emergency Response Team) empanelled agencies after completion of SAT-III and before taking over the project by Employer. The network audit shall include VA-PT for all software(s)/ applications and shall be performed as per guidelines issued by GoI/ MoP/ DOT/ NCIIPC etc. The purpose of this audit is to assess the network vulnerability and implement corrective scheme to avoid unauthorized access or alien intrusion (broadly cyber-attacks).
12.4.1	Guidelines for VA-PT of the Network
	Guidelines of Work: VA-PT should cover the network to be deployed under subject package, which includes Telecom equipment (DWDM, NMS, DCN Hardware, Servers, Workstations, security devices etc.) Technical Audit will be conducted as below:
i	Technical Audit:
(a)	VA-PT: Selected bidder should perform vulnerability assessment and penetration testing through tools which can assess vulnerability in software(s), applications, servers, switches, firewalls, routers etc. and must fix all critical, major & minor vulnerabilities/findings before submission of final report. Network Hardening is the process of evaluating a network's security hardware, software, and processes and then implementing the corrective solution to strengthen them while ensuring that only necessary ports/interfaces/services are enabled in network and all other ports/ interfaces/ services are deactivated or blocked.
(b)	Following things are minimum required to be audited and best practices to be recommended:
	· Checking of Equipment configuration
	· Checking of Firewall, Router, Switch etc. configuration
	· Checking of Server configuration
(c)	Network Forensics
	· Logging and auditing of events to help in post event analysis
	· Login and logouts

	· Unsuccessful access attempts
	· Modifications
	· Object deletion
	· User creation
	· Sending syslog messages to the remote syslog server
	· Security of Log database
(d)	Any other condition/ standard asked by GoI/ MoP/ DoT guidelines, which have not been specifically mentioned in this document.
(e)	Contractor will fix vulnerabilities and gaps found during audit.
ii	Activities/ works are as below:
(a)	Preparation and presentation of approach, methodology, procedures etc. in document form: Prepare a document detailing complete approach, methodology procedures/ list of activities etc.
(b)	Conduct Security audit/ testing as per the guidelines. Evaluation & Submission of Reports of findings and discussions on the findings with PowerTel.
	· Detailing the Security Gaps
	· Addressing the security Gaps
(c)	Submission of Final report and acceptance of the same by PowerTel.
12.4.2	Deliverables:
	The deliverables for Network Security Audit are as follows:
(a)	Execution of Network Forensics, Network Hardening & Vulnerabilities assessments and Penetration Testing for the identified network devices, security devices, servers etc. as per the Scope mentioned in this contract and Analysis of the findings and guidance for resolution of the same
(b)	Audit Report: The Audit Report should contain the following:
	I. Identification of Auditee (Address & contact information)
	II. Dates and Locations of Audit
	III. Terms of reference
	IV. Standards followed
(c)	Summary of audit findings including identification tests, tools used, and results of tests performed including other details as mentioned below:
	I. Tools used and methodology employed
	II. Positive security aspects identified
	III. List of outdated Software & Hardware
	IV. List of vulnerabilities identified
	V. Description of vulnerability
	VI. Risk rating or severity of vulnerability
	VII. Category of Risk: Very High / High / Medium / Low
	VIII. Test cases used for assessing the vulnerabilities
	IX. Illustration of the test cases
	X. Applicable screenshots
	XI. Analysis of vulnerabilities and issues of concern
	XII. Recommendations for corrective action
	XIII. Personnel involved in the audit
	The Contractor/ Agency must disclose all information pertaining to the approach adopted by them and which they feel is relevant to the audit process or requisitioned by PowerTel. All the gaps, deficiencies, vulnerabilities observed shall be thoroughly discussed with respective PowerTel officials before finalization of the report.
	Detailed Scope of VA-PT shall be finalized post award of the contractor during the detailed engineering.
13	MQP & INSPECTION LEVEL REQUIREMENT

	Manufacturing Quality Plan (MQP): The Manufacturing Quality Plan (MQP) shall relate to the specific & objective manufacturing practices followed by manufacturer, right from procurement of raw material till final inspection & testing and shall be broadly subdivided as under:
	a) Raw material / bought out items and components.
	b) In process inspection and test/checks to establish successful completion/accomplishment of the process.
	c) Final test/checks in accordance with relevant national / international standards / specifications.
	The MQP shall also include process flow chart and list of component manufacturers.
	Inspection Levels: For implementation of projects in a time bound manner and to avoid any delay in deputation of PowerTel or its authorized representative, involvement of PowerTel for inspection of various items / equipment will be based on the level below:
	Level –I: Contractor must raise all inspection calls and review the report of tests carried out by the manufacturer, on his own, as per applicable standards / specification, and submit to concerned PowerTel inspection office. CIP / MICC will be issued by PowerTel based on review of test reports / certificates of manufacturers.
	Level – II: Contractor must raise all inspection calls and carry out the inspection on behalf of PowerTel on the proposed date of inspection. However, in case PowerTel wishes to associate itself during inspection, the same would be intimated to Contractor and CIP/MICC will be issued by PowerTel. Else, Contractor would submit their witnessed test report / certificates to PowerTel. CIP/MICC will be issued by PowerTel based on review of these test reports / certificates.
	Level – III: Contractor must raise inspection calls for both, stage (as applicable) & final inspection and carry out the stage inspections on behalf of PowerTel on the proposed date of inspection. However, in case PowerTel wishes to associate itself during stage inspection, the same would be intimated to Contractor and CIP will be issued by PowerTel. Else, Contractor would submit their witnessed test report / certificates of stage inspection after their own review and CIP will be issued by PowerTel based on review of these test reports / certificates. Final inspection will be carried out by PowerTel and CIP/MICC will be issued by PowerTel.
	Level – IV: PowerTel will carry out the inspection for both stage & final inspection and CIP/MICC will be issued by PowerTel.
	In the case of offshore supply items/equipment, the inspection & test plan (ITP) is to be submitted for PowerTel's approval.
	Equipment Cabinet : Inspection Level II
	DWDM Equipment : Inspection Level IV
	NMS (SDN Based)/ TMN : Inspection Level IV
	Contractor's onshore material which has been cleared for dispatch after inspection, will be dispatched within 30 days from the date of issuance of CIP and for offshore dispatch of inspected material to be done within 60 days of CIP. Material which is not dispatched within 30 days for onshore and 60 days for offshore will be reoffered for PowerTel inspection. All Test Reports and documents to be submitted in English during final inspection of equipment by PowerTel or as and when required for submission.
14	PROJECT MANAGEMENT, QUALITY ASSURANCE, TRAINING and DOCUMENTATION
14.1	The Contractor shall assign a Project Manager with the authority to make commitments and decisions that are binding on the Contractor. The Project Manager's responsibility shall include interface and coordination with the other Project Contractor(s) of Employer. The Employer will designate a Project Manager to coordinate all the Employer project activities.
14.2	Contractors shall maintain the storage location for equipment at four major cities Delhi (NCR), Bangalore, Kolkata and Mumbai.
14.3	The bidder is responsible to transport equipment within the city and outside city transportation will take care by PowerTel
14.4	The bidder shall store the equipment if required for maximum 3 months from the date of delivery date at storage location.
14.5	Project Schedule
i	The project schedule shall consist of an implementation schedule, a documentation schedule and a training schedule.
14.6	Implementation Schedule
i	The project schedule shall include all tasks to track overall direction and integration of the project from inception through completion. The actual progress made to date and the scheduled delivery date for the completed systems shall be closely monitored by both the Contractor and the Employer project managers. An overview and general assessment of all the Employer and Contractor activities and any progress or delays in these activities shall be regularly reported to the Employer in a clear and concise manner. Detailed implementation schedule is attached as Appendix-B .
14.7	Implementation Steps
	The basic implementation steps pertaining to the project are:
i	Design & parameterize the Telecom network, including implementation strategies.
ii	Subsystems design, manufacture, factory test, type test (if applicable) and functional test.
iii	Shipping, installation and field testing for the above.

iv	Site Acceptance testing
v	VAPT
14.8	Taking over Certificate (ToC)
(a)	Taking over Certificate (ToC) can be given after successful testing of the following:
i	SAT-I
ii	SAT-II
iii	SAT-III
iv	Vulnerability assessment & penetration testing (VAPT)
v	Implementation of Mitigation Plan post VAPT)
vi	MTCTE & Trusted portal certificate
(b)	Conditional Taking over Certificate (cToC)
i	Conditional Taking over Certificate can be given after completion of SAT-I, SAT-II, SAT-III.
ii	Commissioning of commercial traffic with error-free run of traffic for at least 48 hrs (subject to completion of SAT-III).
iii	The conditional ToC may be issued Lot wise, and Defect Liability Period (DLP) shall be effective from the subsequent month.
iv	In case of delay in Testing and commissioning of equipment beyond three(03) months from the date of delivery by Employer due to non-readiness of customer location, non-identification of customer locations, non-readiness of fiber connectivity, space constraint etc., equipment shall be taken over by Employer and conditional TOC for such Lot(s) will be issued to contractor on their request subjected to successful completion of SAT-III of previous LOTs. Final TOC shall only be given after completion of all necessary compliances as mentioned in para 14.8(a). The DLP period shall be extended in case of delay in mandatory compliances.
Note:	The contractor can perform VAPT during DLP period also, but the final ToC shall only be issued after implementation of mitigation plan & its acceptance by Employer. In case of delay in implementation of mitigation plan and/ or its acceptance by Employer, the DLP shall be extended for the respective Lot(s).
15	System Maintenance
15.1	During Defect Liability Period
	The one-year period commencing immediately after Taking over Certificate (ToC) or conditional Taking over Certificate (ToC) is called the Defect Liability Period. The contractor shall maintain the Network as per the conditions specified for AMC.
15.2	AMC Services after Defect Liability Period
	AMC for Nine (09) years shall be provided by the contractor as per the conditions specified in Clause 17 .
15.3	Payment for Maintenance Services support during and after defect liability period due to quantity variation
i	If there is change (Increase or decrease) in quantity of items during execution of the project as per specified quantity variation limit in the contract, the payment for maintenance services shall be done on pro-rata basis of the total supply price of final quantities.
ii	For Example:
	Let's assume Total Supply price quoted by contractor is 'X' and AMC Price for each year is quoted as 'Y' in the bid.
	The Final supply price after execution of project comes out to 'Z', then the AMC price for each year will be (Y/X)*Z.
	Where 'Z' can be greater/ less than 'X'.
	DLP prices will also be calculated in same way.
16	Document Approval Procedure
16.1	The documents submitted by the Contractor shall be reviewed by the Employer within the practicable duration and shall be modified by the Contractor if any modifications and/or corrections are required by the Employer in compliance with the Specifications. The Contractor shall incorporate such modifications and/or corrections and submit the final documents for approval. Any delays arising out of the failure by the Contractor to rectify the documents in good time shall not alter the contract completions date.
16.2	The documents submitted for approval to the Employer shall be approved with one of the categories as listed below:
i	Cat I: Approved/Released for implementation.

ii	Cat II: Approved/Released for implementation subject to incorporation of comments. Revised drawing required.
iii	Cat III: To be resubmitted for approval after incorporating comments.
iv	Cat IV: For information and record.
16.3	The approval of the document conveyed vide above marked copy shall neither relieve the Contractor of its contractual obligations and its responsibilities towards qualities, design details, assembly fits, performance particulars and conformity of supplies with the Indian Statutory Laws as may be applicable, nor shall it limit Employer's right under the contract.
16.4	Depending upon the category of approval the Contractor shall resubmit the documents for review by Employer after incorporating all corrections.
16.5	Further work by the Contractor shall be strictly in accordance with the Cat-I, Cat-II or Cat-IV approved drawings and no deviation shall be permitted without the written approval of the Employer.
16.6	All manufacturing and fabrication work in connection with the equipment/material prior to the approval of the drawings shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment/material conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Employer. Approval of Contractor's drawing or work by the Employer shall not relieve the Contractor of any of his responsibilities and liabilities under the Contract.
17	Annual Maintenance Services (AMC)
i	This section defines the terms and conditions for maintenance services support during and after defect liability period for all the Equipment including Telecommunication Management Network (TMN), other Hardware & Software, etc. being supplied under this contract.
ii	The scope of work under maintenance services includes management & assisted operations, support services, preventive maintenance and breakdown/ curative maintenance including spare management, repair/ replacement of all the equipment/ modules/ cards and other hardware & software etc. being supplied under this Package. The Bidder shall provide software updates for all supplied equipment complying with NCCS guidelines during the AMC, as applicable.
iii	Minimum percentage of DLP(1 year) and AMC(9 year) is fixed, however bidder can quote higher if required.
iv	Defect Liability Period (01 Year): It covers all the material supplied under the project.
v	AMC (09 Years): Equipment for BackBone& Metro network, Pluggable, Cabinet,TMN System,Client Workstations with Client NMS License , Craft Terminal
vi	AMC (05 Years): Test Equipments
vii	The maximum duration of AMC after DLP will be 9 years for 1 st Lot of Equipment and the duration of AMC of subsequent Lots will be aligned with last date of AMC of 1 st Lot. In this way, the AMC of all Lots will end simultaneously, and contractor will have clear visibility of definite duration w.r.t. support of Equipment/ System to be supplied for the project.
viii	If acceptance has been given LOT wise, the DLP of each LOT will end at a different time. Consequently, the date of start and date of AMC of such LOT will also differ.
ix	The maintenance services shall be carried out during the Defect Liability Period and shall be continued for a minimum period of Nine (9) more years after the end of the defect liability period.
17.1	Philosophy of Maintenance services
	The underlying philosophy of the maintenance services is to maintain the telecom operations running under all conditions with timely and prompt attendance to faults to maintain the performance cum availability of the Network as defined in clause 17 of this specification.
	The Telecom Network may generally be operated by the Employer, with its main NOC (DC) at Katwarai Sarai, New Delhi and/ or back up NOC (DR) at Bangalore. Other regional offices at Delhi, Mumbai, Kolkata, Guwahati/ Shillong or any other office in India can also be used for operations of Network, if required.
	First level of network monitoring shall be carried out by the contractor. Once the problem(s) is observed/occurred, they will perform all the necessary actions to meet the performance parameters. This shall include but not limited to the following:
i	Contractor shall be responsible for supporting Operation and Maintenance of the telecom systems including TMN being supplied under this contract to ensure the network performance cum availability as per clause 17 of this specification during the contract.
ii	Contractor must assign a Service Manager/ coordinator, who shall be responsible for overall coordination among all the support engineers deployed (as per BoQ) under this contract and shall also oversee all the technical issues. In case the coordinator is not available for any reason, alternate competent person shall be arranged by the Contractor who shall act as single point of contact and solely responsible for all necessary coordination during his absence.
iii	Support functions shall primarily be implemented from the Employer's Control Centres located at Katwaria Sarai (New Delhi) and (New Delhi) or any other additional locations along the Employer's Telecom Network as deemed necessary by Employer.

iv	There is scope for Manpower Support in BoQ for deployment during DLP & AMC. The primary responsibility of the manpower is to assist PowerTel in the Operation of Network as per the requirement. On the instructions of Employer, contractor shall deploy qualified and well-trained Engineers (Indian Citizens from OEM) with minimum three (3) years' experience in the relevant field for 24x7 shift operations at Employer's control centres by Employer in the following manner as per the BoQ. The Technical manpower support is planned for operational support of Network and shall be placed at NTCC/ RTCCs for timely resolution of technical issues. The locations & quantity of Manpower is tentative and shall be finalized during DLP/ AMC as per size of operational Network & requirement. The Manpower is proposed as below:																									
	<table><tr><th rowspan="2">Location</th><th colspan="2">Number of Operation</th></tr><tr><th>24x7 Shift* Operation</th><th>Day Operation</th></tr><tr><td>NTCC (DC)</td><td>2</td><td>1</td></tr><tr><td>SRTCC (DR)</td><td>1</td><td>1</td></tr><tr><td>ERTCC</td><td>-</td><td>1</td></tr><tr><td>NRTCC</td><td>-</td><td>1</td></tr><tr><td>WRTCC</td><td>-</td><td>1</td></tr><tr><td>Total</td><td>3</td><td>5</td></tr></table>			Location	Number of Operation		24x7 Shift* Operation	Day Operation	NTCC (DC)	2	1	SRTCC (DR)	1	1	ERTCC	-	1	NRTCC	-	1	WRTCC	-	1	Total	3	5
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	Total	3	5																							
<i>*Four (04) Engineers are required per '24x7 Shift Operation'.</i>																										
a) 'Manpower support' in BoQ has been asked in the unit of 'Month', which means deployment of adequate no's of Engineer(s) to run the 24x7 Shift operation, for one (01) month such that at least one (01) of Engineer shall always be available round the clock during 24x7 Shift Operation. So, <u>four (04) no of Engineers are necessary to run 24x7 Shift Operation to ensure availability of at least one (01) Engineer round the clock, so one (01) Month of '24x7 Shift Operation' is equal to deployment of four (04) Engineers for one (01) month.</u>																										
b) The Contractor shall submit escalation procedure/ personnel contact details for reporting problems till its resolution.																										
c) The Contractor shall keep a strict check on the attendance of their support/ maintenance engineers at Employer's control centre to ensure their presence. The records shall be made available to the Employer on demand.																										
d) The Contractor shall make alternate arrangements when their support/ maintenance engineers fall sick or proceed on leave, except for short duration during emergencies, however no shift shall be left vacant. However, the absence of their Engineers at any of the locations shall not relieve the Contractor to meet the required performance parameters stipulated under these specifications.																										
e) Contractor shall submit CVs of the proposed maintenance engineers for deployment at network control centers, clearly stating their qualifications, experience and competency including courses successfully completed in the relevant fields separately to the Employer's Operation's team for review & approval, well before deployment. The Contractor is required to replace their engineers immediately whenever the same is requested by the Employer on the grounds of their performance and/ or behaviour during execution of duties etc.																										
v	The support functions shall include but are not limited to the following:																									
	a) Network Operations & Management Activities – Assistance in Operations and management of all supplied equipment covering all the hardware and software, Performance Management, Security Management, Configuration Management, Faults Management, Inventory Management and integrated operations of the network including TMN.																									
	b) Handling of all the minor, major and critical problems of network, their repair and restoration.																									
	c) Assist the Employer's personnel in managing service orders, provisioning of the customer circuits, testing coordination etc.																									
	d) Assistance in System Applications Administration including associated software & hardware infrastructure at DC & DR																									
	e) Assistance in Database Administration.																									
	f) Assistance in planning of the network including simulation, necessitated due to either of the reason – network growth, change in protection scheme or provision of additional protection etc.																									
	g) Assistance in commissioning of the equipment for activation of services, including assistance in commissioning of the equipment at customer premises.																									
	h) Submission of Performance and other network related reports to the Employer.																									
	i) Transport Network related advice & consultancy Services																									
	j) Technical assistance/support of the network including 24x7 remote assistance, On-line Assistance, On-site Support etc.																									
	k) Network audit.																									
	l) Routine and planned maintenance activities of TMN system.																									
	m) Monthly preventive maintenance activities from network DC/ DR with status reviews and reports.																									
	n) Interface between Employer, Employers' customers, Tier-2 support, Tier-3 support centers of the Original Equipment Manufacturer to resolve the issues.																									
	o) All other functions & activities required to be undertaken for successful operations of the network and meeting the performance parameters as stipulated in clause of this contract.																									
	p) Fixing of vulnerabilities shared by employer based on internal & external audits.																									

	q) The Contractor shall do the regular monitoring of network alarms on 24x7 basis and shall take prompt action upon noticing any defect/fault in the system and restore it back to normal with minimal delay.
	r) The contractor shall arrange appropriate tester for testing of links, whenever the requirement arises and escalated by PowerTel, within 72hours. The Tester has all necessary functions to test the services, as planned to be commissioned under this package.
	s) The Contractor shall supply and install the new Software Releases, Software Updates and/or Service Packs for TMN and latest versions of Embedded Software for the electronic cards/ equipment etc. as generally made available by the Contractor/ OEMs from time to time during the entire period of this maintenance services. In case any Software upgrade/update requires hardware upgrade then the same will implemented by the Contractor without any additional cost implication to PowerTel. The updates shall be installed only after they have been duly verified and tested in the lab against crashes. The installation of new releases shall not hamper the functioning of the operational network.
	t) Contractor shall upgrade the Operating System (OS) of all the Workstations supplied under the package. In case, the OEM discontinues support on the OS version of the Workstations supplied to PowerTel during the AMC period, contractor shall replace all such Workstations with new Workstations with latest Operating system. If there is no such situation of support discontinuation of Operating System arises during the contract, Contractor may be asked to replace all Workstations after five (5) years (from the date of delivery) with new ones with latest Hardware & Software. PowerTel shall pay the Unit Price of Workstations as per the price quoted by the contractor in its bid, for replacement.
	u) Contractor shall upgrade the Operating System (OS) of all the servers supplied under the package. In case, the OEM discontinues support on the OS version of the Servers supplied to PowerTel during the AMC period, contractor must replace all such Servers with new Servers with latest Operating system. The applications running on over the servers shall also be upgraded/ updated such that it works without any issue in the new OS environment. If there is no such situation of support discontinuation of Server OS arises during the contract, Contractor may be asked to replace all Servers with new ones with latest Hardware & Software, during the 5th year of AMC or as desired by PowerTel. PowerTel shall pay the Unit Price of Servers as per the price quoted by the contractor in its bid, for replacement.
	v) The Contractor shall annually perform Network audit of the telecom network (Date/ time shall be finalized in consultation to Employer) and the report shall be submitted to the Employer within fifteen (15) days. The network audit shall include but are not limited to the following:
	1. Performance audit
	2. DCN Design Audit
	3. Hardware Resource Utilization for Optimum utilization of the resources of the installed telecom equipment
	w) The Contractor shall also ensure the availability of the round-the clock national/ international help desk services of Tier-2 & Tier-3 to resolve the problems, if need be. The Escalation Matrix to be shared at the time of TOC of first LOT.
vi	During the AMC, First level of network management and maintenance shall be carried out by the Employer. Once the problem(s) is escalated to the contractor's maintenance engineers, they will perform all the maintenance activities so as to meet the performance parameters.
17.3	Performance Requirement
	a) Under this maintenance services, the Contractor is expected to meet certain performance criteria against which their services shall be measured and failure to meet the same will attract penalties. The Contractor will maintain his own maintenance spares and other adequate resources at strategic locations to meet the performance criteria. All other expenses of the field engineers, (i.e. accommodation, tours and travel, per diem etc.), inventory of spares and services shall be included in the bid price. The Contractor shall meet the following performance criteria under the maintenance services agreement of this contract:
	i). Annual Failure Rate (%)
	i. The Annual Failure Rate (%) is defined as below:
	$\text{Annual Failure Rate (\%)} = \frac{\text{No. of Failure of Equipment / Modules from a Lot in a year}}{\text{Total No. of Equipment / Modules in the Lot}}$
	ii. All modules except patch cords shall be considered while calculating Annual Failure Rate. The Annual Failure Rate (%) shall be less than 1%, else penalty will be levied as specified at clause 17.
	iii. The Contractor shall maintain the log register at DC, wherein, Failure incident details along with corrective action details shall be filled by contractor's engineer on daily basis.
	ii). Advance Replacement of Faulty Equipment/ modules

	i. The contractor shall provide the advance replacement of faulty equipment/ module etc. after formal intimation by PowerTel (whenever equipment/module declared faulty by NOC team deployed by contractor) via Email/ Letter/ Message (over SMS, WhatsApp etc.)
	ii. The advance replacement will be shipped by contractor such that it shall reach the PowerTel preferable location within 72 hours. In case of failure in delivery of advance Replacement Equipment/ Module to site within 72 Hours, the penalty shall be levied as per clause 17
	iii. Total time shall be calculated from formal intimation by PowerTel to the delivery of advance replacement of healthy Equipment/ module (occurrence of fault). The time shall be calculated irrespective of day/night, weekends, holidays etc.
	b) The existence of protection paths or other network management sites shall neither be treated as restoration/ rectification of the fault by the Contractor, nor shall it relieve the contractor to meet the performance parameters of this specifications.
	c) All other faults that lead to system's inability to perform Network data Communication transmission, corruption of system data bases, DCN failure, trouble notification, loss of Access to the system, performance as per required performance parameters or any other faults/ criticalities that affect the operations & maintenance activities, management of the network etc. shall also be handled with utmost urgency regardless of time of day or day of the week. These faults will not be taken into consideration while calculating Annual Failure Rate. Decision of PowerTel NOC (DC) shall be final while exclusion of fault from the calculation of Annual Failure Rate. The solution/ advance replacement of such modules (causing issues above) shall be provided within 7 days from the time of intimation.
	d) The incident reports will also be generated upon notice of any fault in the network, NMS affected, planned outage of equipment, facilities availed for testing, preventive maintenance, system expansion etc.
	e) Following points shall be excluded for calculation of outage/degradation of links:
	i. Outage/degradation not attributable to equipment faults like fibre outage/degradation, DC power supply failure.
	ii. Time taken for testing of the link(s) on complaint of the customer. Link shall be considered okay only if the test is successful. In case of failure of testing, the outage shall be attributed to the Contractor.
	iii. Outage due to force majeure like floods, storms, curfew, imposition of emergency etc.
17.4	Spares Management for advance replacement
i	Contractor shall maintain its own inventory of requisite no. of all types of spares distributed/ centralized locations required for meeting the network availability requirements as stipulated in clause of these specifications, otherwise penalty shall be imposed as per clause 17. Contractor must share location wise list of spares along with Maintenance Philosophy.
ii	The contractor shall submit a location-wise list of spare items being maintained by them, indicating the total number of such items required to meet the performance criteria as stipulated in clause under these specifications. However, the minimum requirement list does not absolve the contractor in meeting performance requirement under this maintenance services agreement due to non-availability of spares. The contractor shall on its own increase the spare items above the minimum list, if the situation demands so, to meet the performance parameters.
iii	Contractor shall undertake appropriate planning for the storage of spares at strategic locations/ store depots along the Employer's network to meet the performance criteria. It shall be the sole responsibility of the Contractor to ensure storage and logistics support for spares necessary for meeting the performance requirements. Contractor is advised to select storage locations (Region/ state wise), considering the tax liability arises during inter-state transportation of spares (during DLP and AMC). All such tax liabilities shall be borne by the contractor. PowerTel may allow storage of spares at its locations free of cost on the request of contractor, subject to availability of space. However, the contractor is responsible for the insurance, movement, reconciliation, and replenishment without any financial implication to PowerTel.
iv	Transportation of spares (during DLP and AMC) shall be the responsibility of the contractor. The contractor must take necessary & sufficient transit insurance for spares to safeguard the spare assets from any unfortunate incident during transportation. Any tax (including GST) levied on the transportation of spares shall be borne by the contractor.
17.5	Penalty Clause
a)	Penalty for delay in Advance Replacement

i	Penalty shall be levied for each of the incident of delay in delivery of advance replacement. Any delay beyond the stipulated time as mentioned in clause 17 shall attract a penalty of Rs. 5000/- @ per hour for up to 4 hours and Rs. 10000/- @ per hour from the 5 th hour, subject to maximum penalty of Rs. 500,000/- per incident per month.
b)	Penalty for Failure of Equipment/ Modules etc.
i	In case the Annual Failure Rate of Equipment (for which advance replacement asked by PowerTel) falls short of stipulated criteria, penalty shall be levied on the Contractor as per following:
	Annual Failure Rate (%) Penalty
	< 1% ---- No Penalty
	< 2% & >1% ----10% penalty of AMC cost of Lot
	< 3% & >2% ----15% penalty of AMC cost of Lot
	< 4% & >3% ----20% penalty of AMC cost of Lot
	< 5% & >4% ----25% penalty of AMC cost of Lot
	> 5% ----50% penalty of AMC cost of Lot
	Note: Annual failure rate will be calculated in the last quarter (for complete Year) as above. After ToC of all Lots, the Annual Failure Rate will be calculated considering all the Equipment together, instead of Lot wise.
c)	Other Penalties
i	Penalty for not deploying/ non-availability (absence/leaves without replacement for more than three days) of manpower resources at the indicated locations, whenever requested by PowerTel, shall attract penalty of Rs. 10,000/- per day (beyond 3 days, in case of emergency) per shift/manpower, subject to maximum penalty of Rs. 100,000/- per month per manpower.
ii	Any issues related with Unavailability of NMS, DCN Failure, Database corruption etc. shall be attended by technical experts within 6 Hours, after intimation from PowerTel's NoC. In case of delay in attention by contractor, penalty may be levied @ Rs. 5000/- per hour for up to 4 hours and Rs. 10,000/- @ per hour from the 5 th hour, subject to maximum penalty of Rs. 500,000/- per incident per month. PowerTel's NOC In-charge reserve the right to relax the condition and provide additional time to contractor to resolve the issue, on case-to-case basis.
iii	Switching of NMS from DC to DR must be in line to RTO (Recovery Time Objective) defined in relevant paras of TS failing which a penalty of Rs.50,000/- per hour subject to limit of Rs.5,00,000/- per month per case shall be applicable.
17.6	Advance Replacement
i	It is the responsibility of Contractor to arrange advance replacement of the Equipment/ Module etc., if it goes faulty/ malfunction. All the Equipment supplied under the contract shall be covered. Contractor must intimate the address and the contact detail of the concern person/ department at their repair centre to Employer for shipping of faulty modules for repair.
ii	Once an equipment/module etc. is being found malfunctioning (affecting traffic or may lead to outage) & declared faulty by Contractor's Support team at NOC, it will be removed from the network.
iii	Contractor support team shall generate a docket no. for the repair of the module, guide PowerTel site engineer for shipping of the faulty module to Contractor's/ OEM's repair facility.
iv	PowerTel shall send the faulty module to Contractor's/ OEM's repair centre for repair with necessary documents.
v	The contractor shall ship the advance replacement of faulty equipment/module etc. after formal intimation by PowerTel via Email/Letter to Contractor and it shall reach the PowerTel preferable location within 72 hours from the time of declaration of equipment / module etc as faulty by Contractor / OEM.
18	SECURITY REQUIREMENTS
18.1	Introduction
	This section outlines the cyber security requirements for the entire system/equipment being procured, including various applications, operating systems, and networking devices such as firewalls, Servers, routers, and switches etc.. It also specifies the functional and operational requirements for the cyber security components and sub-systems. The system's security features must comply with: •NCIIPC guidelines for Critical Infrastructure Protection •ISO 27001 and ISO 27019 standards •IEC/ISO 15408 •Any additional requirements mentioned in this document:
	The Contractor is required to enter into legal agreement with Employer for security and access to Employer's network as per latest DoT guidelines (agreement format enclosed at Appendix-A) which shall also inter-alia include the following clauses:

18.2	General Security Requirements:
1	All contemporary security related features and the features related to communication security as prescribed under relevant security standards shall be included in the equipment and tested before supply and shall be implemented into the network.
2	Contractor has to furnish complete information about the Supply Chain/ Vendor and ensure the trustworthiness of their components/ sub-system before using them for designing & manufacturing of the equipment to be supplied under subject package. PowerTel or any government authority reserves the right of inspection of their vendors.
3	Contractor & its OEM shall support and resolve in case of any vulnerabilities and security gaps appeared in the supplied products/services or solution during DLP & AMC.
4	Contractor shall ensure the lifecycle of all software to be supplied under the package and replace/ update all End of life (EoL) & End of support (EoS) products during DLP & AMC without any financial implication to PowerTel.
5	Rigorous controls must be imposed through proper authorization by contractors (or their authorized representatives/ OEMs) during implementation of project and service (DLP & AMC) while accessing PowerTel facility and equipment/ system.
6	The Network to be designed and implemented, meeting all the security guidelines of DoT/ MoP/ CERT-Telecom/ CERT-In/ GoI etc.
7	The Contractor shall allow the Employer, DoT and/or its designated agencies to inspect the hardware, software, design, development, manufacturing facility and supply chain and subject all software to a security/threat check any time during the supplies of equipment. The number of such visits will be limited to two in a Purchase Order.
8	All foreign personnel likely to be deployed by the Contractor for installation, operation and maintenance of the Employer's network shall be security cleared by the Government of India prior to their deployment. The security clearance will be obtained from the Ministry of Home Affairs, Government of India.
9	The Contractor shall ensure protection of privacy of communication network and ensure that unauthorized interception does not take place in the network.
10	The Contractor shall:
i	Ensure that all the documentation, including software details provided to Employer are in English Language.
ii	Keep a record of all the Operation and Maintenance command logs for a period of 12 months in online mode and for the next 24 months in offline mode.
iii	Keep a record of all the software updating and changes in the system. The major updating and changes should be informed to Employer week before of commencement of such updating and changes.
iv	Keep a record of supply chain of the products component wise for hardware & software.
11	The directive(s) issued by GoI/ DoT etc on Network security shall be applicable. Accordingly, all the conditions specified under Unified Service License (UL) (earlier National Long Distance (NLD) Service License) Agreement for Network Security in Telecom Services issued vide Department of Telecommunication, letter no. 10-54/2010-CS-III (NLD) dated: 31.05.2011, shall be complied by the Contractor. The Contractor shall have to enter into an agreement with PowerTel as per the DoT template covering all the Equipment, Hardware, Software, services etc.
12	Copy of all test result & certificates for applicable security related certifications (From Common criteria Lab or any other authorized certified agencies) as per DoT Guideline (DoT letter ref: 10-54/2010-CS-III (NLD) dated 31.05.2011) to be submitted by the contractor.
13	The Contractor shall ensure that the equipment/ services/ software that they supply are 'Safe to Connect' in the network, have been checked thoroughly for risks and vulnerabilities, all addressable vulnerabilities have been addressed, non-addressable vulnerabilities have been listed with remedial measures and precautions provided.
14	In addition to the above all security related requirements as amended by DoT on time-to-time basis in future also, shall be followed/ complied & implemented by Contractor at no additional cost to Employer.
15	All the supplied Application software's and Operating systems shall be field tested and all the offered equipment's shall be certified for EAL-2 or above/ NDPP (as applicable) under Common Criteria program for security related functions.
16	Contractor to sign NDAs (Non-Disclosure Agreement) with employer format attached at Appendix-F and undertake commitment to provide malware free software and patches for Software upgrades. Contractor to sign NDA with respective OEM wherever applicable.
18.3	Regulatory Requirements:
i	Supplied Equipment's shall be manufactured in accordance with the international quality standards ISO 9001:2008 or equivalent Indian Standards for which the manufacturer shall be duly accredited.
ii	Supplied Equipment shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards or equivalent Indian Standards for Safety requirements of Information Technology Equipment
18.4	Remote Support:

a	The Remote Access (RA) to network would be provided only to approved locations abroad through approved location(s) in India. The approval for location(s) would be given by the DoT after satisfying itself about the appropriateness.
b	The necessary logging provisions for remote access for TAC support shall be deployed and provision for storage of such logs/ audit trail shall be kept at least for 1(One) year. The necessary hardware, software & license for at least 10(Ten) concurrent users shall be supplied without any additional price implication to PowerTel. Remote logging shall include following but not limited to below:
	i.Record of key stroke during remote access period
	ii.Record of screen display for remote access period
	iii Record of user access and activity logs.
c	In case, the contractor is upgrading the existing Remote Access Server Solution to address the current requirement, the same shall be integrated suitably covering all equipment's/ EMS/NMS supplied under this project.
18.5	Security during AMC period:
i	The contractor shall ensure security when any part of supplied items are given for repair, the replacement and redeployment after repair shall be thoroughly checked for any software and hardware vulnerabilities in test environment. The Contractor shall issue a certificate in this regard.
18.6	System Security & Audit:
1	The Contractor shall have contemporary relevant Security standard certification and shall comply with the provisions of security standards certification with respect to Telecom & IT software and those related to information & communication security management, 3GPP or 3GPP2 security standards for Telecom related elements, ISO/IEC 15408 standards for IT related elements, ISO 27000 series for Information Security Management System. OEM /vendor should submit above mentioned related certificate for compliance to this clause.
2	Contractor shall conduct network security audit for complete network including NOC through CERT-In (the Indian Computer Emergency Response Team) empanelled parties after completion of SAT-III and before taking over the project by Employer. If the bidder itself is a CERT empanelled vendor, it still can't perform the audit by itself. The network audit shall be performed as per guidelines issued by GoI/ MoP/ DOT etc. The purpose of this audit is to assess the network vulnerability and implement corrective schemes to avoid unauthorized access or alien intrusion (broadly cyber-attacks).
18.7	Cyber Security Problem/ Defect Reporting
1	Severity-1 (Critical):
	Complete NMS failure (DC & DR), severe DCN instability, loss or failure of any major subsystem or system component such as to cause a significant adverse impact to Telecom Network availability, performance, or operational capability due Cyber Security failure. Any intrusion in the Network due non-implementation in security conditions/ Policy defined in the contract.
2	Severity-2 (Major):
	The support services not defined under Severity-1 are included under this category. Failure of a Server/ Router/ Switch/ Firewall etc, Password Management System, Patch Management System, Database Sync failure etc. are included in this category. Coverage under this severity would be outages that do not immediately cause disturbance in the Network but subsequently could result into Severity-1 category outage, loss of an important subsystem that may affect the day-to-day works and loss of data. Failure of any redundant system component affecting the critical redundancy would also be included in this category. Following Activities shall also be treated as Severity Level 2: - •Database display activity beyond the stipulated time line •Non –submission of Audit compliance report. •Non-deployment of patches within the stipulated timeline. •Non-completion of recommendation given by OEM during Preventive maintenance Activity
3	Severity-3 (Minor)
	Any other system defect, failure, unexpected operation etc due to any Cyber-attack/ event. The incidents included under this category are when the outage or loss of functionality is neither of an emergency nor priority functionalities as indicated in severity level 1 or 2 above.
18.8	Response and Resolution Time

	This section describes the target times within which the contractor should respond to support requests for each category of severity during Cyber Security incidents. The Initial Response Time is defined as the period between the initial receipt of the support request (through approved communications channels) and the acknowledgment of the contractor. The Action Resolution Time is the period between the initial response and the contractor delivering a solution. This period includes investigation time and consideration of alternative courses of action to remedy the situation. The Action is defined as a direct solution or a workaround. Emergency Support Response/ Resolution Time:																							
	<table><tr><th>Severity Level</th><th>Initial Response* Time</th><th>Action Resolution Time**</th><th>Action</th></tr><tr><td>1</td><td>30 minutes</td><td>1 hour</td><td>An urgent or emergency requiring continuous attention from necessary support staff until system operation is restored – may be by workaround.</td></tr><tr><td>2</td><td>6 hours</td><td>12 Hours</td><td>Attempt to find a solution acceptable to Owner/ Employer (dependent on reproducibility), as quickly as practical or may be by workaround.</td></tr><tr><td>3</td><td>1 days</td><td>5 days</td><td>Evaluation and action plan. Resolution time is dependent on reproducibility, ability to gather data, and Owner/ Employer's prioritisation. Resolution may be by workaround.</td></tr><tr><td></td><td></td><td></td><td></td></tr></table> <i>*Maximum Time **Relaxation can be provided by Operations on case-to-case basis.</i>				Severity Level	Initial Response* Time	Action Resolution Time**	Action	1	30 minutes	1 hour	An urgent or emergency requiring continuous attention from necessary support staff until system operation is restored – may be by workaround.	2	6 hours	12 Hours	Attempt to find a solution acceptable to Owner/ Employer (dependent on reproducibility), as quickly as practical or may be by workaround.	3	1 days	5 days	Evaluation and action plan. Resolution time is dependent on reproducibility, ability to gather data, and Owner/ Employer's prioritisation. Resolution may be by workaround.				
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18.9	Penalty towards failure in Response & Resolution																							
1	It is the endeavour of both the contractor and Owner to minimize any threat to the Telecom Network Infrastructure arises due to lapse in Cyber Security to the extent possible. The contractor shall provide guaranteed compliances for various types of Severity levels as specified in section above.																							
2	NTCC shall maintain full details of each outages, actions taken by Owner to correct the problem, applicable Severity level, time of reporting to the contractor support engineer/ support centers pursuant to the appropriate methods in the Agreement, allowed Response time as per the Response times defined in above section, actual Resolution time, and signature of Engineer-in-charge as well as the contractor's support engineer of the site.																							
3	Duration of outages over and above the Action Resolution time in each of the Severity levels shall be counted for the penalty. The resolution may be accomplished by a work around, and such solution shall mark the end of penalty, subject to acceptance by NTCC.																							
4	In the event of multiple disturbance/ events, due to a common cause, the first FPR (Field Problem, Report) logged shall be used for the purpose of penalty calculation. However, simultaneous multiple outages due to unrelated cause would be counted separately.																							
5	Penalty due improper Security Policy(in line to clause 18)																							
	Any cyber security event recorded due to improper implementation of policy, change in policy without approval, opening of ports etc shall attract penalty irrespective of any loss to Employer. Penalty of Rs 1,00,000/- per incident shall be levied.																							
6	Penalty due to delay in resolution																							
	Delay in time resolution of incidents within the stipulated timelines specified above shall attract penalty as below:																							
	Severity Level 1:																							
	Rs. 10,000/- per hour beyond the resolution time: Subject to Rs 10 Lakhs per incident. Any relaxation subject to approval of Engineer in-Charge at NTCC																							
	Severity Level 2:																							
	Rs. 5,000/- per hour beyond the resolution time: Subject to Rs 2 Lakhs per incident. Any relaxation subject to approval of Engineer in-Charge at NTCC																							
	Severity Level 3:																							
	Rs. 10,000/- per Day beyond the resolution time: Subject to Rs 1 Lakh per incident. Any relaxation subject to approval of Engineer in-Charge at NTCC																							

	Unavailability of customer links arises due to Cyber Security event shall be calculated as specified at Clause 17 of TS.
18.10	Contractor's Obligations
	The contractor shall guarantee negligible incidents due to Cyber Security lapses during the defect liability period and AMC. During this period, the contractor shall take proactive actions to ensure 100% compliance with the security conditions specified in the Contract. Contractor (OEM) may also suggest changes/ modifications in the Security policy for strengthening of Telecom Network.
18.11	Reports and Documentation:
	The contractor shall submit the final report for approval of findings by incorporating the changes/ details advised by PowerTel.
19	Testing Equipmenmt
19.1	Ethernet tester shall support DWDM, OTN, and Ethernet testing, making it suitable for metro and backbone deployments. It shall support 400G transport testing, ensuring readiness for next-generation backbone networks.
19.2	The 400G Ethernet Tester shall be a modular platform with field-replaceable 400G & 100G interface modules & shall support coherent optical transceivers, including 100G ZR and 100G ZR+ pluggables (QSFP28 form factor).The solution shall support generation, analysis, and validation of coherent optical Ethernet interfaces operating over DWDM metro and long-haul fiber networks. The tester shall support end-to-end performance validation, beyond traditional client-side Ethernet testing, suitable for router-to-router and transport network deployments.
19.3	Ethernet Tester (400G) : The Ethernet tester is required for captive testing of links for customers as per agreed SLA parameters. The Contractor shall bring its own testers for testing and verification of links under SAT-II & SAT-III, however PowerTel may use its own testers to expedite the testing of links. The tester shall comply with the following specifications:
i	Tester chassis unit shall be modular and additional modules to be inserted as per requirement.
ii	The tester has touchscreen of minimum 8 inch.
iii	Tester support connectivity via Wi-Fi, Ethernet Port, Bluetooth etc.
iv	The tester runs on 220V AC with in-built Li-ion battery backup of at least 30 minutes at highest test configuration (Both 400G or both 100G).
v	The Tester shall support following pluggable:
	a) 100G: QSFP28 (SR4, LR4, ER4, ZR4, DR1, FR1, LR1)
	b) 400G: QSFP-DD, ZR, ZR+ and new pluggable
	c) MSA standard pluggable
vi	The unit shall simultaneously perform two (02) test of 100G/ 400G links with available ports in Tester, and supports following port configuration:
	a) Minimum 2 ports of 100 Gbps
	b) Minimum 2 ports of 400 Gbps
vii	The Tester can be used for inline testing of the links.
viii	Supports testing of Bit Error Rate (BER) testing, Signal quality analysis, Latency measurement, Optical power measurement, FEC (Forward Error Correction) testing etc.
ix	Supports Ethernet (L2, L3, RFC2544 & Y1564) and OTN (OTU4/ OTUC4) Line rates for Interface types as specified.
x	Test Report File shall be saved in PDF, XML etc.
xi	Measurement of Service Disruption Time with granularity of up to 0.1 ms should be supported.
xii	Supports testing and verification of 4×100GE breakout cables providing optical Tx/Rx power.
xiii	Warranty required: 01 Year
xiv	AMC: 05 Years
xv	Quantity as per BoQ
19.2	Optical Time Domain Reflectometer (OTDR)
i	The OTDR shall be used for long haul application and operate at 1310nm & 1550nm.
ii	OTDR should be portable, handheld, rugged and battery-operated field instrument. The instrument shall comply with TEC GR No. TEC/GR/TX/OTD-001/05/SEP-19 (or its latest amendment).
iii	Battery back-up of min 04 Hours.
iv	Display size: ≥ Minimum 7 inch (diagonally) touch screen display
v	Dynamic Range : a) ≥46dB at 1310nm b) ≥45 dB at 1550nm
vi	AMC: 05 Years

vii	Quantity as per BoQ
19.3	Fibre Probe
	Fiber inspection probes are required for ensuring optimal signal performance and reliability. Fiber inspection probe shall ensure connector's/patch cord health and cleanliness to determine wheather it is ready to use or need to be cleaned again.
i	Inspect Patch cords, bulkheads and Connectors
ii	Easy and precise focus knob
iii	Long-reach head to easily access dense panels and cabinets
iv	Rugged and designed for the field
v	Inspection probe compatible with OTDR base platform, Laptop/PC, Mobile
vi	Blue LEDs for better contrast
20	Important Points
A	Appendix-C BoQ
i	The bidder shall provide the detailed Bill of Material (BoM) including breakup of LOT items, stating all component, their quantity etc.
ii	Route: Table C1 Route Backbone Part 1& Table C1 Route Backbone Part 2 Route Details with fiber parameters
iii	Nodes highlighted in yellow represent Add/Drop sites and are the only permissible locations for regeneration and equalization. No other nodes are allowed for these functions. For remaining sites bidder shall cosider 2 directions sites as ILA and sites having more than 2 directions as ROADM sites without add-drop struture.
iv	Bidders are not allowed to add additional locations to place Amplifier(ILA), other than the locations provided in the Appendix-C
v	Table C2 Traffic Matrix Backbon with Route Details
vi	Table C3 Route Metro with Route Details with fiber parameters
vii	Table C4 Traffic Matrix Metro
viii	In case additional quantities, over and above the quantities estimated by the Contractor in BOM are required for successful completion of the scope of work as per Technical Specification, the contractor shall execute additional quantities of these items for which no additional payment shall be made over and above the lumpsum bid price (unless the scope of work is changed by the Employer).
ix	AMC for BackBone Network(A),Metronetwork(B),Pluggable(C),Cabinet(D),TMN System (E),Client Workstations (F), Craft Terminal(G) for 9 years
x	AMC for Test Equipment (H) for 5 years
xi	Bidder has to offer hardware for Site as per the number of direction mentioned in the network topology.
xii	All Sites in Backbone shall support DC power supply.
xiii	Mertro network shall support AC/DC power supply as requested in Table C3 Route Metro
xiv	Bidders are not allowed to propose any additional locations for installation of equipment's other than those specified in Appendix-C of TS.Bid shall be rejected in case any Bidder proposes additional locations other than those specified in Appendix-C BoQ of Technical Specification.