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CORRIGENDUM - 04 TO NIT NO-86672

Dated 13-12-2024

Subject: Corrigendum-04 to Tender enquiry for Supply & Services of 400kV GIS for NTPC's Singrauli Tender / Project.

Project : NTPC's Singrauli Super Thermal Power Project Stage- III (2x800MW)

Equipment / Item : Supply & Services of 400kV GIS Enquiry No/Date : 61G2500385 dated 14-11-2024

BHEL NIT NO : 86672

Original Tender due date : 26-11-2024 Extended due date : 17-12-2024

This corrigendum is issued for issuance of Technical corrigendum along with technical clarifications (enclosed). Bidder(s) to consider the Annexure BOQ Rev-01 while quoting the prices in price bid format.

All other terms and conditions for this tender enquiry shall remain unchanged.

Bidder to ensure submission of offer on or before due date.

Note: Tender ID on CPP Portal is 2024_BHEL_41882_1.

Thanking you

-----Sd/-----Gaurav Agarwal BHEL TBG, NOIDA Ref. No. Technical Corrigendum-01

Date: 12.12.2024

Project: 400kV GIS Switchyard at Singrauli Super Thermal Power Project Stage- III (2x800MW)

Package: 400kV Gas Insulated Switchgear & its accessories NIT No. 86672/ Enquiry No. 61G2500385 dtd. 14.11.2024

Sl. No.	Clause no./ Doc Reference	Document Description of Original Technical Specification	Technical Corrigendum-01			
31. NO.	Clause no./ Doc Reference	Document Description of Original Technical Specification	Remarks, if any			
1	Section-1/ Clause 6	Please refer Section-1/ Clause 6 as detailed below, ANNEYIPE- BOO for 400by CIS & its Accessories	Revised ANNEXURE- BOQ for 400kV GIS & its Accessories REV01 to be considered for this tender. Detailed description of GIS bay equipment (Sr No. A1 to A7) changed as per approved SLD. Changes are hilighted in RED color. Approved SLD is also attached.			
2	Section-1/ Clause 16	1. Annexure - BOQ for 400kV GIS & its Accessories 2. Single Line Diagram for 400kV GIS Switchyard at NTPC, Singrauli 3. Layout Drawing for 400/220kV GIS Switchyard at NTPC Singrauli	Please refer revised documents as detailed below, 1. ANNEXURE- BOQ for 400kV GIS & its Accessories REV01 2. Approved Single Line Diagram for 400kV GIS Switchyard at NTPC, Singrauli REV01 3. Revised Layout Drawing for 400/220kV GIS Switchyard at NTPC, Singrauli 4. PRE-BID CLARIFICATIONS			

Note: Amendment/addendum/ clarification/ corrigendum issued herein shall form part of Technical Specification. All bidders to please note that amendment/addendum/ clarification/ corrigendum issued will supersede the respective clause/ sub-clause of Technical Specification Document to the extent for the clause/ sub-clause or part thereof the amendment is issued.

ANNEXURE- BOQ for 400kV GIS & its Accessories REV01

Sl. No.	Item Description	Detailed Description	Unit	Qty
A		The 400KV, 4000A, 63kA for 1 sec, One and Half Breaker GIS complete with local control centre (LCC) etc. with open future proof & flexible system in line with IEC 61850 & IEC 62271-203.		
	as per the enclosed SLD, latest IEC standard & type tested equipment as per technical specification	GIS shall comprise following bays but not limited to (Refer attached Single Line Diagram), a 3 Six (6) Set of fully equipped Line Bays. b) Two (2) Set of fully equipped GT Bays. c) One (1) Set of fully equipped Bus Reactor Bay having CB with controlled switching device. d) Two (2) Set of fully equipped ST Bays having CB with controlled switching device e) Three (3) Set of fully equipped Tie Bays having CB with controlled switching device f) Two (3) Set of fully equipped Tie Bays. f) One (1) Set of fully equipped Tie Bay directly connected with Bus as per SLD.		
		g) Two (2) Sets of fully equipped Bus Voltage Transformer Bays with Bus Isolator and Grounding Switches and Bus LA. Typical bay includes but not limited to SF6 gas, Single Phase (isolated) Busbar, circuit breaker, current transformer, bus-bar disconnectors with common grounding switch, Motorised disconnectors with safety grounding switch(es), high speed fault making motorised grounding switch, Local control cubicle, SF6 gas monitoring system for complete GIS, SF6 bus duct termination arrangement including SF6 to air bushing module, PD sensor (adequate number of UHF sensors in the offered GIS equipment for detection of Partial discharge (of 5 pC and above) as per IEC 60270 through Online Partial Discharge (PD) monitoring system,		Unit & Quantit to A18 below.
		different gas compartment, O- ring & gaskets, Nuts, Bolts & Washers, Absorbent, Limit Switch etc. to complete GIS modules & its earthing arrangement for GIS equipment with earthing strips of adequate size (as per IEEE-80-2000 and CIGRE44 to protect operating staff against any hazardous touch voltages and electro-magnetic interferences) as per the technical specification. The Switchgear shall be complete with all necessary terminal boxes, inspection window, SF6 gas filling, inter-connecting wiring, grounding connections, gas monitoring equipment and piping, support structures etc. The scope of supply shall also include all erection and mounting hardwares and interconnecting power and control cables between GIS to LCC and between LCC to LCC including cable tray, glands, lugs, ferrules etc. However cables beyond LCC shall be supplied and laid by BHEL.		
A1	Fully equipped 400kV, 63kA, 3150A GIS - Line bay module	400kV, 63kA for 1 sec, 3150A SF6 gas-insulated metal enclosed LINE bay module. Each set shall be complete & shall comprise of but not limited to: a) ONE set of 3-phase, SF6 insulated Circuit Breaker, complete with operating mechanism. b) THREE sets of 3-phase group operated Disconnector complete with manual and motor driven operating mechanisms. c) TWO sets of 3x1-phase, group operated maintenance Earthing Switches, complete with manual and motor driven operating mechanisms. d) TWO set of 5x1-phase, group operated High Speed Earthing Switches, complete with manual and motor driven operating mechanisms. e) THREE nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTA) as per single line diagram (Core details shall be finalised at detail engg. stage).	Set	6
		f) THREE nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTB) as per single line diagram (Core details shall be finalised at detail engg. stage). g) THREE nos. of 1-phase, 4-CORE, multi ratio, Current Transformers (CTL) as per single line diagram (Core details shall be finalised at detail engg. stage). h) UHF PD sensors, gas monitoring device, pressure relief device, busbar, insulators/ barriers, expansion joint/ flexible joints and other items as required. GIS bus duct, SF6 to air bushing module etc. are not included in this bay module and hence, these items are covered in separate BOQ items.		
A2	Fully equipped 400kV, 63kA, 3150A GIS - GT bay module	400kV, 63kA for 1 sec, 3150A SF6 gas-insulated metal enclosed GT bay module. Each set shall be complete & shall comprise of but not limited to:	Set	2
		a) ONE set of 3x1-phase, SF6 insulated Circuit Breaker, complete with operating mechanism. b) THREE set of 3-phase group operated Disconnector complete with manual and motor driven operating mechanisms. c) FOUR set of 3x1-phase, group operated maintenance Earthing Switches, complete with manual and motor driven operating mechanisms. d) THREE nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTA) as per single line diagram (Core details shall be finalised at detail engg. stage). e) THREE nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTC) as per single line diagram (Core details shall be finalised at detail engg. stage). f) THREE nos. of 1-phase, 1-CORE, multi ratio, Current Transformers (CTC) as per single line diagram (Core details shall be finalised at detail engg. stage). g) UHF PD sensors, gas monitoring device, pressure relief device, busbar, insulators/ barriers, expansion joint/ flexible joints and other items as required. GIS bus duct, SF6 to air bushing module etc. are not included in this bay module and these items are covered in separate items in the BOQ.		
A3	Fully equipped 400kV, 63kA, 3150A GIS - Bus Reactor bay module - with CSD	400kV, 63kA for 1 sec, 3150A, SF6 gas-insulated metal enclosed BUS REACTOR bay module. Each set shall be complete & shall comprise of but not limited to: a) ONE set of 3x1-phase, SF6 insulated Circuit Breaker, complete with operating mechanism and Controlled Switching Device (CSD) b) THREE set of 3-phase group operated Disconnector complete with manual and motor driven operating mechanisms. c) FOUR set of 3x1-phase, group operated maintenance Earthing Switches, complete with manual and motor driven operating mechanisms. d) THREE nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTA) as per single line diagram (Core details shall be finalised at detail engg. stage). e) THREE nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTC) as per single line diagram (Core details shall be finalised at detail engg. stage). f) THREE nos. of 1-phase, 1-CORE, multi ratio, Current Transformers (CTC) as per single line diagram (Core details shall be finalised at detail engg. stage). g) UHF PD sensors, gas monitoring device, pressure relief device, busbar, insulators/ barriers, expansion joint/ flexible joints and other items as required.	Set	1
		GIS bus duct, SF6 to air bushing module etc. are not included in this bay module and these items are covered in separate items in the BOQ.		
A4	Fully equipped 400kV, 63kA, 3150A GIS - ST bay module - with CSD	400kV, 63kA for 1 sec, 3150A, SF6 gas-insulated metal enclosed ST bay module. Each set shall be complete & shall comprise of but not limited to: a) ONE set of 3x1-phase, SF6 insulated Circuit Breaker, complete with operating mechanism and Controlled Switching Device (CSD) b) THREE set of 3-phase group operated Disconnector complete with manual and motor driven operating mechanisms. c) FOUR set of 3x1-phase, group operated maintenance Earthing Switches, complete with manual and motor driven operating mechanisms. d) THREE nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTA) as per single line diagram (Core details shall be finalised at detail engg. stage). e) THREE nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTB) as per single line diagram (Core details shall be finalised at detail engg. stage). e) THREE nos. of 1-phase, 1-CORE, multi ratio, Current Transformers (CTC) as per single line diagram (Core details shall be finalised at detail engg. stage). g) UHF PD sensors, gas monitoring device, pressure relief device, busbar, insulators/ barriers, expansion joint/ flexible joints and other items as required. GIS bus duct, SF6 to air bushing module etc. are not included in this bay module and these items are covered in separate items in the BOQ.	Set	2
A5	Fully equipped 400kV, 63kA, 3150A GIS - Tie GIS bay module - with CSD	400kV, 63kA for 1 sec, 3150A, SF6 gas-insulated metal enclosed TIE bay module. Each set shall be complete & shall comprise of but not limited to: a) ONE set of 3x1-phase, SF6 insulated Circuit Breaker, complete with operating mechanism and Controlled Switching Device (CSD) b) TWO sets of 3-phase group operated Disconnector complete with manual and motor driven operating mechanisms. c) TWO sets of 3x1-phase, group operated maintenance Earthing Switches, complete with manual and motor driven operating mechanisms. d) SIX nos. of 1-phase, 2-CORE, multi-ratio, Current Transformers (CTA1 & CTA2) as per single line diagram (Core details shall be finalised at detail engg. stage). e) Three (3) nos. single phase (isolated) bus bars to inter connect the Tie Bay circuit breaker bay modules with Circuit breaker bay Modules of Line/ICT/Bus Reactor in full diameter of one and half breaker bus system f) UHF PD sensors, gas monitoring device, pressure relief device, busbar, insulators/barriers, expansion joint/ flexible joints and other items as required.	Set	3
A6	Fully equipped 400kV, 63kA, 3150A GIS - Tie GIS bay module - without CSD	400kV, 63kA for 1 sec, 3150A, SF6 gas-insulated metal enclosed TIE bay module. Each set shall be complete & shall comprise of but not limited to: a) ONE set of 3x1-phase, SF6 insulated Circuit Breaker, complete with operating mechanism. b) TWO sets of 3-phase group operated Disconnector complete with manual and motor driven operating mechanisms. c) TWO sets of 3x1-phase, group operated maintenance Earthing Switches, complete with manual and motor driven operating mechanisms. d) SIX nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTA1 & CTA2) as per single line diagram (Core details shall be finalised at detail engg. stage). e) Three (3) nos. single phase (isolated) bus bars to inter connect the Tie Bay circuit breaker bay modules with Circuit breaker bay Modules of Line/ICT/Bus Reactor in full diameter of one and half breaker bus system f) UHF PD sensors, gas monitoring device, pressure relief device, busbar, insulators/ barriers, expansion joint/ flexible joints and other items as required.	Set	2
A7	Fully equipped 400kV, 63kA, 3150A GIS - Tie GIS bay module for half diameter, directly connected to Main Bus - without CSD	400kV, 63kA for 1 sec, 3150A, SF6 gas-insulated metal enclosed TIE bay module. Each set shall be complete & shall comprise of but not limited to: a) ONE set of 3x1-phase, SF6 insulated Circuit Breaker, complete with operating mechanism. b) THREE sets of 3-phase group operated Disconnector complete with manual and motor driven operating mechanisms. c) THREE sets of 3x1-phase, group operated maintenance Earthing Switches, complete with manual and motor driven operating mechanisms.	Set	1
		d) THREE nos. of 1-phase, 2-CORE, multi ratio, Current Transformers (CTAZ) as per single line diagram (Core details shall be finalised at detail engg. stage). e) Three (3) nos. single phase (isolated) bus bars to inter connect the Tie Bay circuit breaker bay modules with Circuit breaker bay Module of Line and connecting module to Main bus bar (through Disconnector) in half diameter of one and half breaker bus system f) UHF PD sensors, gas monitoring device, pressure relief device, busbar, insulators/ barriers, expansion joint/ flexible joints and other items as required.		
A8	400kV, 63kA, 4000A GIS - Busbar GIS module	One set of three single phase (isolated), 400kV, 4000A, 63kA for 1 sec, SF6 gas-insulated metal enclosed bus bars, each comprising of but not limited to: a) Three individual 4000A bus bars enclosures running across the length of the switchgear to inter connect each of the circuit breaker bay modules in one and half breaker bus system. b) UHF PD sensors, Gas monitoring systems, pressure switches, telescopic enclosure etc. as required. c) UHF PD sensors, gas monitoring device, pressure relief device, pressure switches, telescopic enclosure, insulators/ barriers, expansion joint/ flexible jointsetc. and any other items as required. Length of bus bar to be indicated by bidder.	Set	2
A9	400kV, 63kA, 3150A GIS - Bus VT Modules & Bus Earth Switch for Main Bus	400kV, 63kA for 1 sec, 3150A, SF6 gas insulated Bus VT bay module, Disconnector module with Earth switches connected to Main Bus Bars, each comprising of but not limited to: b) ONE set of 3-phase group operated Disconnector complete with manual and motor driven operating mechanisms. c) TWO sets of 3x1-phase, group operated maintenance Earthing Switches, complete with manual and motor driven operating mechanisms. d) THREE nos. of 1-phase, 3-secondary, Voltage Transfromer as per single line diagram. e) UHF PD sensors, gas monitoring device, pressure relief device, busbar, insulators/ barriers, expansion joint/ flexible joints and other items as required.	Set	2
A10	400kV, 63kA, 3150A GIS - Gas Insulated Bus Duct from GIS bay modules upto SF6 Air bushings of Outgoing Lines/ Bus Reactor/ GT/ ST	400kV, 63kA for 1 sec for insulated Bus Duct, 3150A, SF6 gas insulated GIS Bus Duct shall be complete & shall comprise of but not limited to: a) Single phase (isolated) SF6 ducts along with all accessories, bends, joints etc to connect 400kV GIS bay modules to SF6 Air bushings of Outgoing Lines/ Bus Reactor/ GT/ ST b) UHF PD sensors, Gas monitoring devices, barriers, pressure switches, etc. as required. The total tentative length indicated is the sum of all 1 phase SF6 bus duct from end of respective bay to SF6 to air bushing/ connection. However, exact length shall be decided during detailed engineering stage. The	Mtr	2250
A11	400kV, 63kA, 3150A GIS - SF6 to air bushing	GIBus duct length is to be calculated from the end of the GIS module and shall include both the indoor and outdoor GIB. 400kV, 3150A, 63 kA for 1 sec, 31mm/kV creepage, SF6 to Air Bushing for Over head connection of Outgoing Lines/Bus Reactor/GT/ST bays with GIS.	No	33

A12	400kV, 63kA GIS - LA/ Surgre arrester Module	LA/ Surge Arrester Module, comprising of following but not limited to, (a) ONE no. of single phase LA/Surge Arrester along with enclosure for one bus bar section with surge monitor/counter (b) LA/ Surge Arrester Module shall have the provision of link for temporaray isolation during HV testing at site. (c) Number of LA/ Surge arrester and their rating shall be decided based on insulation co-ordination / transient analysis studies for the GIS system. Insulation Coordination study is in bidder scope. However the LA indicated in SLD are the minimum numbers of LA to be provided by bidder.	No.	6
A13	400kV, 63kA, 4000A GIS - GIS Bus bar Extension Module (Applicable only in case of change in standard lengths of busbar modules of GIS/ standard bay pitch during detailed engineering, on account of reasons not attributed to bidder. In case there is no such change, the quantity of this item shall be reduced to zero.)	400kV, 63kA for 1 sec, 4000A, Bus bar extension module for connection between bays, comprising of following but not limited to, (a) 1 phase isolated Bus bar module section shall be used for connection between sections of bus bars to create electrical connectivity due to shifting of GIS bays, arising due to civil and architectural requirements, avoiding building column fouling or expansion joint in the building that houses GIS. (b) This module shall include the bellows/ compensators like lateral mounting units, Axial compensators, Parallel compensators, tolerance compensators and vibration compensators etc. as per requiremnts. c) UHF PD sensors, gas monitoring device, pressure relief device, insulator, expansion joint/ flexible joints etc. as required.	Mtr	6
A14	400kV GIS - Local Control Cabinet (LCC)	Local Control Cabinet (LCC) shall be provided for all Outgoing Lines/ Bus Reactor/ GT/ ST bays including cables between GIS & LCC. However, it may please be noted that any additional requiremenst of LCC (for Bus VT, DS, ES & Bus LA etc.), other than quantity mentioned in BOQ, during detailed engineering stage shall not be payable. All equipments are to be incorporated in BOQ quantity by bidder.	Nos.	17
A15	400kV GIS - SF6 gas required for placing GIS into successful operation	First filling of SF6 gas for the equipment supplied plus an additional quantity sufficient for conducting all tests on equipment at site before placing it into successful operation. Bidder to indicate quantity with break up.	MT	20
A16	Supply of structure material for Installation of 400kV GIS including support structure for GIS ducts, SF6 to air bushings, supports, platforms, ladders, foundation bolts, embedded parts in floors, Rails etc., which are required for installation of GIS as per the specification.	Structure Materials for support of GIS, Bus Ducts, SF6 to air bushing/ connection including Foundation Bolts, Embedded Items, Rails and/ or any other structural items required. All steel structure members shall be hot dip galvanized after fabrication. Unless otherwise specified, minimum mass of zinc coating for Galvanizing shall be 610 gm/square meter. All field assembly joints shall be bolted and hence, Field welding shall not be acceptable. Noncorrosive metal or plated steel shall be used for bolts and nuts throughout the work. Bidder shall provide suitable foundation channels and anchor bolts to support the switchgear assemblies. All anchor fasteners, mounting bolts, nuts and washers shall be provided to fasten the switchgear base frames to the foundation channels. In addition to above, supports, platforms, walkway, catwalk, foundation bolts, embedded parts in floors etc., are also included in the scope as per the specification, but not limited to the following, (a) Base Plate, Channel, Metallic / Structural Member/ Rail for seating of GIS system (b) Lattice / Pipe structure required for GIS bay, GIB, SF6 to air bushing/ connection. (c) Foundation bolt / Anchor Fastener for GIS system, if required. (d) Equipment fixing hardware. (e) Cable tray arrangement (mounted on structures of) GIS bay, GIB, SF6 to air bushing/ connection. (f) Any other structural item required to complete the system in all respects but not limited to above. The civil works shall be done based on bidder's design & drawings.	e- MT	65
A17	Supply of Earthing material for 400kV GIS including High frequency earthing material, if required. The quantity shall be estimated & provided by bidder	Earthing Materials, except 40mm MS rod, 75x12mm/ 50x6 GI Flat, which shall be provided by BHEL as free issue items, but, exact quatity requirement shall be intimated by bidder based on the approved earthing philosphy, and Supervision of erection of all earthing connection for GIS to Earth Mesh on Floor shall be in scope including any special requirements including high frequency earthing. In case, high frequency earthing is not required, necessary design and calculations shall be submitted by bidder in line with IEEE-80-2000 and CIGRE44 to protect operating staff against any hazardous touch voltages and electro-magnetic interferences as per the technical specification. For further details, Please refer Section-2 along with applicable drawing. Bidder shall define clearly what constitutes the main grounding bus of the GIS. Bidder must supply, commission the entire grounding work of GIS viz conductor, clamps, joints, bimetallic strips (for connection between different type of earthing materials), operating and satety platforms etc. Bidder shall provide suitable measure to mitigate trasient enclosure voltage caused by high frequency currents caused by lightning strikes, operation of surge arrester, phase/earth fault and discharge between contracts during switching operation.	Lot	1
A18	Online continuous Partial Discharge Monitoring System (PDM) with all necessary accessories & auxiliaries) complete for 400kV GIS & Busducts	Online continuous Partial Discharge Monitoring System (PDM) for 400kV GIS have following but not limited to, 400kV GIS equipment system shall have Online continuous Partial Discharge Monitoring System (PDM) system to provide an automatic facility for the simultaneous collection of PD data at multiple points on the GIS & its associated GIB ducts and Voltage Transformers adopting UHF technique & the data stored shall provide a historical record of the progress of PD sources and shall identify the areas of maximum activity. PDM system shall be interfacing with UHF PD couplers provided. The PD Monitoring PC Work Station alongwith all accessories shall be considered. Power supply to PDM PC shall have protection against surges, overload and short circuit. A dedicated on-line UPS system shall also be provided as a backup during supply interruption, to ensure trouble-free & reliable running of the PDM System for a minimum of 15 minutes duration.	Lot	1
В	Supply: Mandatory Maintenance Equipment & Monitoring Equipment	Mandatory Maintenance Equipment shall be shipped in separate containers, clearly marked with the name of the equipment for which they are intended.	Header Item; Uas per B1 to	Unit & Quantity o B9 below.
B1	SF6 gas filling and evacuating equipment (Portable)		No.	1
B2	SF6 gas filtering, drying, storage and recycling plant		No.	1
В3	SF6 Gas leak detector		No.	1
В4	Operational analyser with DCRM kit		No.	1
B5	Hydraulic portable type ladder		No.	1
В6	Dew Point Meter		No.	1
В7	Portable PD Monitoring System for Gas Insulated Switchgear		No.	1
B8	SF6 gas analyzing equipment and instrument		No.	1
В9	Portable Leakage current analyzer (for Gapless Surge Arrester),		No.	1
С	Supply- Mandatory Spares for 400kV GIS		Header Item; U	Unit & Quantity o C17 below.
	400kV Gas Insulated Switchgear			
C1	SF6 gas pressure Relief Devices,	1 Set= 3 nos. of each type	Set	2
C2	SF6 Pressure gauge with coupling device cum switch or density monitors and pressure gauge, as applicable	1 Set≈ 1 nos. of each type	Set	1
С3	Rubber gaskets, "0" Rings and seals for SF6 gas, including Circuit Breaker, Disconnector and other GIS equipment's	1 Set= 6 nos. of each type	Set	1
C4	Molecular filter for SF6 gas with filter bags	1 Set=20% total quantity of absorber bags used in GIS	Set	1
C5	SF6 gas	1 Set= 20% of total Gas used in GIS in cylinders of 50Kgs / cylinder capacity	Set	1
C6	Covers with all accessories necessary to close a compartment in case of dismantling of any part of the Enclosure to ensure the sealing of the compartment- For 1 phase enclosure	1 Set= 3 nos. of each type	Set	1
C7	Locking device to keep the Dis-connectors and Earthing switches in close or open position in case of removal of the driving mechanism (If applicable)		No.	3
C8	Bus support insulator of each type for single phase enclosure	1 Set≈ 6 nos. of each type	Set	1
C9	SF6 to air bushing for 1 phase enclosure		No.	2
C10	Spares for Local control cabinet: MCB, fuses, timers, Aux Relay of each type &	1 Set= 1 nos. of each type	Set	1
C10	rating, terminals of each type (Set) All types of Corona shield	1 Set= 3 nos. of each type 1 Set= 3 nos. of each type	Set	1
C11				1
C12	Windowscope/ Observing window, (if applicable) Circuit Breaker	1 Set= 3 nos. of each type	Set	1
C13.1	Complete Circuit Breaker 1 phase pole of each type & rating complete with interrupter, main circuit and enclosure with operating mechanism		Set	3
C13.2	Trip Coil assembly with resistor as applicable, 3 Nos. of each type	1 Set= 3 nos. of each type	Set	2
C13.3	Closing Coil assembly with resistor as applicable, 3 Nos. of each type	1 Set= 3 nos. of each type	Set	2
C13.4	Relays, Power contactors, push buttons, timers & MCBs etc of each type & rating (If applicable)		Set	1
C13.5	Closing assembly/ valve, If applicable	1 Set= 3 nos. of each type	Set	2
C13.6		1 Set= 3 nos. of each type	Set	2
	Trip assembly/ valve, If applicable	1 Sec 3 hos. of each type		
C13.7	Trip assembly/ valve, If applicable Aux. switch assembly	1 Set= 3 nos. of each type	Set	1
C13.7 C13.8			Set Set Set	1 1 1

C13.10	Supply) 1)Spare of pneumatic operated mechanism (complete) a. Motor for compressor – 1 no. b. Pressure switch and valve etc – 1 no. of each type 2)Spare of spring operated mechanism (complete) a. Motor – 1 no b. Limit switch etc – 1 no. of each type 3)Spare of hydraulic operated mechanism(complete) a. Motor – 1 no. b. Limit switch – 1 no. of each type Disconnector	1 Set= 1set for each type of Circuit Breaker	Set	1		
	Complete set of 3 nos. of single phase disconnector including main circuit,					
C14.1	enclosure and driving mechanism	1 Set= 3 nos. of single phase disconnector including main circuit, enclosure and driving mechanism complete in all respect	Set	1		
	High speed/ fast acting fault making grounding switch, 3 nos. of single phase of each rating, including main circuit, enclosure and driving mechanism	1 Set= 3 nos. of single phase of each rating of High speed/ fast acting fault making grounding switch, including main circuit, enclosure and driving mechanism	Set	1		
C14.3	3 nos. of single phase Earthing switch including main circuit, and driving mechanism	1 Set= 3 nos. of single phase Earthing switch including main circuit, and driving mechanism	Set	1		
	Open/ close contactor assembly, timers, key interlock for one complete (3phase) disconnector and earthing switch of each type & rating (if applicable)		Set	1		
C14.5	Limit switches and Aux. switches for complete 3-phase equipment- a) For Disconnector		Set	3		
C14.6	Limit switches and Aux. switches for complete 3-phase equipment-		Set	1		
C14.7	c) For High speed earth switch		Set	1		
C14.9	Relays. Power contactors, resistors, fuses, push buttons, timers & MCBs, if applicable- a) For Disconnector	1 Set= Complete for one 3 phase equipment	Set	3		
C14.9	Relays. Power contactors, resistors, fuses, push buttons, timers & MCBs, if applicable- b) For earth switch	1 Set= Complete for one 3 phase equipment	Set	1		
C14.10	Relays. Power contactors, resistors, fuses, push buttons, timers & MCBs, if applicable-c) For High speed earth switch	1 Set= Complete for one 3 phase equipment	Set	1		
C15	Current Transformer- Complete CT, as applicable, with enclosure, as applicable	1 Set= 1 no. of each type & rating	Set	1		
	Voltage Transformer- Gas Insulated complete VT with enclosure		No.	1		
C17	SF6 Gas Insulated Surge Arrestor with enclosure		No.	3		
	Services- 400kV GIS- Supervision of Erection, Testing & Commissioning and handing over to Customer	These activities shall be carried out at site in stages as per front availability at site, and hence multiple visits for completion of work are envisaged.		Unit & Quantity of D11 below.		
	Site visit for supervision of unloading & verification of 400kV GIS materials for proper storage and up-keeping at site	Site visit for supervision of unloading & verification of materials for proper storage and up-keeping at site includes following activities but not limited to, (a) Supervision of safe unloading of GIS & its accessories at site. (b) Reconcililation, storage & upkeeping of materials, with due instructions/ training to site persons for long storage.	Lot	1		
D2	Supervision of erection of 400kV GIS bays including LCC	Supervision of complete GIS bays along with all bay equipment such as GIS extension module, GIS bus extension module, voltage transformer, Surge Arrester, LCC including structure, cabling, earthing & other associated activities shall be included in the scope. Consumables required for successful erection is included in bidder's scope. Payment shall be made on actual measurement basis, if required.	No	17		
D3	Supervision of erection of 400kV Gas insulated bus duct	Supervision of erection of GIS- gas insulated bus duct including support structure, earthing & other associated activities shall be included in the scope. The GIBus duct quantity will be calculated from the end of the GIS module and shall include both the indoor and outdoor GIB. Consumables required for successful erection is included in bidder's scope. Payment shall be made on actual measurement basis, if required.	Mtr	2250		
D4	Supervision of erection of 400kV SF6 to air bushing/connection	Supervision of erection of 400kV SF6 to air bushing/connection Supervision of erection of SF6 to Air bushing including support structure, earthing & other associated activities shall be included in the scope. Consumables required for successful erection is included in bidde scope. Payment shall be made on actual measurement basis, if required.				
D5	Testing & commissioning of 400kV GIS bays including LCC	Testing & commissioning of complete GIS bays including other associated activities in line with site acceptance testing as per customer approved SAT procedure shall be in bidder's scope. Consumables required for successful commissioning is included in bidder's scope. Payment shall be made on prorata basis, if required.	No	17		
D6	Testing & commissioning of 400kV GIS Gas insulated bus duct	Testing & commissioning of GIS- gas insulated bus duct including support structure, earthing & other associated activities shall be included in the scope. Consumables required for successful commissioning is included in bidder's scope. Payment shall be made on actual measurement basis, if required.	Mtr	2250		
D7	Testing & commissioning of 400kV SF6 to air bushing/ connection	Testing & commissioning of SF6 to Air Bushing including support structure, earthing & other associated activities shall be included in the scope. Payment shall be made on actual measurement basis, if required.	No	33		
		Carrying out successful HV/Power Frequency Testing of complete (all bays) GIS as per IEC including one time arrangement of HV Test kit (on returnable basis) shall be in scope of bidder, which includes charges of HV test kit with operator, accessories & tools required for completion of HV testing. No delay shall be permitted on account of the non availability of the HV test kit. Payment shall be made on the basis site certification. Bays may be commissioned separately. In case the HV testing of any bay is not completed due to reasons not attributed to bidder, the HV testing kit mobilization and demobilization shall be covered under separate unit ref. item of this BOQ. However, the payment of Successful High Voltage/Power Frequency Testing of of balance bays in such a scenario, shall be done on prorata basis i.e. total cost quoted for complete GIS Lot/ total no. of bays.	Lot	1		
D9	Insulation Co-ordination including VFTO Studies for 400kV GIS System	Bidder shall conduct insulation co-ordination studiy in line with IEC 600071-2006.and any other technical requirement for successful operation of GIS. In case of non availability of exact input details, same shall be done be done on basis of standard inputs available and shall be revised, if required after availability of exact input details. Payment shall be made on the basis engineering certification.	Lot	1		
D10	Final Documentation of 400kV GIS	Final Documentation including As Bulit Drawing/ Document, Site Testing Reports/ Protocols, Handing over proptcols along with manuals shall be submitted etc. by bidder. Payment shall be made on the basis engineering certification.	Lot	1		
	Erection, testing & commissioning of Online continuous Partial Discharge Monitoring System (PDM) for 400kV GIS	Supervision of erection, testing & commissioning of Online continuous Partial Discharge Monitoring System (PDM) for 400kV GIS including interfacing with SAS & other associated activities shall be included in the scope. Consumables required for successful erection is included in bidder's scope. Payment shall be made on actual measurement basis, if required. These activities shall be carried out at site in stages as per front availability at site, and hence multiple visits for completion of work are envisaged.	Lot	1		
Е	Service- Training for 400kV GIS			Jnit & Quantity o E2 below.		
E1	400kV GIS Training of 10 nos. Engineers (8 nos. customer engineers+2 nos. BHEL engineers) for a period of at least 5 working days at Manufacturer's works	The scope shall include boarding & lodging charges of engineers, including local conveyance.	Lot	1		
	400kV GIS Training of 8 nos. Engineers (6 nos. customer engineers+2 nos. BHEL engineers) for a period of at least 5 working days at project site	Lodging and Boarding of Training Participants shall be in BHEL scope.	Lot	1		
F	Supply- Unit reference price of 400kV GIS part item/ equipment	GIS part item/ equipment shall be required for supply as a mandatory spares or any addition/ deletion of equipment, due to damage, theft, additional requirement by customer during detailed engineering or later stage. It is to be ensured by bidder that unit prices have a logical relationship with prices of assemblies in main items (Bay, Busbar etc). The reference prices shall be used for breakup rates, if required at any stage. The reference prices shall be considered for evaluation.	Header Item; Unit & Quantif as per F1 to F28 below.			
F1	400kV, 3150A Circuit breaker complete with enclosure without operating mechanism	1 set= 1 no. of 400kV, 3150A Circuit breaker, 1 pole complete with enclosure without operating mechanism	Set	1		
F2	400kV, 3150A Disconnector without operating mechanism	1 set= 1 no. of 400kV, 3150A Isolator (3 pole) complete with enclosure without operating mechanism	Set	1		
F3	400 kV Maintenance Earthing switch without operating mechanism	1 set= 1 no. of 400 kV Maintenance Earthing switch (3 pole) with enclosure without operating mechanism	Set	1		
F4	$400 {\rm kV}$ High speed earth switch/ High speed $$ make proof grounding switch without operating mechanism	1 set= 1 no. of 400kV High speed earth switch (3 pole) with enclosure without operating mechanism	Set	1		

F5	Surge Arrestor including Surge Counter	Surge Arrester with enclosure and surge counte/ monitor. Rated arrester voltage may be changed after insulation coordination study. Rated arrester voltage considered is 390kV.	Set	1
F6	400kV Current transformer of Class PS	400kV Current transformer (1 pole) of Class PS (1 No. of each type) Without enclosure (Individual prices to be furnished).	Set	1
F7	400kV Current transformer of Class 0.2s	400kV Current transformer (1 pole) of Class 0.2s (1 No. of each type) Without enclosure (Individual prices to be furnished).	Set	1
F8	400kV Voltage transformer	400kV Voltage transformer (1 pole) (1 no. of each type) Without enclosure (Individual prices to be furnished).	Set	1
F9	Operating Mechanism box for 400kV, 3150 A Circuit Breaker	1 set= 1 no. of Operating Mechanism box for 400kV, 3150 A Circuit Breaker	Set	1
F10	Operating Mechanism box for 400kV, 3150 A Disconnector	1 set= 1 no. of Operating Mechanism box for 400kV, 3150 A Isolator	Set	1
F11	Operating mechanism for 400kV, Maintenance Earthing Switch	1 set= 1 no. of Operating mechanism for 400kV, Maintenance Earthing Switch	Set	1
F12	Operating Mechanism for 400kV, High Speed Earthing Switch	1 set= 1 no. of Operating Mechanism for 400kV, High Speed Earthing Switch	Set	1
F13	400kV, 1 Phase bus bar conductor		Mtr	1
F14	400kV, 1 phase GIS metalic enclosure for bus bar/ any eqipment		Mtr	1
F15	400kV, 1 Phase conductor for bus duct		Mtr	1
F16	400kV, 1 phase GIS metalic enclosure for bus duct		Mtr	1
F17	Gas permeable/ communication/ barrier type Insulator	1 Set= 1 No of each rating and type	Set	1
F18	Gas non-permeable/non-communication/non-barrier type Insulator	1 Set= 1 No of each rating and type	Set	1
F19	UHF PD sensors	1 Set= 1 No of each rating and type	Set	1
F20	Pressure/ density monitor monitor device & Switch	1 Set= 1 No of each rating and type	Set	1
F21	Pressure relief device	1 Set= 1 No of type	Set	1
F22	Rupture disc	1 Set= 1 No of type	Set	1
F23	Elbow/ bend/ cross and T section	1 Set= 1 No of type	Set	1
F24	Expansion joint	1 Set= 1 No of type	Set	1
F25	Flexible connection for conductor	1 Set= 1 No of type	Set	1
F26	Gas seals	1 Set= 1 No of type	Set	1
F27	Controlled Switching Device for ONE set of 3150A, 3x1-phase, SF6 insulated circuit breaker		Set	1
F28	Enclosure for LCC Panel		No.	1
G	Service- Unit reference price of GIS service item	Reference unit prices for service of Individual Item/ Equipment for any addition/ deletion of equipment, due to damage, theft, additional requirement by customer, any other reasons not attributable to vendor during detailed engineering/ contract execution. The reference prices shall be considered for evaluation. Total charges for one visit of engineer/ HV test kit operator shall include respective unit rate of item I.1/I.2 man-day+ item of I.4.		Unit & Quantity o G6 below.
G1	Services of supervision for Erection of 400kV GIS	Charges for repetition of services - (if required due to reasons not attributed to the bidder) This item will be executed only if repetition of services is required by BHEL.	Manday	10
G2	Services of Testing & Commissioning of 400kV GIS	Charges for repetition of services - (if required due to reasons not attributed to the bidder) This item will be executed only if repetition of services is required by BHEL.	Manday	10
G3	Demobilization & remobilization charges for GIS erection supervision team	This BOQ item shall be payable if required for reasons not attributable to bidder.	Set	2
G4	Demobilization & remobilization charges for GIS testing & commissioning team	This BOQ item shall be payable if required for reasons not attributable to bidder. Hv testing is not part of this item.	Set	2
G5	Demobilization & remobilization charges HV Test Kit along with operator	In this BOQ item, mobilization and demobilization chages for HV test kit is considered for second time or more, for reasons not attributable to bidder. HV testing charges are not included in this line item and the same may be referred from the main line item of supervision of ETC services of this BOQ.	Lot	1
G6	Type Test Charges for conduction of Type Test on 400kV GIS	Please refer Annexure- Break up of Type Test Charges on 400kV GIS for details of type test to be conducted on 400kV GIS.	Lot	1
	·			1

Annexure- Break up of Type Test Charges on 400kV GIS

The following type tests on typical 400kV GIS (As Applicable) GIS bay module as per IEC 62271-203. The components forming parts of the GIS which are covered by other standards shall comply with and shall be type tested according to those standards.

Sl. No.	Description of Test	Number of Type/ Rating	Charges for one Type/ Rating (Rs.)	Total Price (Rs.)
A.	The following type tests on typical 400kV (As Applicable) GIS bay module as per IEC 62271-203. The components forming parts of the GIS which are covered by other standards shall comply with and shall be type tested according to those standards.			
(i)	Lightning impulse voltage dry tests.			
(ii)	Switching impulse voltage dry tests.			
(iii)	Power frequency voltage dry tests.			
(iv)	Partial discharge tests.			
(v)	Test to prove the temperature rise of any part of the equipment and measurement of the resistance of the main circuit.			
(vi)	Test to prove the ability of the main circuit and earthing circuit to carry the rated peak and the rated short time withstand current.			
(vii)	Test to verify the making and breaking capacity of the included switching devices.			
(viii)	Test for satisfactory operation of the included switching devices.			
(ix)	Test to prove the strength of enclosures.			
	Gas tightness tests			
	Electromagnetic capability test (EMC)			
(xii) (xiii)	Test on partitions Internal arc tests			
	Mechanical operation tests.			
	Test to prove the satisfactory operation at limit temperature.			
(xvi)	Verification of degree of protection of auxiliary and control circuit			
	Test to prove performance under thermal cycling and gas tightness test on gas barrier insulators			
	Capacitive Current switching test			
	Shunt reactor current switching test			
	For surge arrestor and Bus VT following type tests as per relevant IEC. 400kV (As Applicable) Surge Arrestor (As per IEC 60099-4)	T		
(a)	Insulation withstand test on housing			
(b)	Residual voltage test			
(c)	Long duration current impulse withstand test			
(d)	Pressure relief test (if applicable)			
(e)	Operating duty test			
(f)	Partial Discharge Test			
(g)	Leakage Test			
С	400kV (As Applicable) Bus VT (As per IEC 60044-2)			
(a)	Temperature rise test			
(b)	Lighting Impulse test			
(c)	Switching Impulse test			
(d)	Determination of errors			
(e)	Short circuit withstand capability			
(f)	Chopped lighting impulse test			
			Total (Rs.):	

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Sl. No	TS ref. Clause/ Doc. No.	TS ref. Doc. No./ Clause No.	Ref. Doc./ Clause description	Deviations/ clarifications sought by bidders	Clarifications/ confirmations provided by BHEL/ Customer
1. Bidder 1					,
1	Section-1	3 Notes (23)	23. Controlled Switching Device (CSD) shall be supplied for ST/Reactor/associated Tie Bay Circuit breakers. CSD shall be mounted in respective GIS Bay LCC Panels. Special cable, if required for integration is deemed to be included in bidder's scope. The CSD shall be type tested as per EN/ IEC 61001-4-16 & IEC 60255 and other relevant standard as mentioned in the specification. For online continuous partial discharge monitoring system, the requirement of any structure materials, hardware, cabling work and other associated items etc. for completion of complete system (i.e. for 400kV GIS) shall be in the scope of bidder. The online PD system shall have provision (necessary compatible ports etc.) for integration with Substation Automation System (SAS based on IEC 61850 Edition 2). Tentative distance between 400kV GIS Building & SAS room shall be 200 m.	seperete AC room. Kindly re -confirm the location of CSD relay. (2) We understand PD monitoring panel shall be placed adjacent to GIS/ LCC panel jn GIS building. Kindly confirm.	(1) Please comply the requirement of Technical Specification. (2) Main PD monitoring panel shall be placed in switchyard control room, however, it shall be subject to customer approval during detailed engineering stage.
2	Section-1	3 Notes (24)	The DC distribution logic for LCC panels shall be as follows,		Please comply the requirement of Technical Specification. DC change over scheme shall be part of LCC.
3	Section-1	4 (1)	In addition to this, packing of GIS & its accessories shall be suitable for long term storage without any deterioration in quality and performance (min. 2 years, if required).	GIS modules to be stored as per recommendations of OEM. Storage guidleline shall be submitted with the Bid. 2 Year timeline is very high and OEM cannot confirm the performance for 2 years as the conditions & maintenence of storage is not in control of OEM.	Please comply the requirement of Technical Specification.
4	Section-1	9. Quality Plan	The supplier shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and comply with the requirements of the specification. Charges for all tests for the equipment (400kV Gas Insulated Switchgear & its accessories) shall be deemed to be included in bidder's scope.	Routine test for the bought out items shall be conducted at third part vendor premises in line with IEC and approved quality plan.Reports for the same shall be submitted to BHEL/ NTPC for approval during executions stage. Kindly confirm.?	It shall be subject to customer approval during detailed engineering stage.
5	Section-1	11 (1)	3. Bidder shall coordinate with manufacturers of other equipment wherever required and shall freely and readily supply all technical information for this purpose as and when called for.	We understand any coordination with manufacturers of other equipment other than GIS contract scope shall be in BHEL scope.	Noted. Bidder to ensure necessary provisions for interfacing of GIS with other systems (like CRP/SAS, etc)
6	Section-1	12 (4)	4. The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains and high ambient temperature.	GIS storage in outdoor is not recommended. Bidder shall submit storage insturctions for the offered product, customer shall comply with the same.	It shall be subject to customer approval during detailed engineering stage.
7	Section-1	12 (7)	7. Bidder to furnish to BHEL complete list of consignments for QR-code generation & shall ensure to affix QR codes of RFID tags/Trackers on the item & punch the same before dispatch.	QR-code affixing of RFID tags/trackers is nonstandard requriement and shall be subjected to technical feasiblity. Same shall be evalauted in execution. However for some reason this is technically not feasible, request BHEL to forego this requriement.	Please comply the requirement of Technical Specification.
8	SLD	1150-001-230PVE- P-001	SLD High speed earth switch position	We wish to clarify that High speed earth switch are only required in Exits of GIS bays and busbar. Hence we request to convert high speed earth siwtch as mentioned below to normal maintenance earth siwtch. This is inline with standard conventional practice and followed previouls by BHEL & NTPC. Kindly confirm. 40189BE1, 40489BE1, 40789BE1, 41089BE1, 41389BE1, 41689BE1	Requirement of high speed earthswitch shall be as per customer approved Single Line Diagram attached with Technical Corrigendum-01. Bidder to provide the same.

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Sl. No	TS ref. Clause/ Doc. No.	TS ref. Doc. No./ Clause No.	Ref. Doc./ Clause description	Deviations/ clarifications sought by bidders	Clarifications/ confirmations provided by BHEL/ Customer
9	Section-1	7. EARTHING MATERIALS FOR GIS	2. Installation/ erection/ laying of earthing system for GIS shall be done by BHEL/ its contractor, however, supervision shall be provided by bidder as per approved design philosophy.	Noted however we understand supervision scope shall be applicable only for the material supplied by GIS OEM. Supervision for the instalation of meterial supplied by BHEL shall not be in GIS OEM scope.	
10	Section-2/ Sub- section-B17	2.03.21	Adequate number of gas leak detectors shall be installed at various locations at the base of the GIS structure to detect presence of gas which may be harmful for human. The detector shall send alarm signal locally as well as at remote stations.	As per technical specification this shall be part of bidders scope.	
11	Section-2/ Sub- section-B17	3.03.02	Circuit breakers shall be provided with two (2) independent trip coils, suitable for trip circuit supervision. The trip circuit supervision relay would also be provided. Necessary terminals shall be provided in the central control cabinet of the circuit breaker.	It shall be subject to customer approval during detailed engineering stage.	
12	Section-2/ Sub- section-B17	11.05.00	f) Capacitance and tan delta measurement at minimum 10kV.	This test is not applicable for GIS CTs. Request to accept the deviation.	It shall be subject to customer approval during detailed engineering stage.
13	Section-2/ Sub- section-B17	11.07.00 (e)	SURGE ARRESTER a) Grading leakage current. b) Resistance of ground connection. c) Resistive current drawn at rated voltage after energisation.	As per OEM recommendation, the subject tests shall not be performed at site.	It shall be subject to customer approval during detailed engineering stage.
14	Section-2/ Sub- section-B17	2.15.00	HEATERS: All the heaters shall be suitable for connection to a 240V AC, single phase, 50 Hz supply. The heater in the mechanism housing shall be connected inside the housing to this supply and shall be thermostatically controlled.	We wish to inform that offered drive in CB/DS/ES is having continuous heater design and does not required any kind of thermostat. Same is as per type tested design.	It shall be subject to customer approval during detailed engineering stage.
15	Section-2/ Sub- section-B17	2.13.00 Monitoring	2.13.02 Gas pressure monitoring devices shall be fitted with test valves such that field testing of the monitoring device can be performed without draining the main gas system.	We would like to inform that, functional check /comparative check/calibration/ replacement of gas density switch can be done by isolating the device from the GIS system, without de-energizing the primary equipment or without reducing pressure in gas compartments and seperete test valve is not required. Understand same shall suffice the requirement. Kindly confirm.	It shall be subject to customer approval during detailed engineering stage.
16	Section-2/ Sub- section-B17	2.19.00 Shop test	Pressure test on enclosures	Test on bought out component shall be done at vendor factory end and routine test reports for the same shall be submitted for review during tender stage. Kindly accept	It shall be subject to customer approval during detailed engineering stage.
17	Section-2/ Sub- section-B17	2.21.00 Commissioning Tests:	On completion of the erection and installation, following commissioning tests shall be performed as per IEC 62271-203, CIGRE working Group 23.03, 1975-Electra No. 42, 7-29:	Offered GIS is designed in line with IEC 62271-203 which applicable standard for GIS. Complete type test, routine test and site test shall be performed on offered GIS shall be inline with IEC 62271-203 only.	It shall be subject to customer approval during detailed engineering stage.
18	Section-2/ Sub- section-B17	2.21.00 Commissioning Tests:	After erection, a test shall be made to prove the absence of the dangerous voltages in the enclosure and other metal parts such as pipes and framework.	No such is aplicable for GIS in line with IEC 62271-203 which is applicable standard for GIS. However complete GIS shall be dielectrically tested at site which itself shall be a proveness for any absence of dangerous voltages. No seperete test applicable against this clause.	It shall be subject to customer approval during detailed engineering stage.

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Sl. No	TS ref. Clause/ Doc. No.	TS ref. Doc. No./ Clause No.	Ref. Doc./ Clause description	Deviations/ clarifications sought by bidders	Clarifications/ confirmations provided by BHEL/ Customer
19	Section-2/ Sub- section-B17	11.00.00 SITE TESTING AND COMMISSIONING	11.04.00: ISOLATORS	Below test shall not be applicable at site as same shall be only performed during routine test. c) Insulation resistance of control circuits and motors. g) Measurement of operating torque for isolator and Earth switch h) Resistance of operating and interlocking coils.	It shall be subject to customer approval during detailed engineering stage.
20	Section-2/ Sub- section-B17	11.00.00 SITE TESTING AND COMMISSIONING	11.05.00: CURRENT TRANSFORMERS	f) Capacitance and tan delta measurement at minimum 10kV is not enisaged and shall not be performed at site.	It shall be subject to customer approval during detailed engineering stage.
21	Section-2/ Sub- section-B17	11.00.00 SITE TESTING AND COMMISSIONING	11.06.00: VOLTAGE TRANSFORMERS/CAPACITOR VOLTAGE TRANSFOREMER	f) Capacitance and tan delta measurement at minimum 10kV is not enisaged and shall not be performed at site.	It shall be subject to customer approval during detailed engineering stage.
22	Section-2/ Sub- section-B17	11.00.00 SITE TESTING AND COMMISSIONING	11.07.00: SURGE ARRESTER a) Grading leakage current. b) Resistance of ground connection. c) Resistive current drawn at rated voltage after energisation.	As per OEM recommendation, the subject tests shall not be performed at site.	It shall be subject to customer approval during detailed engineering stage.
23	Section-2/ Sub- section-B17		Type test	Offered GIS is type tested in line with IEC 62271-203. Type test are conducted by parent/colaborator company on same offered GIS model. Understand same shall be accepted which is also inline with latest CEA amendement. For bought out items (CT,VT, SA etc) Type test conducted by vendor with validity more than 10 years shall be submitted with confirmation of no design change. Any kind of repitition of type test shall not be considered in execution. If any repitition of TT is envisaged same shall be with additional cost.	Please comply the requirement of Technical Specification and BOQ.
24	Section-2/ Sub- section-B17	Annexure-D - SPECIFICATION OF MANDATORY MAINTENANCE EQUIPMENT	4.0) Self-powered hydraulic aerial working platform with articulated and fly boom for General purpose maintenance in switchyard and Transformer yard. (Suitable for 24m working height)- Qty: 1no $$	We understand this item is not in scope of bidder/OEM. Kindly confirm.	Noted in line with requirement of Technical Specification and BOQ. However, item mentioned at serial no. B5 (i.e. Hydraulic portable type ladder) in BOQ is in bidders scope.
2. Bidder 2	2				
1	Section-1/BOQ	Item No. 5.09	Insulation Co-ordination including VFTO Studies for 400kV GIS System	Insulation Co-ordination including VFTO Studies is under scope of bidder, however BHEL should confirm to release the study input details along with GIS layout approval to sucessful bidder. Otherwise, Manufacturer can not commence manufacturing activiy untill Insulation Co-ordination including VFTO Studies study shall not be completed. Kindly confirm to provide the inputs as per above requested timeline.	Being customer dependent input data, it is not possible to furnish all input details with Layout drawing, however, GIS item related with study shall be cleared for manufacturing only after completion of study.
2	Section-1/BOQ	ANNEXURE- BOQ for 400kV GIS & its Accessories Sr no.A	SF6 gas monitoring system requirement	We would like to inform you that, For remote SF6 pressure monitoring we will supply temperature-compensated hybrid gas density sensors with analog output on each gas compartment for GIS. The supply of an online gas density monitoring kit along with an HMI panel will be in EPC's scope of supply. Kindly accept the same.	Please comply the requirement of Technical Specification and BOQ.

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Sl. No	TS ref. Clause/ Doc. No.	TS ref. Doc. No./ Clause No.	Ref. Doc./ Clause description	Deviations/ clarifications sought by bidders	Clarifications/ confirmations provided by BHEL/ Customer
3	Section-2/ Sub- section-B17	Clause no. 2.02.02	Gas leakage system Each section & phase of the GIS enclosure shall be monitored for leakage of SF6 gas and suitable indication shall be provided in the control room	We would like to inform that for mentioned clause seprate gas detection system is required which includes gas leakage detection sensors but as per BOQ we understand portable gas leakage detector is required we have considered as per BOQ Kindly confirm the requirement	Please comply the requirement of Technical Specification.
4	Section-2/ Sub- section-B17	Clause no. 4.01.02	The isolators and earth switches shall be AC / DC motor operated	We shall provide DC motor operated switches for GIS operation. Kindly confirm.	It shall be subject to customer approval during detailed engineering stage.
5	Section-2/ Sub- section-B17	Clause no. 4.03.00 (A) t)	Pad lock The disconnecting switches shall be capable of being padlocked in both the open and closed positions with the operating motor automatically disengaged. The padlocking device shall be suitable for a standard size lock with a 10mm shank. The padlock must be visible and directly lock the final output shaft of the operating mechanism. Integrally mounted lock when provided shall be equipped with a unique key for such three-phase group. Master key is not permitted.	We shall provide provision for padlocking in DS/ES operating mechanisms, supply of padlocks will be in EPC scope.	Please comply the requirement of Technical Specification and BOQ.
6	Section-2/ Sub- section-B17	Clause no. 5.05.00 x)	The secondary terminals shall be terminated on stud type suitable no's of non disconnecting and disconnecting terminal blocks inside the terminal box of degree of protection IP:55 at the bottom of CT.	We would like to inform you that, the GIS will be installed inside the GIS hall. The GIS hall has well controlled temerature and humidity by air condition system. So, IP 54 is enough instead of IP 55. Kindly accept the same.	Please comply the requirement of Technical Specification and BOQ.
7	SLD (TB-429-316- 001) & NIT (annexure- BOQ for 400kV)	BOQ-Sr no. A1	2 No.HES in line bay 401 89A	We would like to inform you that, In customer SLD For line bays 2 HES are shown. HES are used to earth the residual charge in lines, Hence HES is only required at the line side then after DS only Maintenance ES is sufficient for operation, HES is not required. Kindly accept.	Requirement of high speed earthswitch shall be as per customer approved Single Line Diagram attached with Technical Corrigendum-01. Bidder to provide the same.
8	NIT (annexure - BOQ for 400kV)	BOQ-Sl. no. A17	Supply of Earthing material for 400kV GIS including high frequency earthing material.	Please note for our GIS, high frequecy is not required, We shall provide GIS related earthing material only upto earth riser	Please comply the requirement of Technical Specification and BOQ.
9	Price bid format& NIT (annexure - BOQ for 400kV)	BOQ- Sl. no. B9	Special tools requirement	We observed discrepancy for Mandatory maintenance equipment BOQ between Price bid format sheet & NIT-BOQ we are considering as per NIT BOQ Kindly confirm	Noted. Please comply the TS BOQ.

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Sl. No	TS ref. Clause/	TS ref. Doc. No./	Ref. Doc./ Clause description						n		Deviations/ clarifications sought by bidders	Clarifications/ confirmations provided by
	Doc. No.	Clause No.										BHEL/ Customer
10	SLD (TB-429-316- 001		 Core No.	/ GIS CTA/ CTA	Output Burden (VA) at lowest Tap	Minimum KPV (Volts) 6000-4000-2000 6000-4000-2000	Max le (mA) at KPV 20-30-60 20-30-60	Maximum Ret (Ohms) 15-10-5 15-10-5	Accuracy Class PS PS 0.2s, ISF ≤ 5	Protection Protection Protection Metering	We would like to inform that, generally Knee point voltage (Vk) value for current transformer shall be same for each current ratio tap ex. For CT ratio 3000/2000/1000/1A the Vk values will be 3000V, 2000V, 1000V We hyosung have executed NTPC project by considering Vk values as stated above, Kindly confirm.	Please refer customer approved Single Line Diagram attached with Technical Corrigendum-01.



एन टी पी सी लिमिटेड (भारत सरकार का उद्यम) NTPC Limited (A Govt. of India Enterprise) (Formerly National Thermal Power Corporation Ltd.) (केंद्रीय कार्यालय नोएडा) Corporate Center NOIDA

From: PUNEET SHARMA To: BHEL PEM, NOIDA

SENIOR MANAGER

Cc:

Subject: EPC package of Singrauli Stage-III

Please find enclosed following drawings/ documents for necessary action at your end.

Vendor Drg. No.: TB-429-316-001

Orgn. Drg. No. : 1150-001-230-PVE-P-001

Revision No. : 01

Drg. Title : SINGLE LINE DIAGRAM FOR SWITCHYARD

App. Category : CAT-I

Comments

Release Date : 27/11/2024

Document to be updated on finalization of transmission lines & Wavetrap details and in case

of any changes.



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Sharama

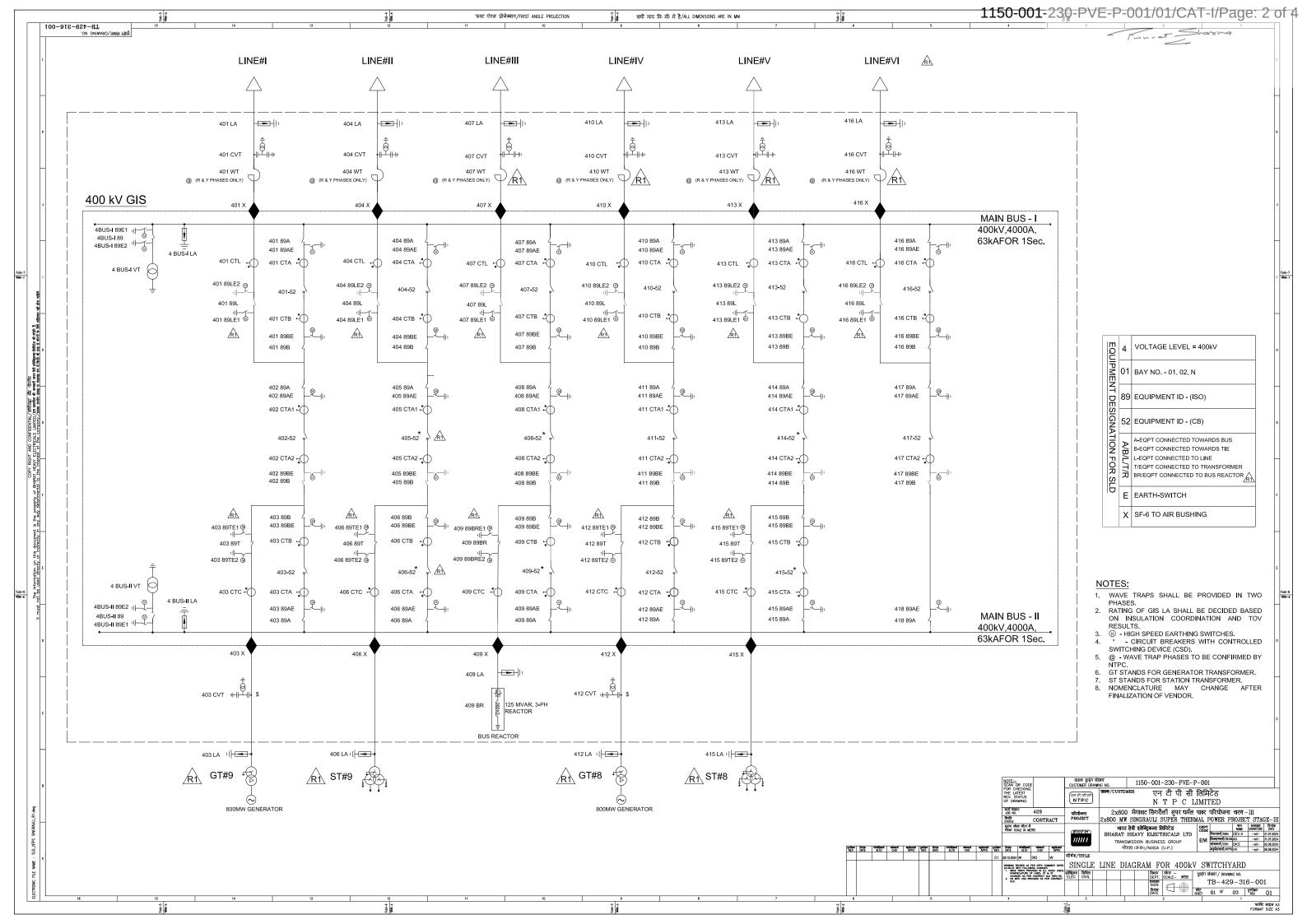
PROJECT: 400kV GIS SWITCHYARD: 2X800MW SINGRAULI THERMAL POWER PROJECT (STAGE-III)

<u>Comments Resolution Sheet</u> <u>CRS No.:NTPC/SINGRAULI/TBG/SLD/Rev00</u>

DATE: 28.10.24

DOCUMENT TITLE: Single Line Diagram for 400kV Switchyard

SI. no.	NTPC Comments	BHEL Reply
1	NTPC Drawing No. to be corrected	Noted & corrected in revised drawing.
2	Nomenclature of Lines & GT/ ST to be corrected as per Annexure to Ammendment-2 SLD Rev-B.	Noted & corrected in revised drawing.
3	Wave Traps to be indicated in every line. Wave Trap in two phases of line side to be confirmed later at detailed engineering stage.	Noted & Wave Traps provided in all lines. For phases of Wave Traps, a note is already mentioned in the drawing.
4	Main Bus rating: 4000A. Reference to be provided.	4000A normal current rating considered as per contract SLD.
5	As per tender document disconnector with two High speed Earth Switch to be provided. Provide explaination.	High speed ES provided on both side as per contract SLD.
6	CB with CSD to be provided in bay 405 rather then 402. Please refer tender document.	Noted & corrected in revised drawing.
7	Please recheck the location of this metering CT wrt tender document and state reason.	As per general practice, the metering CTs are provided after the line/ Transformer side disconnector. Same philosophy is being followed. There shall not be any fuctional discrepancy wrt that shown in tender SLD. Thus the same may kindly be approved.
8	Reason for change in position of Bus Reactor to be specified.	As per tender SLD, Bus Reactor was indicated in the diameter that included Line-1 & GT-9, ST-9 were shown with line 2 & 3 respectively. However, to accommodate the space available in the Switchyard area and for better accessibility of Reactor for maintenance and future withdrawal, BHEL has proposed to change the bay sequence. As all the Bus Reactor, GT & ST are still in the diameters with Lines at the other end, there shall be not be any functional disadvantage wrt the tender SLD bay sequence.
9	Wave Trap phases to be intimated later on finalization by NTPC.	Noted. Same is already mentioned in notes.
10	If any additional LA are required as per the study, same shall be incorporated.	Adequacy of rating/ number of LAs shall be as per the insulation coordination study done by GIS manufacturer. Same shall be done for this project and any changes, if required shall be incorporated. However, for completing the study, BHEL will need the basic input data/ grid data from NTPC during detailed engineering. NTPC to ensure that the data is provided at that stage.
11	The rated burden of cores shall be closer to the maximum burden requirement of metering and protection system for better sensitivity and accuracy .The supporting calculation for burden to be furnished during detail engineering.	Noted. Burden calculations shall be submitted during detailed engineering stage.



| Sign 4841/DRAMING NO. | TB-429-316-001

400kV OUTDOOR EQUIPMENT

S.NO.	DESCRIPTION	SYMBOL	BAY NO./LOCATION	UNIT	QUANTITY
1	125 MVAR BUS REACTOR - 3PH	<u>}</u>	409 BR	SET	1
2	336 kV LIGHTNING ARRESTER - 1PH	<u> </u>	401 LA, 403 LA, 404 LA, 406 LA, 407 LA, 409 LA, 410 LA, 412 LA, 413 LA, 415 LA, 416 LA	NO.	33
3	400kV, 8800pF LINE CAPACITIVE VOLTAGE TRANSFORMER - 1PH.		401 CVT, 404 CVT, 407 CVT, 410 CVT, 413 CVT, 416 CVT	NO.	18
4	400kV, 4400pF CAPACITIVE VOLTAGE TRANSFORMER FOR GT BAYS - 1PH	- - 	403 CVT, 412 CVT	NO.	06
5	400kV, 3150A, 1/ 0.5mH PEDESTAL MOUNTED WAVE TRAP - 1PH		401 WT, 404 WT, 407 WT, 410 WT, 413 WT, 416 WT	NO.	12
6	400kV SF6 TO AIR BUSHING - 1PH	♦	401 X, 403 X, 404 X, 406 X, 407 X, 409 X 410 X, 412 X, 413 X, 415 X, 416 X	NO.	33

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400kV INDOOR GIS EQUIPMENT

S.NO.	DESCRIPTION	SYMBOL	BAY NO./LOCATION	UNIT	QUANTITY	
1	400kV, 3150 A, 63kA FOR 1 SEC, CIRCUIT BREAKER WITH CONTROLLED SWITCHING - 3PH	• <u>*</u> ×	405 52, 406 52, 408 52, 409 52, 414 52 ,415 52	SET	06	Æ
2	400kV, 3150 A, 63kA FOR 1 SEC, CIRCUIT BREAKER WITHOUT CONTROLLED SWITCHING - 3PH	•—×—•	401 52, 402 52, 403 52, 404 52, 407 52, 410 52, 411 52, 412 52, 413 52, 416 52, 417 52	SET	11	Æ
3	400kV, 3150 A, 63kA FOR 1 SEC, DISCONNECTOR WITH ONE EARTH SWITCH - 3PH		401 89A, 401 89B, 402 89A, 402 89B, 403 89A, 403 89B, 404 89A, 404 89B, 405 89B, 406 89B, 406 89B, 407 89B, 408 89B, 408 89B, 408 89B, 409 89B, 409 89B, 410 89B, 410 89B, 411 89B, 411 89B, 412 89B, 412 89B, 413 89B, 413 89B, 414 89A, 414 89B, 415 89A, 415 89B, 416 89B, 417 89B, 417 89B, 418 89A	SET	35	R
4	400kV, 3150 A, 63kA FOR 1 SEC, DISCONNECTOR WITH TWO EARTH SWITCHES - 3PH		403 89T, 406 89T, 409 89BR, 412 89T, 415 89T, 4BUS-I 89, 4BUS-II 89	SET	07	Æ
5	400kV, 3150 A, 63kA FOR 1 SEC, DISCONNECTOR WITH TWO HIGH SPEED EARTH SWITCHES -3PH		401 89L, 404 89L, 407 89L, 410 89L, 413 89L 416 89L	SET	06	Æ
6	400kV, 3000A, 63kA FOR 1 SEC, CURRENT TRANSFORMER (CT-A: 3 CORE) - 1PH	.	401 CTA, 402 CTA1, 402 CTA2, 403 CTA, 404 CTA, 405 CTA1, 405 CTA2, 406 CTA, 407 CTA, 408 CTA1, 408 CTA2, 409 CTA, 410 CTA, 411 CTA1, 411 CTA2, 412 CTA, 413 CTA, 414 CTA1, 414 CTA2, 415 CTA, 416 CTA, 417 CTA2	NO.	66	Æ
7	400kV, 3000A, 63kA FOR 1 SEC, CURRENT TRANSFORMER (CT-B: 2 CORE) - 1PH	<u>.</u>	401 CTB, 403 CTB, 404 CTB, 406 CTB, 407 CTB,409 CTB, 410 CTB, 412 CTB, 413 CTB, 415 CTB, 416 CTB	NO.	33	
8	400kV, 3000A, 63kA FOR 1 SEC, METERING CURRENT TRANSFORMER (CT-C: 1 CORE) - 1PH	.	403 CTC, 406 CTC, 409 CTC, 412 CTC, 415 CTC	NO.	15	
9	400kV, 3000A, 63kA FOR 1 SEC, CURRENT TRANSFORMER (CT-L: 4 CORE) - 1PH	.	401 CTL, 404 CTL, 407 CTL, 410 CTL, 413 CTL, 416 CTL	NO.	18	
8	400kV BUS VOLTAGE TRANSFORMER (3 SECONDARY) - 1PH	•——	4BUS-I VT, 4BUS-II VT	NO.	06	
10	BUS SURGE ARRESTER - 1PH	<u> </u>	4BUS-I LA, 4BUS-II LA	NO.	06	

MAIN SYSTEM PARAMETERS

1. NOMINAL VOLTAGE	-	400kV
2. HIGHEST SYSTEM VOLTAGE	-	420kV rms
3. RATED FREQUENCY	-	50 HZ
4. RATED SHORT TIME CURRENT	-	63kA FOR 1 SEC
5. POWER FREQUENCY WITHSTAND VOLTAGE	-	650 kVrms
6. LIGHTNING IMPULSE WITHSTAND VOLTAGE	-	± 1425 kVpeak
7. SWITCHING IMPULSE WITHSTAND VOLTAGE	-	± 1050 kVpeak
8. CREEPAGE	-	31mm/kV (13020 MM)

NOTES:

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- 1. WAVE TRAPS SHALL BE PROVIDED IN TWO PHASES. PHASES TO BE CONFIRMED BY NTPC.
- 2. RATING OF GIS LA SHALL BE DECIDED BASED ON INSULATION COORDINATION AND TOV
- 3. EARTHING SWITCHES MARKED WITH \oplus ARE HIGH SPEED EARTHING SWITCHES.
- 4. CIRCUIT BREAKERS MARKED WITH * ARE BREAKERS WITH CONTROLLED SWITCHING DEVICE (CSD).
- 5. GT STANDS FOR GENERATOR TRANSFORMER.
- 6. ST STANDS FOR STATION TRANSFORMER.
- 7. NOMENCLATURE MAY CHANGE AFTER FINALIZATION OF VENDOR.

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400kV GIS CT DETAILS

Core No.	Current Ratio	Output Burden (VA)	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	3000-2000-1000/1 A	-	6000-4000-2000	20-30-60	15-10-5	PS	Protection
2	3000-2000-1000/1 A		6000-4000-2000	20-30-60	15-10-5	PS	Protection
400k V	GIS CTB						
Core No.	Current Ratio	Output Burden (VA)	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	3000-2000-1000/1 A	24	6000-4000-2000	20-30-60	15-10-5	PS	Protection
2	3000-2000-1000/1 A	-	6000-4000-2000	20-30-60	15-10-5	PS	Protection
	GIS CT-C (GT/	017 000 1	TENO I OIL OI				
Core No.	Current Ratio	Output Burden (VA)	Minimum KPV (Volts)	Max Ie (mA) at KPV	Maximum Rct (Ohms)	Accuracy Class	Purpose
1	Current Ratio 3000-2000-1000-500/1 A GIS CTL (400K	Burden (VA) 20/20/20/20	(Volts)	Max Ie (mA) at			Purpose
1	3000-2000-1000-500/1 A	Burden (VA) 20/20/20/20	(Volts)	Max Ie (mA) at KPV	(Ohms)	Class	-
1 400kV	3000-2000-1000-500/1 A GIS CTL (400K	Burden (VA) 20/20/20/20 (V LINE SI Output Burden (VA)	(Volts) - DE) Minimum KPV	Max Ie (mA) at KPV - Max Ie (mA) at	(Ohms)	Class 0.2s, ISF < 5 Accuracy	Metering
1 400kV Core No.	3000-2000-1000-500/1 A GIS CTL (400K Current Ratio	Output Burden (VA) Output Burden (VA) at lowest Tap	(Volts) - DE) Minimum KPV (Volts)	Max Ie (mA) at KPV - Max Ie (mA) at KPV	(Ohms) - Maximum Ret (Ohms)	Class 0.2s, ISF < 5 Accuracy Class	Metering
1 400kV Core No.	3000-2000-1000-500/1 A GIS CTL (400K Current Ratio	Burden (VA) 20/20/20/20 (V LINE SI Output Burden (VA) at lowest Tap	(Volts) - DE) Minimum KPV (Volts) 6000-4000-2000	Max Ie (mA) at KPV - Max Ie (mA) at KPV 20-30-60	(Ohms) - Maximum Rct (Ohms)	O.2s, ISF < 5 Accuracy Class	Purpose Protection

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NOTES

- 1. RATED EXTENDED PRIMARY CURRENT OF THE CURRENT TRANSFORMERS SHALL BE 120% CONTINUOUS OF 3000A.
- 2. FOR VTs THE ACCURACY OF 0.2 ON SECONDARY III SHOULD BE MAINTAINED THROUGHOUT THE ENTIRE BURDEN RANGE UP TO TOTAL SIMULTANEOUS BURDEN OF 50VA ON ALL THE THREE WINDINGS WITHOUT ANY ADJUSTMENTS DURING OPERATION.
- 3. PHYSICAL ARRANGEMENT OF CURRENT TRANSFORMERS SHALL BE AS PER PROTECTION SLD/ GIS MANUFACTURER'S RECOMMENDATION.

400kV GIS VT DETAILS

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CORE DETAILS OF 400kV VTs (GIS)					
SECONDARY WINDING	APPLICATION	RATED SECONDARY VOLTAGE (V)	ACCURACY	RATED SECONDARY. BURDEN (VA) MINIMUM	
I	PROTECTION	110/v3	3P	50	
II	PROTECTION	110/v3	3P	50	
III	METERING	110/√3	0.2	50	

400kV AIS CVT DETAILS

1001171120					
CORE DETAILS OF 400kV CVTs (AIS) - OUTDOOR Capacitance(Nominal) = 8800pF / 4400pF					
SECONDARY MINDING APPLICATION RATED SECONDARY VOLTAGE (V) RATED SECONDARY BURDEN (VA) MINIMUM					
1	PROTECTION	110/v3	3P	50	
II PROTECTION 110/v3 3P 50					
III	METERING	110/v3	0.2	50	
IV	ABT METERING	110/v3	0.2	50	

| NOTE:- SCAN OR CODE FOR CHECKING | 1150-001-230-PVE-P-001 | 1150-001

Comments Resolution Sheet

CRS No.:NTPC/SINGRAULI/TBG/ELEC LAYOUT/Rev00

Date

05.11.24

Sl. no.	NTPC Comments	BHEL Reply
1	The minimum sizing criteria of the control room and GIS building shall be as	Details of GIS building, associated rooms like Maintenance room, toilet etc
	given below:	and Control Room Building details are mentioned in separate drawings.
	i) The GIS building shall be adequately designed so as have a passage of 2.0	Following drawings may kindly be referred,
	m on either side and adequate overhead clearance for the movement of	i) 1150-001-230-PVC-C-006 : GIS BUILDING - GA & ARCHITECTURAL PLAN,
	equipments without any obstruction, from the top of the GIS equipment to	ELEVATION AND SECTIONS
	EOT Crane. The GIS Control Room Building shall have with provision of	
	Switchgear room, Battery room, charger room, office, cable vault, SAS room,	POINTS NOTED: Adequate clearances have been ensured as per contract
	Lab room, CRP Panel room, conference room, Pantry, toilet etc.	specification. Further, the GIS supplier is under finalization, all details with
	The GIS & control room building is to be designed keeping future provision	GIS euipment layout shall be submitted later stage.
	for extension if any as shown in the Single line diagram. The GIS building	
	shall have adequate provision (at least 4.0m) for maintenance bay shall be	For Control Room Building a separate drawing shall be submitted 1150-001-
	provided one side of GIS building considering the future provision for GIS	230-PVC-C-001 : SWITCHYARD CONTROL ROOM BUILDING - ARCHITECTURAL
	extension.	PLAN AND ELEVATION.
	ii) Maintenance room (as a part of GIS building) shall be constructed for	
	carrying out repair works / small part assembly, storage of material, test	ii) Noted and complied.
	equipment and tools and tackles to be	
	stored separately from GIS hall in this room.	iii) Noted and complied.
	iii) GIS building shall have with provision of Toilet room etc	
2	Road between switchyard and Transformer yard should be of 7.5m width	This drawing is meant only for Switchyard area. The road outside switchyard
		on transformer yard side shall be shown in separate Transfromer yard
		layout. The details may be referred from that drawing.
3	All UT, UAT, GT, ST Naming to be corrected w.r.t. Unit#8 & Unit#9	Details of GT, ST, UT & UAT shall be shown in separate Transfromer yard
		layout.
4	Line numbering to be done as per Ammended SLD Rev B	Noted & incorporated.

Comments Resolution Sheet

CRS No.:NTPC/SINGRAULI/TBG/ELEC LAYOUT/Rev00

Date

05.11.24

Sl. no.	NTPC Comments	BHEL Reply
5	 Please mark Dimension for each & every Room. Please indicate SAS Room. 	Marked in revised drawing. However for more details of Control Room Building a separate drawing shall be submitted 1150-001-230-PVC-C-001: SWITCHYARD CONTROL ROOM BUILDING - ARCHITECTURAL PLAN AND ELEVATION
6	 Indicate plant boundary and patrol road passing along switchyard area. Also indicate clearance available b/w switchyard fencing and patrol road at areas with less margin. 	These details shall be part of overall Plot Plan drawing of complete Power station. Please refer the same.
7	Road along circumference of switchyard is intermedite road. As per tender it should be of 5.5m width	The mentioned road of 5.5m width is meant for outside switchyard on the outer periphery. For Switchyard, as per contract specification, VII_Part_B_CIVIL_SECTION-VI, clause no. 5.10.02 - "All access roads to all buildings / facilities / structures, road approaches / connections, access roads to liquid fuel storage areas and other equipment areas where access is necessary from inspection, operation and maintenance point of view and all roads inside the switchyard shall be single lane roads as given in tender drawing "Details of road". Single lane road as per "Details of road" is of 3.75m width with shoulders of 1m on both side. Same has been provided in the layout drawing of Switchyard. Same road is also provided in other NTPC projects like Lara and North Karanpura. We thus request NTPC to approve the same.
8	Correct the symbol as indicated in layout - for Wave Trap	Noted & incorporated.

Comments Resolution Sheet

CRS No.:NTPC/SINGRAULI/TBG/ELEC LAYOUT/Rev00

Date 0

05.11.24

Sl. no.	NTPC Comments	BHEL Reply
9	what is this ?	That was a hydra crane shown for checking the availability of space between various GIBs for future maintenance. Same is now deleted from layout.
10	Indicate approach road to unloading platform & GIS Hall	Noted & incorporated.
11	Indicate Dimension of Maintainance Area	It is of minimum 4m as per contract specification. All the details inside building cannot be shown in this switchyard layout due to legibility constraints. However, these details will be part of GIS layout- indoor (to be submitted after finalization of GIS supplier). Please note that the building dimensions shall remain as per the above mentioned drawing no. 1150-001-230-PVC-C-006: GIS BUILDING - GA & ARCHITECTURAL PLAN, ELEVATION AND SECTIONS.
12	25m turning radius is required at this main road turn to facilitate entry of trailer carrying generator stator. Location of fencing & gate may be revised accordingly.	In line with comment, the location of Main Gate-1 is changed for better accessibility inside switchyard and to avoid steep turning of trailer.
13	What does this boundary indicate ?	That is not a boundary but the double lane road between Switchyard and Transformer yard. Details may be referred from separate transformer yard drawing.
14	Indicate Dimension of VFD Room.	These details are not Switchyard related and separate transformer yard
15	Indicate road coordinate near Gate-1.	drawing may kindly be referred for the same. We have updated the details
16	Same identification number for 2 locations.	as per the latest Transformer yard drawing.
17	Naming to be done.	
18	Rails to be extended till here for access to both maintenance bays	
19	Adequate clearance to be ensured for AIS between guard wire on gantry and phase conductors and also between different phase conductors of adjacent systems.	Noted. As per contract specification, the stringing of conductor at A-row shall be at 22m height from Transformer yard FGL & the stringing height of Earth wire shall be at 22m + 8.5m on A-row.
20	In case of any changes in SLD, same to be updated in layout.	Noted.
21	Individual sump pits for transformers and their connection to common oil pit for the unit to be marked.	These details are not Switchyard related and separate transformer yard drawing may kindly be referred for the same. We have updated the details as per the latest Transformer yard drawing.

Comments Resolution Sheet

CRS No.:NTPC/SINGRAULI/TBG/ELEC LAYOUT/Rev00

Date 05.11.24

Sl. no.	NTPC Comments	BHEL Reply
22	The transformer firewall, pit sizing and clearances from adjacent building/structures etc. shall be as per IS 1646/CBIP manual on Transformer	Noted. These details are not Switchyard related and separate transformer yard drawing may kindly be referred for the same. We have updated the details as per the latest Transformer yard drawing.
23	The pit size of reactors shall be designed for minimum 1000mm beyond the physical dimension of the reactor.	Soak pit details shall be part of Civil Foudation drawing of 125MVAR Reactor and shall be submitted separately. However, we confirm that the pit is designed for minimum 1000mm beyond the physical dimension of the Reactor.
24	Rolling shutter provision in ventilation room.	Ventilation room for GIS will be provided with fire proof steel doors opening outwards. Being positively pressurized room, rolling shutter is not advisable as per standard practice followed for all major central & state utilities, including NTPC.
25	All 'T' off connections at 'A' row of TG Building associated with transformers shall be provided with a bye pass utilizing two PG clamps for each T off. As far as possible the conductor shall pass without cut/joint unless otherwise necessary for planned shutdown/maintenance.	Noted & confirmed. Same shall be shown in separate EKD drawing of Switchyard.
26	Reference drawings/documents to be listed	Noted & incorporated.
27	Indicate soak-pit for reactor	Indicated in revised drawing
28	Spacing between GIBs of two systems to be reviewed to allow approach for maintenance.	Noted. Best possible arrangement as per the available space for Switchyard has been done.
29	One no(1no) suitable industrial socket and suitable power cable for oil filtration equipment for Bus reactor shall be provided	Shall be part of Illumination system package & shall be shown in Illumination layout.
30	Suitable drain arrangement inside switchyard area shall be provided and connection of switchyard drain outlet with outside main drain shall be done so that no water accumulation inside switchyard area occurs.	It shall be part of civil drain layout to be submitted separately.

Comments Resolution Sheet

CRS No.:NTPC/SINGRAULI/TBG/ELEC LAYOUT/Rev00

Date

05.11.24

Sl. no.	NTPC Comments	BHEL Reply
31	Each equipment room shall be provided with alternate exits in case of fire/accidents as per requirements of factory act and TAC. Further minimum two number fireproof double door shall be provided in Cable vaults, switch gear room.	Doors & windows shall be as per the civil architectural drawings of building submitted/ to be submitted separately. Same may kindly be referred.
32	Battery room shall be properly ventilated to release the gases produced. No roof openings leading to electrical / C & I panels shall be allowed. An easily accessible wash basin with mirror shall be provided in the battery room. The enclosure of battery room shall be of brick wall.	Details shall be as per the civil architectural drawings of building submitted/to be submitted separately. Same may kindly be referred.
33	Handling space and approach for equipment and panels in GIS control room building to be ensured based on largest size of equipment.	Noted.
34	Indicate paths approach to different bay equipments in AIS and for GIBs	Switchyard is GIS with road approaches already provided for GIS building, Control Room building and Bus Reactor.
35	Angle of conductors from A-row to Gantry and Gantry to Gantry to be minimized	As per contract specification, A provision of \pm 30 degree angle of deviation of line in horizontal plane and \pm 20 degree deviation in vertical plane is considered and the resulting worst combination of forces shall be considered for design. Same has been ensured.
36	Panel mounted automatic start / stop type centrifugal self-priming pump for sump pit to drain the water in approximately one (1) hour shall be provided along with suitable pedestal / foundation for this pump. The pump shall be complete with all necessary fittings such as NRV, inlet & outlet pipes of suitable length and dia. The out door cable trenches shall be connected to common sump pit with necessary slope shall be maintained. In side GIS building, Switchyard MCC room, control room etc for cable trenches, panel mounted automatic start / stop type centrifugal self-priming pump shall be provided to drain the water in approximately one (1) hour.	Noted. Pump as per specification shall be provided for draining water from cable trenches. Details of same shall be finalized in detailed civil engineering.
37	All comments marked on plot plan 1150-001-301-POC-F-001, PE-DG-512-100-M001, PLOT PLAN (GLP) REV 0A to be incorporated.	Noted

Comments Resolution Sheet

CRS No.:NTPC/SINGRAULI/TBG/ELEC LAYOUT/Rev00

Date

05.11.24

SI. no.	NTPC Comments	BHEL Reply
38	Rail Lines not marked in front of ST-1 & ST-2. Rail track shall be provided in Transformer yard for movement of each transformer. The rail track in Transformer yard shall be connected with TG area rail track The Foundation top of transformer & rail top shall be at EL +/- 0.0M. Bus duct support or Transformer body shall be at least 8.0M from A-Row of TG building to clear the movement of GT/ Stator/UT/ST/UAT on rail line.	These details are not Switchyard related and separate transformer yard drawing may kindly be referred for the same. We have updated the details as per the latest Transformer yard drawing.
39	Transformers may foul with gantry. Clearances to be ensured. Movement of GT/ST shall be such that the same can be moved with bushing installed.	We have checked the clearances (both electrical & physical) of near transformers and also for LA & BPI. At critical location the electrical clearance is also marked. Transformer withdrawal is done without radiator and bushings and only the main tank is moved. Accordingly sufficient clearance is available.
40	Bus reactor Rail Line to be connected to main rail line.	Noted & incorporated.
41	Provisioning of space for Structured Lightning Cum Lighting Masts or Structured Lighting Masts / towers for lighting in AIS to be ensured.	Same will be finalised as per approved DSLP calculations.
42	Phase sequence depicted on line side need to be reviewed	Line side phase sequence is tentative and shall be confirmed by GIS supplier Will be finalised during detailed engineering. NTPC to also ckeck the phase sequence with their TL contractor and inform the same to BHEL.
43	Foundation of LA/BPI in path of rail track for transformers to be taken care to not foul with respective transformers during erection / withdrawal	LA & BPI structures in transformer yards are removable type. This practice is followed for all NTPC projects.
44	Layout of facilities and equipment shall allow removal of Generator Stator, Generator transformers, Station & Unit transformers without disturbing equipment, piping, cabling, ducts routed in the area.	This comment is not Switchyard related and separate transformer yard drawing may kindly be referred for the same. We have updated the details as per the latest Transformer yard drawing.

Comments Resolution Sheet

CRS No.:NTPC/SINGRAULI/TBG/ELEC LAYOUT/Rev00

Date

05.11.24

Sl. no.	NTPC Comments	BHEL Reply
45	In transformer yard cables shall be laid in overhead trestle. The main cable routes coming out from Main plant building and crossing the Transformer yard shall be laid in overhead trestles. In transformer yard, trestle height for rail/road crossing shall be suitable for movement of Generator Transformer with bushing. Trestle to be marked and clearances to be ensured.	This comment is not Switchyard related and separate transformer yard drawing may kindly be referred for the same. We have updated the details as per the latest Transformer yard drawing.
46	Associated facilities like Jacking pads, mooring posts etc., shall be provided to facilitate the movement of Generator transformers, Station and Unit transformers to the maintenance bay. Jacking pads shall be provided where the rail track changes the direction. Jacking pad shall also be provided at the location of installation of transformer and mooring post shall be provided on rail track for handling the transformers.	This comment is not Switchyard related and separate transformer yard drawing may kindly be referred for the same. We have updated the details as per the latest Transformer yard drawing.
47	Fencing for transformers to be ensured.	This comment is not Switchyard related and separate transformer yard drawing may kindly be referred for the same. We have updated the details as per the latest Transformer yard drawing.
49	Indicate BHEL drawing number also as per MDL	Noted & incorporated.
50	Wave traps in two phases of line side to be confirmed later at Detailed Engineering after confirmation of power Evacuation System.	Note mentioning the same is already incorporated at Sl. No. 3.
51	To be finalized based on site requirement for transmission line tower	Location of take-off gantries in Switchyard are already shown and finalised at our end as per the GIS layout. In case there is any change of location of Dead end TL towers, NTPC to inform the same well in advance. Foundations of line side equipments (LA, BPI, WT & CVT) shall be kept ON HOLD till NTPC gives the co-ordinates of Dead End towers. Please understand that the space availability in Switchyard is very less and any slight change in the location of take-off gantries may have a major impact on the overall Switchyard layout.

Comments Resolution Sheet

CRS No.:NTPC/SINGRAULI/TBG/ELEC LAYOUT/Rev00

Date 05.11.24

Sl. no.	NTPC Comments	BHEL Reply
52	In case any changes are required based on site requirements same to be	We have considered Quad Moose conductor in line for design of take -off
	incorporated.	switchyard gantries. However, NTPC shall confirm the actual line conductor
		details during detailed engineering for finalizing the dropper types on LA,
		BPI, Wave trap etc.
53	Indicate FGL level.	Noted & incorporated.
54	Layouts of GIS & CRB yet to be submited	Layout of GIS building drg. No. 1150-001-230-PVC-C-006 : GIS BUILDING - GA
		& ARCHITECTURAL PLAN, ELEVATION AND SECTIONS may kindly be referred.
55	LT Bus Duct	As per contract specification, LT Bus Duct in Switchyard shall be provided
		only if the LT Transformer rating for Switchyard is 1000kVA or above. For
		lower ratings, cable connections are acceptable. We shall be submitting LT
		Transformer sizing and the connection between Transfromer & LT
		Switchgear will be decided based on the rating of transformer.

