

SPECIFIC REQUIREMENT'S (Section- Project)
C/ENGG/SPEC/SEC-PROJECT/SPECIFIC REQUIREMENT REV NO 02

Employer has standardized its Specific Requirement for various equipments and works for different voltage levels. Items or clauses, which are not applicable for the scope of this package as per schedule of quantities described in BPS or as per scope defined elsewhere in Section Project, the technical specification/clauses for the items specified below should not be referred to.

S.No.	Model Section & Clause No.	Amended As
1.	Section GTR Rev 14 Para 1 at Clause No.24	<u>Technical Requirements of Equipment's</u> Following equipment shall be offered from the Indian manufacturing facilities meeting the technical requirements as stipulated below, provided that the same equipment are not covered under the Bidder's Qualifying requirement of the Bidding Documents.
2.	Section GTR Rev 14 Clause No. 24.19	<u>Technical Requirement of Communication Equipment</u> The SDH equipment shall be offered from a manufacturer(s) who is a "Local Supplier" as per DPIIT PP notification & has been Manufacturing SDH equipments for the last three (3) years and SDH equipment Manufactured by such manufacturer(s) shall have been satisfactory operation in 110kV or higher voltage Power Substations for at least two (2) years as on the date of NOA.
3.	Section GTR Rev 14 New Clause No. 24.21	<u>Technical Requirement of Sub-contractor for 765kV & 400kV GIS packages:</u> In case of Indian GIS manufacturer, the erection, testing & commissioning including civil works shall be executed either by the bidder himself or by the Subcontractor meeting the following technical requirement: The bidder/Subcontractor must have erected, tested and commissioned at least two (2) nos. GIS/AIS Circuit breaker equipped bays of 345kV or above voltage level in one (1) substation or switchyard during the last seven (7) years and these bays must be in satisfactory operation# as on the date of NOA. Further, the sub-contractor shall also meet the requirement specified at Clause No. 24.23 of this section.
4.	Section GTR Rev 14 New Clause No. 24.22	<u>Technical Requirement of Sub-contractor for 220/132/66 kV* level GIS/Hybrid GIS/MTS packages:</u> In case of Indian GIS manufacturer, the erection, testing & commissioning including civil works shall be executed either by the bidder himself or by the Subcontractor meeting the following technical requirement: The bidder/Subcontractor must have erected, tested and commissioned at least two (2) nos. GIS/Hybrid GIS/MTS/AIS Circuit breaker equipped bays@ of 220/110/66kV* or above voltage level in one (1) substation or switchyard during the last seven (7) years and these bays must be in satisfactory operation# as on the date of NOA. Further, the sub-contractor shall also meet the requirement specified at Clause No. 24.23 of this section. Note: 1. (*) voltage class of respective equipment as applicable

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		<p>2. (@) For the purpose of technical requirement, one no. of circuit breaker bay shall be considered as a bay used for controlling a line or a transformer or a reactor or a bus section or a bus coupler and comprising of at least one circuit breaker, one disconnecter and three nos. of single phase CTs / Bushing CTs. GIS means SF6 Gas insulated Switchgear, Hybrid GIS means outdoor SF6 Gas insulated switchgear connected to outdoor Air insulated bus-bar System (AIS bus-bars System), MTS means outdoor SF6 Gas insulated Mixed Technology Switchgear connected to outdoor AIS bus bar system.</p> <p>3. Combination of GIS CB bay, Hybrid GIS CB Bay & MTS CB Bay is also acceptable</p>
<p>5.</p>	<p>Section GTR Rev 14</p> <p>New Clause No. 24.23</p>	<p><u>Technical Requirement of Sub-contractor:</u></p> <p>1. The sub-contractor must have either of the following experience of having successfully completed similar works during last 7 years as on the last day of month previous to the one in which the sub-contractor is proposed to be engaged:</p> <p>a) Three similar works costing not less than the amount equal to 40% of the cost of the work to be sub-contracted.</p> <p align="center">OR</p> <p>b) Two similar works costing not less than the amount equal to 50% of the cost of the work to be sub-contracted.</p> <p align="center">OR</p> <p>c) One similar work costing not less than the amount equal to 80% of the cost of the work to be sub-contracted.</p> <p>2. Minimum Average Annual Turnover **(MAAT) for best three years i.e. 36 months out of last five financial years of the sub-contractor should be.....:</p> <p>**Annual Gross Revenue from operations/ Gross operating income as incorporated in the profit & loss account excluding Other Income.</p> <p>Note:</p> <p>a) Similar work shall mean the work which are of similar in nature to the work to be sub-contracted e.g. for the scope of civil work to be sub-contracted, the experience should be of civil work.</p> <p>b) The aforesaid qualifying requirement shall however, not be applicable for engaging labour as per extant policy.</p> <p>c) The cost of the work to be sub-contracted shall be considered as available in the Contract Agreement. However, if the value is not available in the Contract Agreement, the same shall be the estimated value for such work.</p> <p>d) The above criteria is in addition to extant policy on selection of sub-contractor as per WPPP, Vol-II.</p>

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		<p>e) The MAAT requirement shall be worked out basis the following formula:</p> $\frac{\text{Minimum Average Annual Turnover (MAAT)}}{\text{Completion period in years}} = \text{Cost of the work to be sub-contracted} \times 1.5$ <p>**The completion period shall be considered as 1 year even if the same is less than 1 year.</p>
<p>6.</p>	<p>Section GTR Rev 14</p> <p>New Clause No. 24.24</p>	<p><u>Technical Requirement for 400kV GIS Equipment</u></p> <p>(i) The manufacturer whose 400kV GIS bays are offered must have designed, manufactured, type tested** (as per IEC or equivalent standard), supplied and supervised erection & commissioning of at least two (2) nos. Gas Insulated Switchgear (GIS) circuit breaker bays@ of 345kV or above voltage class in one (1) Substation or Switchyard during the last seven (7) years and these bays must be in satisfactory operation# for at least two (2) years as on the date of NOA.</p> <p>(ii) Alternatively, the manufacturer, who have established manufacturing and testing facilities in India and not meeting the requirement stipulated in (i) above, can also be considered provided that</p> <p>a) Atleast one no. 345kV or above voltage class GIS Circuit Breaker bay@ must have been manufactured in the above Indian works based on the technological support of the Collaborator(s) and either supplied or type tested the above CB bay (as per IEC or equivalent standard) as on the date of NOA.</p> <p>b) The collaborator(s) meets the requirements stipulated in (i) above. A valid collaboration agreement for technology transfer / license to design, manufacture, test and supply 400kV or above voltage level GIS equipment in India, shall be submitted.</p> <p>c) The Collaborator(s) shall furnish performance guarantee for an amount of 10 % of the ex-works cost of such equipment(s) and this performance guarantee shall be in addition to Contract Performance Guarantee to be submitted by the bidder.</p> <p>Note :-</p> <p>(**) Type test reports of the collaborator/ parent company/ subsidiary company/ group company shall also be acceptable.</p>

7.	Section GTR Rev 14 New Clause No. 24.25	<p><u>Technical Requirement for 220/132/66 kV* level GIS/Hybrid GIS/MTS Equipment:</u></p> <p>(i) The manufacturer whose 220/132/66 kV* level GIS/Hybrid GIS/MTS bays are offered must have designed, manufactured, type tested** (as per IEC or equivalent standard), supplied and supervised erection & commissioning of at least two (2) nos. Gas Insulated Switchgear (GIS)/Hybrid GIS/MTS circuit breaker bays@ of 220/110/66kV* or above voltage class in one (1) Substation or Switchyard during the last seven (7) years and these bays must be in satisfactory operation# for at least two (2) years as on the date of NOA.</p> <p>(ii) Alternatively, the manufacturer, who have established manufacturing and testing facilities in India and not meeting the requirement stipulated in (i) above, can also be considered provided that</p> <p>a) Atleast one no. 220/110/66kV* or above voltage class GIS/Hybrid GIS/MTS Circuit Breaker bay@ must have been manufactured in the above Indian works based on the technological support of the Collaborator(s) and either supplied or type tested the above CB bay (as per IEC or equivalent standard) as on the date of NOA.</p> <p>b) The collaborator(s) meets the requirements stipulated in (i) above. A valid collaboration agreement for technology transfer / license to design, manufacture, test and supply 220/110/66*kV or above voltage level GIS/Hybrid GIS/MTS equipment in India, shall be submitted.</p> <p>c) The Collaborator(s) shall furnish performance guarantee for an amount of 10 % of the ex-works cost of such equipment(s) and this performance guarantee shall be in addition to Contract Performance Guarantee to be submitted by the bidder.</p> <p>Note:</p> <p>1. (*) voltage class of respective equipment as applicable</p> <p>2. (@) For the purpose of technical requirement, one no. of circuit breaker bay shall be considered as a bay used for controlling a line or a transformer or a reactor or a bus section or a bus coupler and comprising of at least one circuit breaker, one disconnecter and three nos. of single phase CTs / Bushing CTs. GIS means SF6 Gas insulated Switchgear, Hybrid GIS means outdoor SF6 Gas insulated switchgear connected to outdoor Air insulated bus-bar System (AIS bus-bars System), MTS means outdoor SF6 Gas insulated Mixed Technology Switchgear connected to outdoor AIS bus bar system.</p> <p>3. Combination of GIS CB bay, Hybrid GIS CB Bay & MTS CB Bay is also acceptable</p> <p>4. (**) Type test reports of the collaborator/ parent company/ subsidiary company/ group company shall also be acceptable.</p>
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<p>8.</p>	<p>Section GTR Rev 14</p> <p>Clause No. 24.2</p>	<p><u>Technical Requirement for 765kV class Transformer</u></p> <p>(i) The Manufacturer whose 765kV Transformer(s) are offered must have designed, manufactured, tested & supplied 715 kV or higher voltage class one (1) number 1-phase Transformer of at least 500 MVA capacity or at least three (3) numbers 1-phase Transformers each having a capacity of at least 166 MVA, and the same transformer (s) should have been in satisfactory operation# for atleast two (2) years as on the date of NOA.</p> <p>(ii) Alternatively, the manufacturer, who have established manufacturing and testing facilities in India and not meeting the requirement stipulated in (i) above, can also be considered provided that</p> <p>d) 715 kV or higher voltage class either One (1) no. 1-phase Transformer of at least 166 MVA capacity or One (1) no. 1-phase Reactor of at least 80 MVAR capacity must have been manufactured in the above Indian works based on technological support of collaborator, type tested (as per IEC/IS standard) and same should have been supplied as on the date of NOA.</p> <p>e) The collaborator meets the requirements stipulated in (i) above. A valid collaboration agreement for technology transfer / license to design, manufacture, test and supply 765kV transformer in India, shall be submitted.</p> <p>f) the collaborator shall furnish performance guarantee for an amount of 10% of the ex-works cost of such equipment(s) and this performance guarantee shall be in addition to contract performance guarantee to be submitted by the contractor.</p>
<p>9.</p>	<p>Section GTR Rev 14</p> <p>Clause No. 24.3</p>	<p><u>Technical Requirement for 765kV class Reactor</u></p> <p>(i) The Manufacturer whose 765kV Reactor(s) are offered must have designed, manufactured, tested & supplied 715 kV or higher voltage class one (1) number 1-phase Reactor of at least 110 MVAR capacity or at least three (3) numbers 1-phase Reactors each having a capacity of at least 36.7 MVAR and the same Reactor(s) should have been in satisfactory operation# for atleast two (2) years as on the date of NOA.</p> <p align="center">OR</p> <p>The Manufacturer must have designed, manufactured, tested & supplied 715 kV or higher voltage class one (1) number 1-phase Transformer of at least 500 MVA capacity or at least three (3) numbers 1-phase Transformers each having a capacity of at least 166 MVA and the bidder should have designed, manufactured, tested & supplied 345 kV or higher voltage class one (1) number 3-phase Reactor of at least 50 MVAR capacity or at least three (3) numbers 1-phase Reactors each having a capacity of at least 16.7 MVAR and the same Transformer(s) & Reactor(s) should have been in satisfactory operation# for atleast two (2) years as on the date of NOA.</p> <p>(ii) Alternatively, the manufacturer, who have established manufacturing and testing facilities in India and not meeting the requirement stipulated in (i) above, can also be considered provided that</p>

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		<p>a) 715 kV or higher voltage class either One (1) no. 1-phase Reactor of at least 80 MVAR capacity or One (1) no. 1-phase Transformer of at least 166 MVA capacity must have been manufactured in the above Indian works based on technological support of collaborator, type tested (as per IEC/IS standard) and same should have been supplied as on the date of NOA.</p> <p>b) The collaborator meets the requirements stipulated in (i) above. A valid collaboration agreement for technology transfer/license to design, manufacture, test and supply 765kV Reactor in India, shall be submitted.</p> <p>c) the collaborator shall furnish performance guarantee for an amount of 10% of the ex-works cost of such equipment(s) and this performance guarantee shall be in addition to contract performance guarantee to be submitted by the contractor.</p>
10.	Section GTR Rev 14 Clause No. 24.9	<p><u>Technical Requirement for 1.1 KV Grade PVC Control Cable</u></p> <p>The manufacturer(s), whose PVC control cables are offered, must have designed, manufactured, tested and supplied in a single contract atleast 100 Kms of 1.1kV grade PVC insulated control cables as on date of NOA. Further the manufacturer must also have designed, manufactured, tested and supplied atleast 1 km of 27C x 2.5 Sq.mm or higher size as on the date of NOA.</p>
11.	Section GTR Rev 14 Clause No. 24.10	<p><u>Technical Requirement for 1.1 KV Grade PVC Power Cable</u></p> <p>The manufacturer(s), whose PVC Power Cables are offered, must have designed, manufactured, tested and supplied in a single contract atleast 100 Kms of 1.1kV or higher grade PVC insulated power cables as on the date of NOA. Further the manufacturer must also have designed, manufactured, tested and supplied atleast 1 km of 1C x 150 Sq. mm or higher size as on the date of NOA.</p>
12.	Section GTR Rev 14 Clause No. 24.11	<p><u>Technical Requirement for 1.1 KV Grade XLPE Power Cables</u></p> <p>The manufacturer(s), whose XLPE Power cables are offered, must have designed, manufactured, tested and supplied in a single contract atleast 25 Kms of 1.1 KV or higher grade XLPE insulated power cables as on the date of NOA. Further the manufacturer must also have designed, manufactured, tested and supplied atleast 1 km of 1C x 630 Sq. mm or higher size as on the date of NOA.</p>
13.	Section GTR Rev 14 New para added under Clause No. 9.2	Tests witnessed by agencies certified by National Accreditation Board for Certification Bodies (NABCB) shall also be acceptable.
14.	Section GTR Rev 14 Annexure-A	Annexure-A stand replaced by Annexure-A (Rev 1)
15.	Section GTR Rev 14	“The seismic withstanding test on the complete equipment (for 400kV and above) shall be carried out along with supporting structure. Seismic Withstand Test carried out using either lattice or pipe structure is acceptable. ”

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	Para-1 at Annexure-B	
16.	Section GTR Rev 14 New para added under Clause no. 12.3.6	Band colour is required for Emulsifier system detection line only if both water and air detection lines are present at the same substation. Further, band colour shall be applied at an interval of 2 meters approx. along the length and minimum width of band shall be 25mm.
17.	Section GTR Rev 14 New Clause no. 15.2	Pickup value of binary input modules of Intelligent Electronic Devices, Digital protection couplers, Analog protection couplers shall not be less than 50% of the specified rated station auxiliary DC supply voltage level.
18.	Section GTR Rev 14 New Clause No. 16.3	In case, different designs of lattice and pipe structures other than Employer supplied structures are required to be adopted in view of higher creepage (31mm/kV) of the switchgear/equipments, insulator strings, bushings & bus post insulators etc., Design, supply & erection of such structures shall be in the scope of contractor against respective standard structure. However dimensional details (except height) shall not be less than that specified in standard structure drawing of respective equipments.
19.	Section GTR Rev 14 Clause No. 22.9	RTV coating shall be done at site on all porcelain insulators including mandatory spares (i.e. bushings, hollow and solid insulators, disc insulators etc.) for substation(s) in coastal area as defined elsewhere. The cost of RTV coating shall be deemed to be included in the respective equipment/items' erection cost. The technical details of RTV coating is attached in Annexure-H (Rev 1).
20.	Section GTR Rev 14 New Clause No. 13.14	Erection, testing and commissioning of Transformers, Reactors, Circuit breakers, Isolators, Substation automation system, Control & protection panels, PLCC, PMU, Telecommunication Equipments, etc. shall be done by the contractor under the supervision of respective equipment manufacturers. Charges for the above supervision shall be included by the bidder in the erection charges for the respective equipment in the BPS.
21.	Section Switchgear-SA Rev 11 Clause No. 3.0 (e)	Outer insulator of surge arrester shall be porcelain/polymer conforming to requirements stipulated in Section-GTR. Terminal connectors shall conform to requirements stipulated under Section-GTR. The outer insulator housing shall be so coordinated that external flashover will not occur due to application of any impulse or switching surge voltage upto the maximum design value for arrester.
22.	Section Switchgear-SA Rev 11 Annexure-1 Table 1.0	Technical Parameters for 765kV, 400kV, 220kV and 132kV Surge Arresters (with Polymer/Porcelain Housing)
23.	Section Switchgear-INST Rev 11 Clause No. 9.2	CTs must have adequate provision for taking oil samples from the bottom of the CT without exposure to atmosphere. Manufacturer shall recommend the frequency at which oil samples should be taken and norms for various gases in oil after being in operation for different durations. Manufacturer should also indicate the total quantity of

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	Para 3 & 4	oil which can be withdrawn from CT for gas analysis before refilling or further treatment of CT becomes necessary. Manufacturer/Contractor shall supply 2 nos. of oil sampling device for every 20 nos. of oil filled CT supplied with a minimum of 2 nos. of oil sampling device for each substation.
24.	Section Switchgear- INST Rev 11 Clause No. 9.3	Voltage Transformers a) Insulation Resistance test for primary (if applicable) and secondary winding b) Polarity test c) Ratio test d) Dielectric test of oil (wherever applicable) e) Tan delta and capacitance measurement of individual capacitor stacks f) Secondary winding resistance measurement g) DGA of oil (for IVT/PT) Dissolved Gas Analysis (DGA) shall be carried out twice within the first year of service, first within the first month of commissioning/charging and second between six months to one year from the date of commissioning/charging. IVTs/PTs must have adequate provision for taking oil samples from the bottom of the IVT/PT without exposure to atmosphere. Manufacturer shall recommend the frequency at which oil samples should be taken and norms for various gases in oil after being in operation for different durations. Manufacturer should also indicate the total quantity of oil which can be withdrawn from IVT/PT for gas analysis before refilling or further treatment of IVT becomes necessary. Manufacturer/Contractor shall supply 2 nos. of oil sampling device for every 20 nos. of oil filled IVT/PT supplied with a minimum of 2 nos. of oil sampling device for each substation.
25.	Section Switchgear- INST Rev 11 Clause No. 10.0	Defect Liability The actions required to be taken by contractor in case of defects observed in CT/CVT/IVT/PT of ratings 145kV & above during the warranty period (defect liability period) shall be as per enclosed Annexure-V (Revised) of this specification. Further, the replaced/repaired/refurbished equipment (or part of equipment) shall have Two (2) years warranty without prejudice to contractual warranty period (defect liability period).
26.	Section Switchgear - CB Rev 11 Clause no. 2.6 Para 2	The CSD shall be provided in Circuit breaker of switchable line reactor bay and in Main & Tie bay circuit breakers of Transformers (required for 765/400kV transformers only), line with non-switchable line reactors and Bus reactors. The CSD shall be supplied as per bid price schedules.
27.	Section Switchgear - CB Rev 11 New Clause no. 2.6.1(n)	For Circuit breaker with CSD controlling a Transformer following is applicable "The limit for inrush current for switching of Transformer by CSD shall be 1.0 p.u. of rated current of transformer after fine tuning of CSD settings during pre-commissioning checks. For site acceptance of CSD, during online CSD test after fine tuning inrush current should be less than 1.0 P.U. of rated current in five consecutive operations".

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28.	Section Switchgear – CB Rev 11 Clause No. 11.4	Separate cables shall be used for AC, DC-I, DC-II and selected DC. Each control cable shall include minimum 10% spare cores (subject to minimum 1 no. of spare core).
29.	Section Switchgear – CB Rev 11 Clause No. 11.5	Requirement of Plug-In type connector for Inter-pole cabling is deleted
30.	Section Switchgear – CB Rev 11 Clause No. 11.6	Vertical run of cables to the operating mechanism box shall be properly supported by providing the perforated closed type galvanized cable tray (Cable tray also to be supplied along with the Circuit Breaker) to be fixed as an integral part of the structures. The load of the cable shall not be transferred to the mechanism box/terminal arrangement in any circumstances. Hanging or loose run of cable is not permitted. The drawing of cable tray including fixing arrangement shall be incorporated in the GA drawing of CB also.
31.	Section GIS Rev 5A Clause no. 6.8.2	The CSD shall be provided in 765kV/400kV Circuit breakers for controlling transformers (required for 765/400kV transformers only) and reactors (ie for breakers of switchable line reactor and in Main& Tie circuit breakers of Transformers, Transmission lines with non-switchable line reactors and Bus reactors). The requirement of CSD shall be explicitly specified in price schedule
32.	Section GIS Rev 5A New Clause no. 10.1.3(n)	For 400kV & above voltage class GIS bay module, CT cores shall be duly distributed on both side of circuit breaker. For 220 kV and below voltage level GIS bay module, CT on one side of the circuit breaker is also acceptable.
33.	Section GIS Rev 5A New Para added under Clause no.20	During detailed engineering, the type test reports of GIS equipment of the parent company/subsidiary company/group company shall also be acceptable provided that the design of offered GIS is same as that of type tested GIS equipment.
34.	Section GIS Rev 5A New Clause no. 15.2.14	All 765kV & 400kV Circuit Breaker control schematics shall be finalized in such a way, that it may operate with or without CSD by using a suitable selector switch irrespective of whether circuit breakers to be supplied are envisaged along with CSD or not as per bid price schedules.
35.	Section GIS Rev 5A New Clause no. 5.41(10)	The price of Bus-duct inside the GIS hall shall be integral part of the respective bay module and it will not be paid separately. However, the payment of bus-duct for outside the GIS hall along with support structure shall be paid as per running meters in line with provision of Bid Price schedule.
36.	Section Air Conditioner Rev 04 New Annexure-S3	Annexure S3 – Air Conditioning & Ventilation System for GIS Building
37.	Section CRP Rev 09 New Clause No. 21.8	Back-up Impedance protection function shall be provided for 765kV & 400kV sides of 765/400/33kV ICT and for 400kV side of 400kV class ICT. This protection function and Differential Protection function shall not be combined in the same IED.

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38.	Section CRP Rev 09 New para added under Clause no.18.8	Line Differential relays used as both Main -I & Main-II protection of a line, shall be of either different make & model or shall be on different hardware platform.
39.	Section CRP Rev 09 New Para added under Clause No.5.1	Requirement of Shrouding shall not be applicable to TB's where live parts are concealed.
40.	Section PLCC Rev 05 New Clause no. 10.4.13	All protection couplers (Analog protection coupler, digital protection coupler) shall be equipped with direct reading type counter facility for all the codes (Tx & Rx).
41.	Section PLCC Rev 05 New Clause no.10.5	Digital protection coupler (DPC) shall be used as one of the two tele-protection channel on the lines between the stations having Optical Fiber link alongwith SDH Equipment. Specification of digital protection coupler is enclosed as Annexure-S2. The DPC can be housed either in offered Control & Protection Panel / PLCC Panel or in separate panel. Generally SDH Equipment are placed in communication room of Control room where as DPC is placed in panel room. The connection between SDH equipment and each DPC shall be through Optical fiber. Necessary converter(s) for converting E1 signal to optical fiber at both ends (at Panel Room as well as at Control room) along with FODP shall be in the scope of the contractor. Further sharing of additional spare ports of converter for DPC placed in other Panel Room or in same Panel Room is also permitted. Necessary optical fiber for interconnection of DPC is to be provided by the contractor. Further any copper wiring for ensuring the protection signaling/data/speech shall be in the scope of the contractor.
42.	Section PLCC Rev 05 New Clause No. 6.12.4	For 765 kV Wave Trap, cantilever strength of BPIs used for Wave Trap shall be 10 kN.
43.	Section: Power & Control Cable Rev 06 New Para added under Clause 1.1.4	The cable sizes specified at clause no. 1.1.4 of Section-Power & Control Cables Rev-6 are minimum required. In case, more nos. of runs or larger sizes of cables are required between two points based on design calculations, same shall deemed to be included in the scope of bidder.
44.	Section: Power & Control Cable Rev 06 Clause No. 4.2	Standard lengths for each size of power and control cables shall be 500/1000 meters. However, to avoid cable wastage and cable jointing at site, non-standard lengths of each size of Power & Control cable may also be acceptable subject to maximum length of 1000meters (+ 5% tolerance)
45.	Section Fire Protection Rev 06 Appendix-I	Appendix-I (Rev 4) stand replaced by following Appendix-I (Rev 5)

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46.	Section: Fire Protection Rev 06 Clause No.9.01.00(c) & Appendix-V	Deleted
47.	Section Fire Protection Rev 06 New para added at Clause no.2.03.00	Fire detection and alarm system shall also be provided in the GIS Hall using beam type smoke detectors to be installed at suitable mounting height, and in the Relay Panel room with ionization/ optical type smoke detectors to be installed on the ceiling.
48.	Section Fire Protection Rev 06 New Clause no.2.01.02	Adequate no. of Hydrant posts and Fire extinguishers (CO2 and DCP type) shall also be provided for GIS Building.
49.	Section Fire Protection Rev 06 Clause No. 2.04.02 & 10.00.00	Mechanical foam type fire extinguishers wherever specified as 50 litre capacity, conforming to IS:13386, shall be read as 60 litre capacity conforming to IS 16018 Further in case of non-availability of any type of fire extinguisher (i.e. water, CO2, DPC, foam type) of a particular size as specified in BPS or technical specification, next available higher size conforming to IS shall be supplied.
50.	Section Fire Protection Rev 06 New Clause No. 2.02.06	Alternatively, bidder may offer Nitrogen Injection based fire prevention & extinguishing system for transformer/ reactor instead of HVW Spray System. Nitrogen Injection Fire Prevention & Extinguishing system shall be as per Appendix - VII .
51.	Section DG Set Rev 05 New para added under Clause no. 7.1(a)	Alternatively, AMF Panel for DG Set may be installed outside the acoustic enclosure near the DG Set. In such cases, AMF panel with or without additional enclosure shall meet IP-55 degree of protection.
52.	Section: Lighting System Rev 07 Clause no. 6.2.1(ii)	All Outdoor Lighting Panels shall be Stainless sheet steel of Grade 304 and shall be dust, weather and vermin proof. Panels shall be of thickness not less than 1.5 mm smoothly finished, leveled and free from flaws. Stiffeners shall be provided wherever necessary. Alternatively, outdoor lighting panels of Aluminum shall also be acceptable as per provisions stipulated in Section GTR.
53.	Section: Lighting System Rev 07 Clause no. 6.6(i) (b)	The outdoor junction boxes shall be complete with conduit knockouts/threaded nuts and provided with terminal strips. The junction boxes shall be suitable for termination of Cable glands of required size. The junction boxes shall be provided with 4 way knockouts suitable for street lighting/switchyard lighting terminals suitable for 2 numbers 4C x 16 Sq.mm Al. cable or as per requirement. All Outdoor Junction boxes shall be of Stainless Steel of thickness 1.5mm of grade 304. Outdoor Junction Boxes shall be suitable for mounting on columns, structures etc for Outdoor Lighting. The outdoor Junction shall have IP 55 protection. Alternatively, outdoor junction boxes of Aluminum shall also be acceptable as per provisions stipulated in Section GTR.
54.	Section: LT Switchgear Rev 05 Clause no. 1.21.2	Contractor shall submit type test reports for the Lighting transformers as per IS:2026 for which test conducted once are acceptable (i.e. The requirement of test conducted within last ten years shall not be applicable)

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55.	Section LT Switchgear Rev 05 Clause no. 1.6.1	MCCB shall in general conform to IS: 13947 Part-2. All MCCB offered shall have Ics = 100% Icu rating.								
56.	Section: Structure Rev 06 New Clause No. 3.2.4 Added	POWERGRID will issue the fabrication drawings of the standard structures to the successful bidder. The contractor shall do the proto assembly of the structures as per the issued fabricated drawings. Employer may opt to witness such proto assembly. The bidder shall follow the fabrication drawing for preparing the proto assembly and do the minor adjustments if necessary, without affecting the strength of the structure. In case of equipment support structure the attachment of stool and fixing of MOM box etc. shall be taken care by the contractor as per the requirement of the equipment. The contractor however shall not submit the proto corrected drawings and BOM for approval of the employer. The arrangement shall however not absolve the contractor from the responsibility of supply and erection of safe sound and durable structure.								
57.	Section: Structure Rev 06 New Clause no. 3.4	Nuts, Bolts and washers for all non standard structures shall be payable as per BPS.								
58.	Section Civil Works Rev 11A New Clause No. 21.0	<p>The dewatering pump shall be Portable, Self Priming, Non clog, horizontal type monobloc pump. The Pump shall be driven by electric motor suitable for outdoor application with IP-55 degree of protection. Following are the major technical parameters for the pumps to be supplied as per BPS:</p> <p>(A) Pump Rating : 2 HP Flow Rate : 200-400 LPM Minimum Total Head : 12 Mtrs Voltage Range : 415 ± 10% Volts (Three Phase)</p> <p>(B) Pump Rating : 5 HP Flow Rate : 1000-1400 LPM Minimum Total Head : 10 Mtrs Voltage Range : 415 ± 10% Volts (Three Phase)</p>								
59.	Section Switchyard Erection Rev 10 Clause No. 9.4(j)	<table border="1" data-bbox="516 1436 1435 1635"> <thead> <tr> <th>S.No</th> <th>Item</th> <th>Size</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>j)</td> <td>Isolator MOM Box</td> <td>50X6 mm GS flat & Flexible copper braid</td> <td>Galvanise steel and copper braid</td> </tr> </tbody> </table>	S.No	Item	Size	Material	j)	Isolator MOM Box	50X6 mm GS flat & Flexible copper braid	Galvanise steel and copper braid
S.No	Item	Size	Material							
j)	Isolator MOM Box	50X6 mm GS flat & Flexible copper braid	Galvanise steel and copper braid							
60.	Section: Switchyard Erection Rev 10 New Clause no. 20.1	<p><u>Neutral formation for Transformer(s), DELTA formation and making connection arrangement to connect spare unit in place of any unit of the bank without physical shifting and Earthing Arrangement :</u></p> <p>For Spare Unit connection to form 3-ph bank of 765kV Class Transformers with isolator based switching arrangement without physical shifting of spare unit along with necessary Neutral Formation, Earthing Arrangement & Tertiary (DELTA) formation for 3-ph bank formation with 1-ph units shall be under present scope as per the details</p>								

		<p>mentioned below:</p> <p><u>i. Neutral Formation including Neutral auxiliary bus and Earthing Arrangement</u></p> <p>The contractor shall connect the neutrals of three (3) 1-phase transformers by overhead connection using 3" IPS Al tube. The neutral formation shall be such that neutral winding of single-phase spare transformer can be disconnected or connected to the three phase banks. The connection from the neutral bushing to neutral bus shall be through 3" IPS Al tube and wherever flexible jumper needs to be provided, same shall be through twin conductor. All material like Bus post insulator, Aluminium tube, conductor, clamps & connectors, earthing materials, support structure, hardware etc. required for neutral formation and connection with neutral CT and earthing of neutral shall be provided by contractor.</p> <p><u>ii. Tertiary Delta Formation including Tertiary auxiliary bus(Insulation level 52 kV).</u></p> <p>The contractor shall connect 33kV tertiary of single-phase auto-transformers in DELTA configuration by overhead connection to operate in 3-Ph Bank. The Delta shall be formed by 3" IPS Al tube, which shall be insulated with heat shrinkage insulating sleeve of at least 52kV class and shall be supported by structure mounted bus post insulators at suitable intervals. Jumpers (twin conductors) wherever provided shall also be insulated using suitable insulation tape or sleeve at least 52kV class at site. The minimum phase to phase horizontal spacing for delta formation shall be 1.5meter. All associated materials like bus post insulators, Aluminium tube, conductor, clamps & connectors, support structures, hardware, earthing materials etc. required for tertiary delta formation shall be provided by the contractor.</p> <p><u>iii. HV & IV Auxiliary Buses (Applicable for AIS Substation)</u></p> <p>Formation of HV & IV auxiliary buses for connection of transformer 3-Phase bank with 1-Phase Spare transformer unit is under the present scope of the bidder. All associated materials like Bus post insulators, Aluminium tube, conductors, clamps & connectors, insulator strings, hardware, earthing materials, support structures, required for the above-mentioned arrangement shall be provided by the contractor.</p>
61.	<p>Section: Switchyard Erection Rev 10</p> <p>New Clause no. 20.2</p>	<p><u>Neutral formation for Reactor banks, connection to neutral grounding reactor through 132kV Surge arrester, connection to ground through neutral CTs and connection arrangement to connect spare reactor unit in place of any other units of the bank without physical shifting and Earthing Arrangement :</u></p> <p>For Spare Unit connection to 3-ph bank of 765kV Class Reactors with isolator based switching arrangement without physical shifting of spare unit along with necessary Neutral Formation, Earthing Arrangement for 3-ph bank formation with 1-ph units shall be under present scope as per the details mentioned below:</p> <p><u>i. Neutral Formation including Neutral auxiliary bus and Earthing Arrangement</u></p> <p>The contractor shall connect the neutrals of three (3) 1-phase reactors by overhead connection using 3" IPS Al tube. The neutral formation shall be such that neutral winding of single-phase spare reactor can be disconnected or connected to the three phase banks. Neutral Connections of spare unit shall be extended upto the other unit(s)</p>

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		<p>by forming Neutral auxiliary bus. The connection from the neutral bushing to neutral bus shall be through 3" IPS Al tube and wherever flexible jumper needs to be provided, same shall be through twin conductor. All material like Bus post insulator, Aluminum tube, conductor, clamps & connectors, earthing materials, support structure, hardware etc. required for neutral formation and connection with neutral CT and earthing of neutral shall be provided by contractor. Required Insulation level is 145 kV from individual reactor neutral to point of neutral formation. However after neutral formation, the insulation level is 36kV.</p> <p>Connection of each Line reactor bank formed under present scope to Neutral grounding reactor through 132kV Surge Arrester including NGR by passing arrangement is also under present scope.</p> <p><u>ii.HV Auxiliary Bus (Applicable for AIS Substation)</u></p> <p>Formation of HV auxiliary bus for connection of reactor 3-Phase bank with 1-Phase Spare reactor unit is under the present scope of the bidder. All associated materials like Bus post insulators, Aluminium tube, conductors, clamps & connectors, insulator strings, hardware, earthing materials, support structures, required for the above-mentioned arrangement shall be provided by the contractor.</p>
62.	<p>Section: Switchyard Erection Rev 10</p> <p>New Clause no. 20.3</p>	<p>Supply & Laying of Power, Control Cables & Special Cables (if any) (including all cabling works for spare unit of transformer/reactor) along with accessories for power supply, alarm, trip, control & indication, status and monitoring signals & contacts made available at MB/CMB of Transformers/Reactors upto Control & Relay Panels and BCUs located in the Switchyard Panel Room/Control Room and successful integration of same with Station Control, Protection & SAS System is in the scope of the contractor.</p>
63.	<p>Section: Switchyard Erection Rev 10</p> <p>New Clause no. 20.4</p>	<p>3½Cx300 Sq. mm XLPE power cable for oil filtration units of reactors & transformers shall be provided. The cable shall be terminated at 250A receptacle near Reactor & Transformer in the switchyard. XLPE Power cables shall be looped in & out for 250A Power receptacles.</p>
64.	<p>Section: Switchyard Erection Rev 10</p> <p>New Clause no. 20.5</p>	<p>Neutral of spare transformer/reactor is to be connected to station grounding system through a jumper/copper flat. This shall be applicable for single phase transformer/reactor wherever spare unit have been provided.</p>
65.	<p>Section: Switchyard Erection Rev 10</p> <p>New Clause no. 20.6</p>	<p>Tertiary connections made for tertiary loading of LT Transformer shall be insulated using suitable insulation tape or sleeve of at least 52kV class at site</p>
66.	<p>Section Switchyard Erection Rev 10</p> <p>New Clause No. 2.5</p>	<p>Transmission line side insulator string along with hardware for line termination shall be in the scope of substation contractor.</p>

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67.	Section Switchyard Erection Rev 10 New Clause No. 21	Connection arrangement of 765kV equipment's shall be done as per the conceptual drawing (Drawing No. C/ENGG/SS/CONCEPTUAL 765KV BAY CONNECTION, Rev-0) enclosed as Annexure-S1of this Section-Project.
68.	Section Switchyard Erection Rev 10 New Clause No. 22	For connection to HV bushing of LT Transformer, insulated copper rod/strip of at least 75 sq.mm cross sectional area shall be used.
69.	Section: Auto-transformer Rev-07 Clause no. 10.14	Deleted
70.	Section: Auto-transformer Rev-07 Clause no. 10.15	If Tan delta of OIP bushing goes beyond 0.005 or increase is more than 0.001 within the warrantee period w.r.t. pre-commissioning values, the contractor shall arrange to replace the defective bushing by new one. No temperature correction factor shall be applicable for tan delta. Tan δ value of RIP (Resin Impregnated Polymer) condenser bushing shall be 0.005 (max.) in the temperature range of 20°C to 90°C. The measured Tan δ value at site should not exceed by 0.001 w.r.t. factory results (measured at approx. similar temperature conditions) during warrantee period.
71.	Section: Auto-transformer Rev-07 New Clause no. 18.00 (cc)	Canopy arrangement shall be provided for Pressure Relief Device, Sudden Pressure Relay and Buchholz Relay to prevent ingress of rain water.
72.	Section: Auto-transformer Rev-07 New Clause no. 6.1.5(f)	04 nos. of Gate valves (minimum size 50NB) for UHF sensors for PD Measurements at various locations. Location of valves shall be finalized during design review.
73.	Section: Auto-transformer Rev-07 New Para added under Clause No. 6.4	Fixing of cooler bank support shall be provided through Anchor Fastener with chemical grouting and no pockets for bolting shall be provided. Further, metallic support structure (for cooler pipe supports, Buchholz pipe (if required) shall be fixed directly in the pit through Anchor Fastener with chemical grouting. Further, these support structures shall be encased with concrete to prevent rusting. No foundation block for these support structures are envisaged. Specific area shall not be provided for jacking pad in the foundation as jacking shall be done by laying temporary metal plates size 400 mm x 400 mm x 32 mm (min) thick. One set of metal plates for jacking of Transformer shall be provided by manufacturer.

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74.	<p>Section: Auto-transformer Rev-07</p> <p>New Para added under Clause no. 8.0</p>	<p>Manufacturer may also offer Gas to Liquid (GTL) based insulating oil. The technical parameters of this oil shall be finalized during detailed engineering.</p>
75.	<p>Section: Auto-transformer Rev-07</p> <p>Clause No. 18.v</p>	<p>On-line insulating oil drying system (Cartridge type) (if specified in BPS) as per Annexure-L</p>
76.	<p>Section: Auto-transformer Rev-07</p> <p>Clause No. 6.14</p>	<p>16 numbers optical temperature sensors shall be fitted on each unit. The optical sensors measuring system shall be of direct measurement non-calibrating type. All the sensors shall be brought out to separate optical sensor box or in Individual Marshalling Box mounted on transformer tank to facilitate measurement of temperature during service life on each unit.</p> <p>Location of optical temperature sensors inside the transformer shall be decided during design review. The installation and commissioning at site shall be done under the supervision of OEM representative or OEM certified representative.</p> <p>Supply of temperature measuring unit is not required. However, manufacturer shall keep one unit in their works as a part of testing equipment for measurement of temperature through sensor during factory testing.</p>
77.	<p>Section: Auto-transformer Rev-07</p> <p>New Clause no. 6.1.5(g)</p>	<p>Suitable provision (valves, etc.) shall be provided for installation of Nitrogen Injection Fire Protection System in transformer.</p>
78.	<p>Section: Auto-transformer Rev-07</p> <p>Clause no. 13.4.8(c)</p>	<p>When the flow from conservator to main tank is more than the normal operating conditions, the valve shall shut off by itself and will have to be reset manually. It shall be provided with valve open/close position indicator along with alarm contact indication in control room during closing operation of valve. This valve shall be provided with locking arrangement for normal position and oil filling / filtration position. Glass window for visual inspection similar to Buchholz glass inspection window shall be provided for physical checking of status of valve. It shall have IP 67 class degree of protection. A suitable platform or ladder (if required) shall be provided to approach the valve for manual reset.</p>
79.	<p>Section: Auto-transformer Rev-07</p> <p>Annexure -B, Test Plan Sr. No. 17</p> <p>Annexure - C Test Procedures Sr. No.5</p>	<p>Deleted</p>
80.	<p>Section: 765kV Shunt Reactor Rev-07</p> <p>Clause No.11.14</p>	<p>Deleted</p>

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81.	<p>Section: 765kV Shunt Reactor Rev-07</p> <p>Clause No.11.15</p>	<p>If Tan delta of OIP bushing goes beyond 0.005 or increase is more than 0.001 within the warrantee period w.r.t. pre-commissioning values, the contractor shall arrange to replace the defective bushing by new one. No temperature correction factor shall be applicable for tan delta.</p> <p>Tan δ value of RIP (Resin Impregnated Polymer) condenser bushing shall be 0.005 (max.) in the temperature range of 20°C to 90°C. The measured Tan δ value at site should not exceed by 0.001 w.r.t. factory results (measured at approx. similar temperature conditions) during warrantee period.</p>
82.	<p>Section: 765kV Shunt Reactor Rev-07</p> <p>Clause No.7.1.5 (d)</p>	<p>04 nos. of Gate valves (minimum size 50NB) for UHF sensors for PD Measurements at various locations. Location of valves shall be finalized during design review.</p>
83.	<p>Section: 765kV Shunt Reactor Rev-07</p> <p>New Para added under Clause No. 7.4</p>	<p>Cooler bank shall be tank mounted. Further, specific area shall not be provided for jacking pad in the foundation as jacking shall be done by laying temporary metal plates size 400 mm x 400 mm x 32 mm (min) thick. One set of metal plates for jacking of reactor shall be provided by the manufacturer.</p>
84.	<p>Section: 765kV Shunt Reactor Rev-07</p> <p>Annexure-I</p>	<p>Annexure-I stands replaced as Annexure-I (Rev 1)</p>
85.	<p>Section: 765kV Shunt Reactor Rev-07</p> <p>New para added under Clause No.9</p>	<p>Manufacturer may also offer Gas to Liquid (GTL) based insulating oil. The technical parameters of this oil shall be finalized during detailed engineering.</p>
86.	<p>Section: 765kV Shunt Reactor Rev-07</p> <p>Clause No.7.14</p>	<p>8 numbers optical temperature sensors shall be fitted on each unit. The optical sensors measuring system shall be of direct measurement non-calibrating type. All the sensors shall be brought out to separate optical sensor box or in Individual Marshalling Box mounted on reactor tank or ground mounted to facilitate measurement of temperature during service life on each unit.</p> <p>Location of optical temperature sensors inside the reactor shall be decided during design review. The installation and commissioning at site shall be done under the supervision of OEM representative or OEM certified representative.</p> <p>Supply of temperature measuring unit is not required. However, manufacturer shall keep one unit in their works as a part of testing equipment for measurement of temperature through sensor during factory testing.</p>
87.	<p>Section: 765kV Shunt Reactor Rev-07</p> <p>New Clause No.7.1.5 (f)</p>	<p>Suitable provision (valves, etc.) shall be provided for installation of Nitrogen Injection Fire Protection System in reactor.</p>
88.	<p>Section: 765kV Shunt Reactor Rev-</p>	<p>When the flow from conservator to main tank is more than the normal operating conditions, the valve shall shut off by itself and will have to be reset manually. It shall be</p>

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	07 Clause No.14.8 (c)	provided with valve open/close position indicator along with alarm contact indication in control room during closing operation of valve. This valve shall be provided with locking arrangement for normal position and oil filling / filtration position. Glass window for visual inspection similar to Buchholz glass inspection window shall be provided for physical checking of status of valve. It shall have IP 67 class degree of protection. A suitable platform or ladder (if required) shall be provided to approach the valve for manual reset.
89.	Section: 765kV Shunt Reactor Rev-07 Annexure - C Test Procedures Sr. No.14	Frequency Response analysis The test shall be performed on each phase of the Reactor by taking open circuit response of complete winding as HV to neutral terminal and vice versa. The response shall be compared with other units of same design for reference.
90.	Section : Transformer (Upto 400kV Class) Rev 11 Clause no.10.13	Deleted
91.	Section : Transformer (Upto 400kV Class) Rev 11 Clause no.10.14	Tan δ value of RIP (Resin Impregnated Polymer) condenser bushing shall be 0.005 (max.) in the temperature range of 20°C to 90°C. The measured Tan δ value at site should not exceed by 0.001 w.r.t. factory results (measured at approx. similar temperature conditions) during warrantee period.
92.	Section : Transformer (Upto 400kV Class) Rev 11 Clause No.6.1.5 (d)	04 nos. of Gate valves (minimum size 50NB) for UHF sensors for PD Measurements (applicable for 400kV Transformer only) at various locations. Location of valves shall be finalized during design review.
93.	Section : Transformer (Upto 400kV Class) Rev 11 New para added under Clause No.6.4	Fixing of cooler support for 400kV class transformer shall be provided through Anchor Fastener with chemical grouting and no pockets for bolting shall be provided. Further, metallic support structure (for cooler pipe supports, Buchholz pipe (if required) shall be fixed directly in the pit through Anchor Fastener with chemical grouting. Further, these support structures shall be encased with concrete to prevent rusting. No foundation block for these support structures are envisaged.
94.	Section : Transformer (Upto 400kV Class) Rev 11 New para added under Clause No.8	Manufacturer may also offer Gas to Liquid (GTL) based insulating oil. The technical parameters of this oil shall be finalized during detailed engineering.

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95.	<p align="center">Section : Transformer (Upto 400kV Class) Rev 11</p> <p align="center">Clause No.3.13.1</p>	<p>For 400 kV Class Auto transformer:</p> <p>i. Bidder / Manufacturer should have successfully carried out Dynamic Short Circuit test on 315MVA or above rating 400/220/33kV, 3-Phase Auto transformer as on the originally scheduled date of bid opening and shall enclose the relevant Test Report/certificate along with bid. In case bidder/manufacturer has not successfully tested 315MVA or above rating 400/220/33kV, 3-Phase Auto transformer for Dynamic Short Circuit test, their bid shall be considered technically non responsive. Further, design review of offered 400kV Class Auto transformer shall be carried out based on the design of short circuit tested 315MVA or above rating 400/220/33kV, 3-Phase Auto transformer.</p> <p>ii. Following Loss parameters of 315 MVA, 400/220/33kV 3-Phase Auto Transformer are added to 2.20 of Annexure A of Technical Specification: Section - Transformer (Upto 400kV Class) Rev-11</p> <table border="1" data-bbox="553 722 1235 1205"> <thead> <tr> <th>Sr. No.</th> <th>Maximum Permissible Losses of 315 MVA, 400kV Transformer</th> <th>Losses</th> </tr> </thead> <tbody> <tr> <td>i)</td> <td>Max. No Load Loss at rated voltage and frequency</td> <td>75 kW</td> </tr> <tr> <td>ii)</td> <td>Max. Load Loss at rated current and at 75° C</td> <td>440 kW</td> </tr> <tr> <td>iii)</td> <td>Max. Auxiliary Loss at rated voltage and frequency</td> <td>10 kW</td> </tr> </tbody> </table> <p>Note: Transformer manufacturer who have already short circuit tested 315MVA or above rating 400kV class transformer shall offer the 315MVA Transformer meeting the above specified losses for which design review shall be carried out based on earlier short circuit tested transformer design.</p>	Sr. No.	Maximum Permissible Losses of 315 MVA, 400kV Transformer	Losses	i)	Max. No Load Loss at rated voltage and frequency	75 kW	ii)	Max. Load Loss at rated current and at 75° C	440 kW	iii)	Max. Auxiliary Loss at rated voltage and frequency	10 kW
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96.	<p align="center">Section : Transformer (Upto 400kV Class) Rev 11</p> <p align="center">Clause No.21 Z, aa, bb, dd</p>	<p>z. On line insulating oil drying system(if specified in BPS) as per Annexure-M</p> <p>aa. Online Dissolved Gas (Multi-gas) and Moisture Measuring Equipment (if specified in BPS) as per Annexure-K</p> <p>bb. On line dissolved Hydrogen and Moisture Measuring Equipment (if specified in BPS) as per Annexure-L</p> <p>dd. Deleted</p>												

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97.	<p>Section : Transformer (Upto 400kV Class) Rev 11</p> <p>Clause No.6.14</p>	<p>Optical temperature sensors shall be fitted on each Transformer unit. 16 number probes for 3-ph unit and 8 number probes for 1-ph unit shall be provided. The optical sensors measuring system shall be of direct measurement non-calibrating type. All the sensors shall be brought out to separate optical sensor box or in Individual Marshalling Box mounted on transformer tank to facilitate measurement of temperature during service life on each unit.</p> <p>Location of optical temperature sensors inside the transformer shall be decided during design review. The installation and commissioning at site shall be done under the supervision of OEM representative or OEM certified representative.</p> <p>Supply of temperature measuring unit is not required. However, manufacturer shall keep one unit in their works as a part of testing equipment for measurement of temperature through sensor during factory testing.</p>
98.	<p>Section : Transformer (Upto 400kV Class) Rev 11</p> <p>New Clause No.6.1.5(f)</p>	<p>Suitable provision (valves, etc.) shall be provided for installation of Nitrogen Injection Fire Protection System in transformer.</p>
99.	<p>Section : Transformer (Upto 400kV Class) Rev 11</p> <p>Clause No.13.7.8(c)</p>	<p>When the flow from conservator to main tank is more than the normal operating conditions, the valve shall shut off by itself and will have to be reset manually. It shall be provided with valve open/close position indicator along with alarm contact indication in control room during closing operation of valve. This valve shall be provided with locking arrangement for normal position and oil filling / filtration position. Glass window for visual inspection similar to Buchholz glass inspection window shall be provided for physical checking of status of valve. It shall have IP 67 class degree of protection. A suitable platform or ladder (if required) shall be provided to approach the valve for manual reset.</p>
100.	<p>Section : Transformer (Upto 400kV Class) Rev 11</p> <p>Annexure -B, Test Plan Sr. No. 18</p> <p>Annexure - C Test Procedures, Sr.No.5</p>	<p>Deleted</p>
101.	<p>Section : Upto 400kV Shunt Reactor Rev 10</p> <p>Clause no. 11.13</p>	<p>Deleted</p>

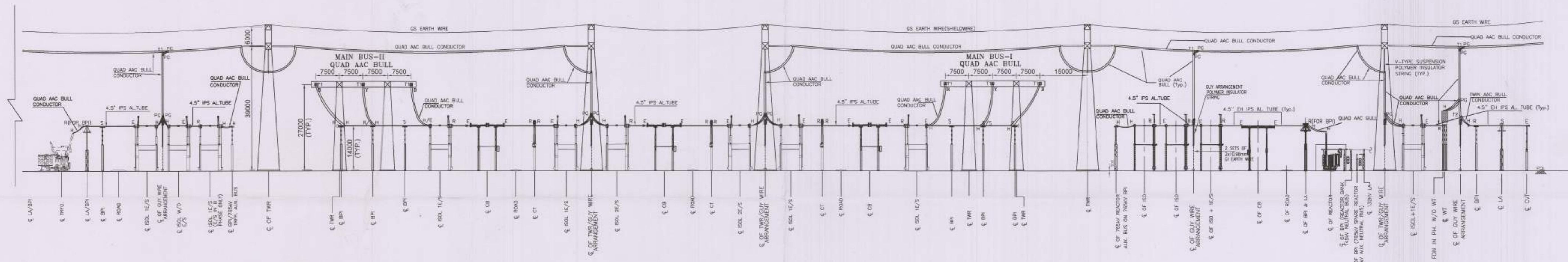
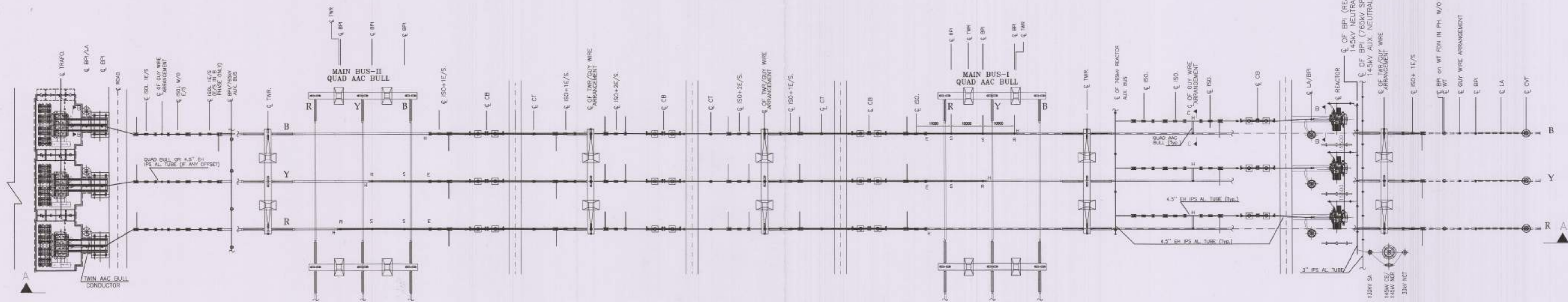
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102.	<p>Section : Upto 400kV Shunt Reactor Rev 10</p> <p>Clause no. 11.14</p>	<p>Tan δ value of RIP (Resin Impregnated Polymer) condenser bushing shall be 0.005 (max.) in the temperature range of 20°C to 90°C. The measured Tan δ value at site should not exceed by 0.001 w.r.t. factory results (measured at approx. similar temperature conditions) during warrantee period.</p>
103.	<p>Section : Upto 400kV Shunt Reactor Rev 10</p> <p>Clause No.7.1.5 (d)</p>	<p>04 nos. of Gate valves (minimum size 50NB) for UHF sensors for PD Measurements (applicable for 420kV Reactor only) at various locations. Location of valves shall be finalized during design review.</p>
104.	<p>Section : Upto 400kV Shunt Reactor Rev 10</p> <p>New Para added under Clause No.7.4</p>	<p>For 400kV Reactors, cooler bank shall be tank mounted.</p> <p>Further, reactor Manufacturers to ensure that roller mounting pad at the bottom of the tank shall be removed for better contact of reactor bottom plate to plinth. Roller to be mounted directly with tank bottom.</p> <p>Specific area shall not be provided for jacking pad in the foundation as jacking shall be done by laying temporary metal plates size 400 mm x 400 mm x 32 mm (min) thick. One set of metal plates for jacking of reactor shall be provided.</p>
105.	<p>Section : Upto 400kV Shunt Reactor Rev 10</p> <p>New para added under Clause No.9</p>	<p>Manufacturer may also offer Gas to Liquid (GTL) based insulating oil. The technical parameters of this oil shall be finalized during detailed engineering.</p>
106.	<p>Section : Upto 400kV Shunt Reactor Rev 10</p> <p>Clause No.7.14</p>	<p>8 numbers optical temperature sensors shall be fitted on each unit. The optical sensors measuring system shall be of direct measurement non-calibrating type. All the sensors shall be brought out to separate optical sensor box or in Individual Marshalling Box mounted on reactor tank or ground mounted to facilitate measurement of temperature during service life on each unit.</p> <p>Location of optical temperature sensors inside the reactor shall be decided during design review. The installation and commissioning at site shall be done under the supervision of OEM representative or OEM certified representative.</p> <p>Supply of temperature measuring unit is not required. However, manufacturer shall keep one unit in their works as a part of testing equipment for measurement of temperature through sensor during factory testing.</p>
107.	<p>Section : Upto 400kV Shunt Reactor Rev 10</p> <p>New Clause No.7.1.5 (f)</p>	<p>Suitable provision (valves, etc.) shall be provided for installation of Nitrogen Injection Fire Protection System in reactor.</p>
108.	<p>Section : Upto 400kV Shunt Reactor Rev 10</p> <p>Clause No.22.1. (xxix)</p>	<p>Deleted</p>

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109.	Section : Upto 400kV Shunt Reactor Rev 10 Clause No.14.8 (c)	When the flow from conservator to main tank is more than the normal operating conditions, the valve shall shut off by itself and will have to be reset manually. It shall be provided with valve open/close position indicator along with alarm contact indication in control room during closing operation of valve. This valve shall be provided with locking arrangement for normal position and oil filling / filtration position. Glass window for visual inspection similar to Buchholz glass inspection window shall be provided for physical checking of status of valve. It shall have IP 67 class degree of protection. A suitable platform or ladder (if required) shall be provided to approach the valve for manual reset.
110.	Section : Upto 400kV Shunt Reactor Rev 10 Annexure - C Test Procedures, Sr.No.14	Frequency Response analysis The test shall be performed on each phase of the Reactor by taking open circuit response of complete winding as HV to neutral terminal and vice versa. The response shall be compared with other units of same design for reference.

TOWARDS 765KV LINE DEAD END TOWER



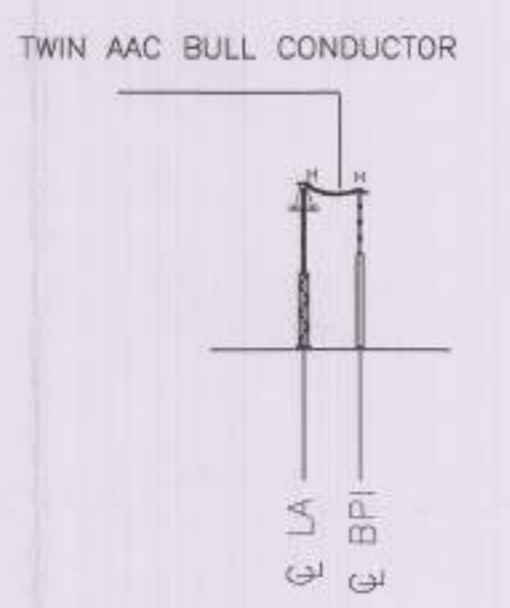
SECTION A-A (TYPICAL PLAN & SECTION FOR 765KV SIDE OF 765/400/33kV ICT -TIE-765KV LINE WITH LINE REACTOR BAY)

LEGENDS:

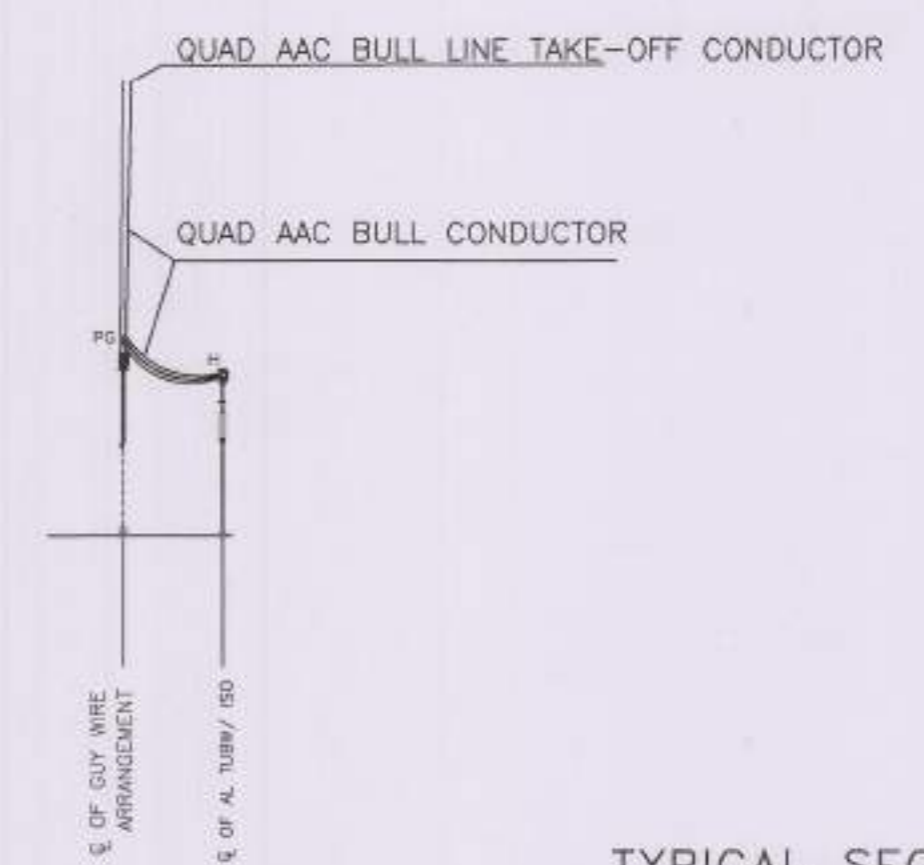
- R- RIGID CONNECTION
- E- EXPANSION TYPE CONNECTION
- S- SLIDING TYPE CONNECTION
- PG-PARALLEL GROOVE CONNECTION
- T1- T1 TYPE CONNECTION (EACH T CONNECTOR SHALL BE OF TWIN TO SINGLE CONDUCTOR TYPE FOR QUAD TO QUAD CONNECTION)
- T2- T2 TYPE CONNECTION (EACH T CONNECTOR SHALL BE OF TWIN TO SINGLE CONDUCTOR TYPE FOR QUAD TO TWIN CONNECTION)
- H- HORIZONTAL TYPE CONNECTION

NOTES:

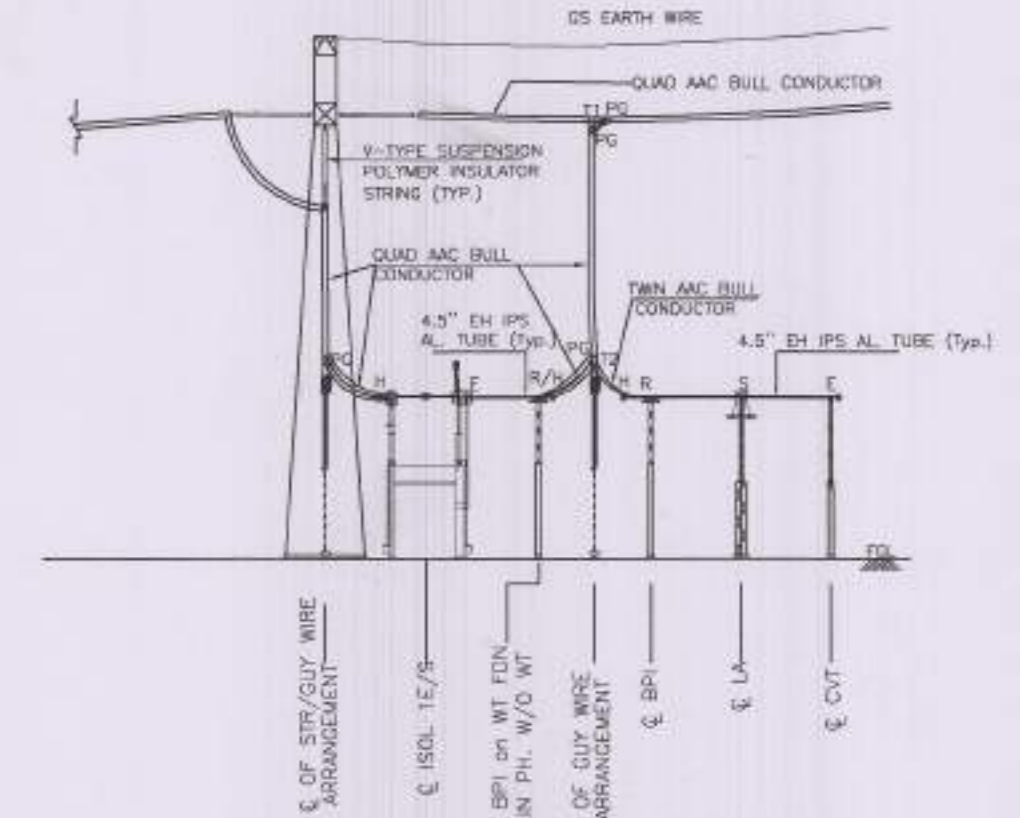
- 1) TWIN-SINGLE CONNECTOR SHALL BE USED FOR QUAD-QUAD DROPPER CONNECTION.
- 2) TWIN-SINGLE CONNECTOR SHALL BE USED FOR QUAD-TWIN CONNECTION
- 3) TWIN CONDUCTOR SHALL BE USED FOR 765KV LA TAPPED CONNECTION
- 4) STANDARD SUPPORT STRUCTURE FOR 765KV WT (i.e 3NOS. LATTICE TYPE STRUCTURE TO SUPPORT 3NOS. BPI ASSOCIATED WITH MOUNTING OF WT) SHALL BE ADOPTED
- 5) AUXILIARY BUS ARRANGEMENT FOR 765KV TRANSFORMERS & REACTOR NEUTRALS, SPARE TRANSFORMER/REACTOR CONNECTION, TERTIARY ARRANGEMENT OF TRANSFORMERS ARE NOT SHOWN COMPLETELY.
- 6) CANTILEVER STRENGTH OF 765KV INSULATORS/BPI USED FOR 765KV ISOLATORS/WT SHALL BE OF 10KN AND FOR OTHER BPI IN SWITCHYARD SHALL BE OF 8KN MINIMUM.
- 7) HORIZONTAL TAKE-OFF OF JUMPERS AT EQUIPMENT LEVELS WITH ADEQUATE SAG SHALL BE PROVIDED



SECTION B-B



SECTION C-C



TYPICAL SECTION FOR 765KV LINE SIDE EQUIPMENT CONNECTION ARRANGEMENT IN PHASE WITHOUT WT

POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

TITLE: CONCEPTUAL CONNECTION ARRANGMENT OF 765KV TRANSFORMER BAY-TIE BAY- LINE WITH LINE REACTOR BAYS

DRAWING NO. C/ENGG/SS/CONCEPTUAL 765KV BAY CONNECTIONS
REV.0 SH.10F1

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PREPARED BY			REVIEWED BY				APPROVED BY

SPECIFICATION FOR DIGITAL PROTECTION COUPLER

1.0 Digital protection coupler for protection signalling through optical fibre cable system.

- 1.1 The Digital protection signalling equipment is required to transfer the trip commands from one end of the line to the other end in the shortest possible time with adequate security and dependability. It shall also monitor the healthiness of the link from one end to the other and give alarms in case of any abnormality. The protection signalling equipment shall have a proven operating record in similar application over EHV systems and shall operate on 48V DC (+10%, -10%). It shall provide minimum four commands. These commands shall be suitable for Direct tripping, Intertripping and Blocking protection schemes of EHV lines.

The protection signalling equipment shall communicate to the remote end interfacing with SDH terminal equipment at its 2Mbps port. It shall provide suitable interfaces for protective relays, which operate at 220/110V DC. Power supply points shall be immune to electromagnetic interface.

1.2 Principle of operation

During normal operation, protection signalling equipment shall transmit a guard signal/code. In case Protection signalling equipment is actuated by protective relays for transmission of commands, it shall interrupt the guard signal/code and shall transmit the command code to the remote end. The receiver shall recognize the command code and absence of the guard code and will generate the command to the protective relays.

All signal processing i.e. generation of tripping signal and the evaluation of the signals being received shall be performed completely digital using Digital Signal Processing techniques.

1.3 Loop testing

An automatic loop testing routine shall check the teleprotection channel.

It shall also be possible to initiate a loop test manually at any station by pressing a button on the front of the equipment.

Internal test routine shall continuously monitor the availability of the protection signaling equipment.

Proper tripping signal shall always take the priority over the test procedure.

The high speed digital protection signalling equipment shall be designed and provided with following features.

- Shall work in conjunction with SDH terminal equipment.
- It shall communicate on G 703 (E1,2 Mbps)
- Full Duplex operation
- Auto loop facility shall be provided
- Shall meet IEC 60834-1 standard
- Shall be able to transmit upto 4 commands with trip counter simultaneously or sequentially in one 2Mbps channel

Bidder shall quote for protection signalling equipment suitable for 4 commands with separate trip counters for transmit and receive. With regard to trip counters alternate arrangement .i.e. Laptop along with software & all accessories to download events including carrier receipt and transmit shall be acceptable. Laptop for the above shall be supplied at each substation under substation package.

High security and dependability shall be ensured by the manufacturer. Probability of false tripping and failure to trip shall be minimum. Statistical curves/figures indicating above mentioned measures shall be submitted along with the bid.

The DPC can be either housed in offered Control & Protection Panel / PLCC Panel or in separate panel.

Reports of the following tests as per clause 9.2 of Chapter 2-GTR shall be submitted for approval for protection signalling equipment and relays associated with the protection signalling equipment and interface unit with protective relay units, if any.

i) General equipment interface tests :

- a) Insulated voltage withstand tests
- b) Damped oscillatory waves disturbance test
- c) Fast transient bursts disturbance test
- d) Electrostatic discharge disturbance test
- e) Radiated electromagnetic field test
- f) RF disturbance emission test

ii) Specific power supply tests

- a) Power supply variations
- b) Interruptions

- c) LF disturbance emission
- d) Reverse polarity

iii) Tele-protection system performance tests

- a) Security
- b) Dependability
- c) Jitter
- d) Recovery time
- e) Transmission time
- f) Alarm functions
- g) Temperature and Humidity tests (As per IEC 68-2)
 - Dry heat test (50°C for 8 hours)
 - Low temperature test (-5°C for 8 hours)
 - Damp heat test (40°C/95%RH for 8 hours)

All the above tests at i, ii & iii (except temperature & humidity tests) shall be as per IEC 60834-1 and the standards mentioned therein.

iv) Relays

- a) Impulse voltage withstand test as per IEC 60255.
- b) High frequency disturbance test as per IEC 60255.

The protection signalling equipment shall be of modular construction and preferably mounted in the Relay panels. Cabling between the protection signalling equipment & Protection relays and between protection signalling equipment & Communication equipment shall be in the scope of bidder.

The input/output interface to the protection equipment shall be achieved by means of relays and the input/output rack wiring shall be carefully segregated from other shelf/cubicle wiring.

The isolation requirements of the protection interface shall be for 2kV rms.

1.4 Major technical Particulars

The major technical particulars of protection signalling equipment shall be as follows.

- i) Power supply 48V DC +10%, -10%
- ii) Number of commands 4 (four)
- iii) Operating time <7 ms
- iv) Back to back operate time without propagation delay ≤ 8 ms

- v) Interface to Protection relays
- | | |
|-------------------------|-----------------|
| Input: | Contact Rating: |
| Rated voltage | : 250 volts DC |
| Maximum current rating: | 5 amps |
- Output:
- | | |
|--------------------|---------------------|
| Contact Rating: | |
| Rated voltage | : 250 volts DC |
| Rated current | : 0.1 A DC |
| Other parameters : | As per IEC-255-0-20 |
- vi) Alarm contact
- | | |
|--------------------|---------------------|
| Rated voltage | : 250 volts DC |
| Rated current | : 0.1 A DC |
| Other parameters : | As per IEC-255-0-20 |
- vii) Digital communication interface: G 703(E1)

AIR CONDITIONING & VENTILATION SYSTEM FOR GIS BUILDING

AIR CONDITIONING SYSTEM FOR GIS

1 GENERAL

- 1.1 This specification covers supply, installation, testing and commissioning and handing over to POWERGRID of Air conditioning system for the Local Control rooms & Maintenance Room in the GIS halls.
- 1.2 Air conditioning system shall be designed to maintain the inside DBT below 24°C. Bidder shall submit necessary design calculations for employer's approval.
- 1.3 At least 50% spare Air-Conditioning capacity shall be provided for Local Control rooms in the GIS halls.
- 1.4 Controllers shall be provided in Local Control room inside GIS hall for controlling and monitoring the AC units in these rooms as detailed in clause no.2.6
- 1.5 Each Local Control room inside GIS hall shall be provided with temperature transducer to monitor the temperature of the Local Control rooms in the GIS halls. The Temperature transducer shall have the following specification:

Sensor	: Air temperature sensor (indoor use)
Output	: 4 to 20mA
Temperature range	: -5°C to 60°C
Resolution	: 0.1°C
Accuracy	: 0.5°C or better.

2 AIR CONDITIONING SYSTEM REQUIREMENTS.

- 2.1 Air conditioning requirement of the buildings shall be met using a combination of following types Air Conditioning units as required.
 - a) Cassette type split AC units of 3TR.
 - b) High wall type split AC units of 2TR.
- 2.2 Type & Capacity of air conditioners shall be so chosen such that quantity of air conditioners in the room is optimized keeping the necessary air flow.
- 2.3 **Scope**

The scope of the equipment to be furnished and services to be provided under the contract are outlined hereinafter and the same is to be read in

AIR CONDITIONING & VENTILATION SYSTEM FOR GIS BUILDING

conjunction with the provision contained in other sections/ clauses. The scope of the work under the contract shall be deemed to include all such items, which although are not specifically mentioned in the bid documents and/or in Bidder's proposal, but are required to make the equipment/system complete for its safe, efficient, reliable and trouble free operation.

- 2.3.1 Required number of Cassette type split AC units of 3TR capacity each complete with air cooled outdoor condensing unit having hermetically sealed compressor unit with cordless remote controller.
- 2.3.2 Required number of High wall type split AC units of 2TR capacity each complete with air cooled outdoor condensing unit having hermetically sealed compressor and high wall type indoor evaporator unit with cordless remote controller.
- 2.3.3 Copper refrigerant piping complete with insulation between the indoor and outdoor units as required.
- 2.3.4 First charge of refrigerant and oil shall be supplied with the unit.
- 2.3.5 GSS/Aluminium sheet air distribution ducting for distributing conditioned dehumidified air along with supply air diffusers and return air grilles with volume control dampers and necessary splitters etc., suitable fixtures for grilles/diffusers and supports for ducting complete with insulation.
- 2.3.6 Local start/stop facility for local starting/ stopping of all electrical equipment/ drives.
- 2.3.7 All instruments and local control panels alongwith controls and interlock arrangements and accessories as required for safe and trouble free operation of the units.
- 2.3.8 PVC drain piping from the indoor units upto the nearest drain point.
- 2.3.9 Supply and erection of Power and control cable and earthing.
- 2.3.10 MS Brackets for outdoor condensing units, condensers as required.
- 2.4 **Technical specifications.**
- 2.4.1 **Cassette type split AC units.**
The Cassette type AC units shall be complete with indoor evaporator unit, outdoor condensing units and cordless remote control units.

AIR CONDITIONING & VENTILATION SYSTEM FOR GIS BUILDING

- 2.4.1.1 Outdoor unit shall comprise of hermetically/ semi hermetically sealed compressors mounted on vibration isolators, fans and copper tube aluminium finned coils all assembled in a sheet metal casing. The casing and the total unit shall be properly treated and shall be weatherproof type. They shall be compact in size and shall have horizontal discharge of air.
- 2.4.1.2 Indoor units shall be of 4-way, ceiling mounted cassette type. The indoor unit shall be compact and shall have elegant appearance. They shall have low noise centrifugal blowers driven by suitable motors and copper tube aluminium finned cooling coils. Removable and washable polypropylene filters shall be provided. They shall be complete with multi function cordless remote control unit with special features like programmable timer, sleep mode etc.
- 2.4.1.3 Cooling capacity of 3TR AC units shall not be less than 36000btu/hr. and shall have energy efficiency rating of 5 star as on the date of NOA.
- 2.4.2 **High wall type split AC units**
- 2.4.2.1 The split AC units shall be complete with indoor evaporator unit, outdoor condensing units and cordless remote control units.
- 2.4.2.2 Outdoor unit shall comprise of hermetically/semi hermetically sealed compressors mounted on vibration isolators, propeller type axial flow fans and copper tube aluminium finned coils all assembled in a sheet metal casing. The casing and the total unit shall be properly treated and shall be weatherproof type. They shall be compact in size and shall have horizontal discharge of air.
- 2.4.2.3 The indoor units shall be high wall type. The indoor unit shall be compact and shall have elegant appearance. They shall have low noise centrifugal blowers driven by suitable motors and copper tube aluminium finned cooling coils. Removable and washable polypropylene filters shall be provided. They shall be complete with multi function cordless remote control unit with special features like programmable timer, sleep mode and soft dry mode etc.
- 2.4.2.4 Cooling capacity of 2TR AC & 3 TR AC units shall not be less than 22000btu/hr. and shall have energy efficiency rating of 5 star as on the date of NOA.
- 2.5 The Split AC units shall be of Carrier, Voltas, Blue Star, Hitachi, Daikin, LG, National, O'General, or Samsung make.

AIR CONDITIONING & VENTILATION SYSTEM FOR GIS BUILDING

2.6 Controllers shall be provided in Local Control room inside GIS hall, one controller for each room, to control and monitoring of AC units and shall have the following facilities;

- Standby units shall come in to operation automatically when the running main unit fails
- Main and standby units shall be changed over periodically which shall be finalised during detailed engineering.
- Following alarms shall be provided:
 - a. Compressor On/OFF condition of each unit
 - b. Compressor failure of each unit
 - c. Power OFF to AC unit
 - d. High temperature in room.

2.7 **Warranty**

All compressors shall have minimum 5 years Warranty from the date of commissioning.

Ventilation system for GIS Hall

Each GIS Hall shall have an independent ventilation system. Each Ventilation system shall consist of two 100% capacity systems, one operating and one stand-by.

To ensure that the air being supplied to the GIS hall is free from dust particles, a minimum two stage dust filtration process shall be supplied. This shall consist of at least the following:

1. Pre Filters: To remove dust particles down to 10 micron in size with at least 95% efficiency.
2. Fine Filters: To remove dust particles down to 5 microns in size with at least 99% efficiency.

All the filters shall be panel type. Easy access should be available to the filters for replacement/cleaning.

The ventilation of the GIS hall shall be of a positive pressure type with minimum 2 air changes per hour. The pressure inside the GIS hall shall be maintained 5 mm of water above the atmospheric pressure. Fresh outdoor air shall be filtered before being blown into the GIS hall by the air fans to avoid dust accumulation on components present in the GIS hall. GIS hall shall be provided with motorized exhaust dampers with local control.

CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST

1. General

Unless otherwise stipulated, all equipment, shall be tested for external corona (for 400kV & above) both by observing the voltage level for the extinction of visible corona under falling power frequency voltage and by measurement of radio interference voltage (RIV) for 132kV and above.

2. Test Levels:

The test voltage levels for measurement of external RIV and for corona extinction voltage are listed under the relevant clauses of the specification.

3. Test Methods for RIV:

3.1 RIV tests shall be made according to measuring circuit as per International Special-Committee on Radio Interference (CISPR) Publication 16-1(1993) Part -1. The measuring circuit shall preferably be tuned to frequency with 10% of 0.5 Mhz but other frequencies in the range of 0.5 MHz to 2 MHz may be used, the measuring frequency being recorded. The results shall be in microvolts.

3.2 Alternatively, RIV tests shall be carried out in accordance with relevant IEC of respective equipment or NEMA standard Publication No. 107-2016.

3.3 In measurement of, RIV, temporary additional external corona shielding may be provided. In measurements of RIV only standard fittings of identical type supplied with the equipment and a simulation of the connections as used in the actual installation will be permitted in the vicinity within 3.5 meters of terminals.

3.4 Ambient noise shall be measured before and after each series of tests to ensure that there is no variation in ambient noise level. If variation is present, the lowest ambient noise level will form basis for the measurements. RIV levels shall be measured at increasing and decreasing voltages of 85%, 100%, and 110% of the specified RIV test voltage for all equipment unless otherwise specified. The specified RIV test voltage for 765kV, 400 kV, 220 KV, 132kV is listed in the detailed specification together with maximum permissible RIV level in microvolts.

3.5 The metering instruments shall be as per CISPR recommendation or equivalent device so long as it has been used by other testing authorities.

3.6 The RIV measurement may be made with a noise meter. A calibration procedure of the frequency to which noise meter shall be tuned shall establish the ratio of voltage at the high voltage terminal to voltage read by noise meter.

4. Test Methods for Visible Corona

The purpose of this test is to determine the corona extinction voltage of apparatus, connectors etc. The test shall be carried out in the same manner as RIV test described above with the exception that RIV measurements are not required during test and a search technique shall be used near the onset and extinction voltage, when the test voltage is raised and lowered to determine their precise values. The test voltage shall be raised to 110% of specified corona extinction voltage and maintained there for five minutes. In case corona inception does not take place at 110%, test shall be stopped, otherwise test shall be continued and the voltage will then be decreased slowly until all visible corona disappears. The procedure shall be repeated at least 3 times with

corona inception and extinction voltage recorded each time. The corona extinction voltage for purposes of determining compliance with the specification shall be the lowest of the three values at which visible corona (negative or positive polarity) disappears.

The test to determine the visible corona extinction voltage need not be carried out simultaneously with test to determine RIV levels.

However, both test shall be carried out with the same test set up and as little time duration between tests as possible. No modification on treatment of the sample between tests will be allowed. Simultaneous RIV and visible corona extinction voltage testing may be permitted at the discretion of Employer's inspector if, in his opinion, it will not prejudice other test.

5. Test Records:

In addition to the information previously mentioned and the requirements specified as per CISPR or NEMA 107-2016 the following data shall be included in test report:

- a) Background noise before and after test.
- b) Detailed procedure of application of test voltage.
- c) Measurements of RIV levels expressed in micro volts at each level.
- d) Results and observations with regard to location and type of interference sources detected at each step.
- e) Test voltage shall be recorded when measured RIV passes through 100 microvolts in each direction.
- f) Onset and extinction of visual corona for each of the three tests required shall be recorded.

Gapless Surge Arrester – Technical parameters

a.	Rated arrester voltage	132 kV
b.	Rated system voltage	145 kV
c.	Rated system frequency	50Hz
d.	System neutral earthing	Earthed through NGR
e.	Installation	Outdoor
f.	Nominal discharge current	10kA of 8/20 microsec wave.
g.	Class of arrester	20kA heavy duty type
h.	Minimum discharge capacity	12 kJ/kV (referred to rated voltage)
i.	Continuous operating voltage at 50°C	106 kV
j.	Maximum switching surge residual voltage (1kA)	280kVp
k.	Maximum residual voltage at	
(i)	10kA	314kVp
(ii)	20kA nominal discharge current	334kVp
l.	Long duration discharge class	4
m.	High current short duration test value (4/10micro-sec.wave)	100kAp
n.	Current for pressure relief test	40kArms
o.	Low current long duration test value (2000microsec.)	1000Apeak
p.	Min. total creepage distance	3625 mm.
q.	One minute dry power frequency withstand voltage of arrester housing	275kVrms
r.	Impulse withstand voltage of arrester housing with 1.2/50 micro-sec. wave	+ 550KVp
s.	Pressure relief class	A
t.	RIV at 92 kVrms.	Less than 500microvolts
u.	Partial discharge at 1.05 continuous over voltage	Not more than 50pC
v.	Seismic acceleration	As specified in section project
w.	Reference ambient temperature	50 deg C

Annexure-V (Revised): Actions required in case of defects observed during warrantee period

Equipment	Nature of problem	Corrective measures to be taken by contractor
CT/IVT/PT (Oil filled)	DGA Violation H2 > 300 ppm C2H2> 2 ppm	Refurbished or replaced
CT/IVT/PT (SF ₆ filled)	a) SF6 gas leakage b) High Dew point of SF6 gas (> -36 deg C at atm press)	a)Repair/ replacement b)Re-processing of gas and replacement of Gas in case of no improvement
CT/IVT/PT (Oil filled)	Violation of Tan delta Tan Delta: >0.5%(during pre-commisioning) >0.7% (in operation) or change w.r.t. to previous year value > 0.1%	Replacement
CT, IVT/PT & CVT	- Oil leakage - Low Oil level -Sec winding problem leading to open/ short circuit, saturation etc	Replacement or repair as per repair procedure approved by QA.
CVT	Secondary voltage drift: Upto ± 0.5 volts Healthy a) ± 0.5 or beyond	a) CVT to be replaced

***Replaced/Repaired/Refurbished Equipment (or part of equipment) shall have 2 years warranty without prejudice to contractual warranty period.**

Nitrogen Injection Type Fire Prevention & Extinguishing System

- 1.1 Nitrogen Injection Type Fire Protection System (NIFPS) shall be designed to prevent explosion of transformer/reactor tank and the fire during internal faults/arc.

The system shall work on the principle of Drain & stir. On activation, it shall drain a pre-determined quantity of oil from the tank top through drain valve to reduce the tank pressure, isolate conservator tank oil and inject nitrogen gas at high pressure from the bottom side of the tank through inlet valves to create stirring action and reduce the temperature of oil below flash point to extinguish the fire. On operation, the quantity of oil removed from the tank shall be such that adequate amount of oil shall remain to cover active part (i.e. core coil assembly).

Electrical isolation of transformer shall be an essential pre-condition for activating the system.

- 1.2 Operational Controls

The system operation shall be fully automatic and activate from the required fire and other trip signals. In addition to automatic operation, remote operation from control room/ remote centre and local manual control in the fire extinguishing cubicle shall also be provided. System shall operate on following situations:

- 1.2.1 Prevention of transformer from explosion and fire

To prevent transformer from explosion and fire in case of an internal fault, signals given by operation of Electrical protection relays (Differential / Restricted earth fault) and tripping of circuit breaker of transformer and operation of either Buchholz relay or pressure relief valve (PRV) shall be used to activate the system. The exact logic for system activation shall be finalized during detailed engineering.

- 1.2.2 Prevention of transformer from fire

In case of fire, sensed by fire detectors, the system shall be activated only after electrical isolation of the transformer, confirmed by breaker trip. If the fire detection is not associated with any other fault, the system activation shall be only manual. Manual operation switch shall be provided in the control room with a cover to avoid accidental operation of it.

- 1.3 Operation of System

On receiving activation signal, the following shall take place:

- i) Open the quick opening drain valve to drain the top layer oil
- ii) Shut off the conservator isolation valve to prevent flow of oil from the Conservator tank to the main tank
- iii) Open the valve to inject Nitrogen into the transformer tank to create stirring of oil.

There shall be interlock to prevent activation of the system if the transformer is not

electrically isolated.

There shall also be provision for isolating the system during maintenance and/or testing of the transformer.

1.4 Technical Particulars

The contractor shall be responsible for the design of the complete system and shall submit the drawings and design calculations for the number of fire detectors, pipe sizing of drain pipe and Nitrogen injection pipe, Nitrogen cylinder capacity, number of injection points, etc. and get approval from POWERGRID.

Facility shall be provided to test the system when the transformer is in service, without actually draining the oil and injecting Nitrogen.

The Nitrogen regulator valve shall be designed in such a way that the Nitrogen shall not enter the transformer tank even in case of passing/ leakage of valve.

Owner shall provide two distinct station auxiliary DC feeders for control purposes. The system shall work on station DC supply with voltage variation defined in GTR .The control box of fire protection system shall have facility to receive these feeders for auto changeover of supply. It shall be the contractor's responsibility to further distribute power to the required locations. In case auxiliary DC power supply requirement is different than station auxiliary DC supply, then all necessary DC-DC converters shall be provided by the Contractor.

Following minimum indications and alarms shall be provided in the local cubicle as well as in the control box:-

- Nitrogen cylinder pressure indication - manometer with sufficient number of adjustable NO contacts
- Nitrogen cylinder pressure low
- Fire in Transformer/ Reactor
- Oil drain started
- Conservator oil isolation valve closed
- Nitrogen injection started
- DC supply fail
- Oil drain valve closed
- Gas inlet valve closed

1.5 Details of Supply of System Equipments and Other Related Activities:

The scope of supply shall include the following items and any other items required for safe and trouble free operation of the system.

- i) Fire extinguishing cubicle with base frame and containing at least the following:
 - Nitrogen gas cylinder of sufficient capacity with pressure regulator and manometer with sufficient number of adjustable NO contacts.
 - Oil Drain Assembly including oil drain pipe extension of suitable size for connecting pipes to oil pit

- Mechanical release device for oil drain and nitrogen release
 - Limit switches for monitoring of the systems
 - Panel lighting
 - Flanges on top of the panel for connecting oil drain and nitrogen injection pipes for transformer
 - Back up pressure switch to operate nitrogen gas valve
 - Pressure indicators for Nitrogen pressure of the cylinder and actual injection through Nitrogen regulator
 - Fire Extinguishing Cubicle shall have oil leakage detection arrangement for detecting oil leakage from drain valve. In case of any oil leakages, alarm to be provided.
 - shall have minimum IP55 degree of protection
- ii) Control box to be installed in the control room of the station for monitoring system operation, automatic control and remote operation, with alarms, indications, switches, push buttons, audio signal, suitable for tripping and signalling.
- iii) Required number of fire detectors to be located in strategic locations to be finalized during detailed engineering. Fire detectors shall have minimum IP-67 class degree of protection.
- iv) All controls, alarms, panels, cables, cable trays (if required), junction boxes etc.
- v) Flow sensitive conservator Isolation valve to isolate the conservator oil from the main tank is being provided by the transformer/reactor supplier. This valve shall be located in the piping between the conservator and the buchholz relay.

1.6 Under Ground Oil Storage Tank

Each transformer unit shall be provided with an underground oil storage tank. The oil storage tank shall have Non Corrosive, water proof, epoxy coated (from Inside) mild steel (minimum thickness 5 mm) to store drained out oil on operation of NIFPS. The tank shall be painted from outside as per **table below**:

PAINTING	Surface preparation	Primer coat	Intermediate undercoat	Finish coat	Total dry film thickness (DFT)	Colour shade
Oil storage tank	Shot Blast cleaning Sa 2 ½*	Epoxy base Zinc primer (30-40µm)	Epoxy high build Micaceous iron oxide (HB MIO) (75µm)	Aliphatic polyurethane (PU) (Minimum 50µm)	Minimum 155µm	RAL 7035

Note: (*) indicates Sa 2 ½ as per Swedish Standard SIS 055900 of ISO 8501 Part-1.

The total capacity of storage tank shall be at least 10% of transformer tank oil to avoid overflowing of oil considering that drained oil volume shall be around 10% of

transformer tank oil. Necessary arrangement shall be made on underground storage tank so as to take out the drained oil from the tank for further processing and use. All the pipe and physical connection from transformer to oil pit shall be in the scope of contractor.

This storage tank shall be placed in the pit made of brick walls with PCC (1:2:4) flooring with suitable cover plates to avoid ingress of rain water. The design of tank and pit shall be finalised during detailed engineering.

1.7 Installation and pre-commissioning test

After installation the system pre-commissioning tests shall be carried out jointly with the Owner's representative before the system is put in service.

ANNEXURE –III LIST OF MANDATORY SPARES

Sl.N	Description	Unit	Quantity
A.	245 kV SF6 Circuit Breakers		
1a.	Complete Pole of 245kV 1600A 40kA CB including closing resistor, Grading Capacitor, Interrupter, pole column, with driving mechanism and Marshalling Box but without support structure.	Pole.	1
2.	Grading capacitors	No	1
3	Rubber gaskets, O rings and seals	SET	1
4.	Trip coils with resistor	Nos.	2
5.	Closing coils with resistor	No.	1
6.	Molecular filter	No	2
7	Terminal pads and connectors	Nos	2
8.	Corona rings	No.	1
9.	Relays, power contactors, switch-fuse units, limit switches, push buttons, timers and MCBs etc	Set	1
10.	Pressure switches (of each type)	set	1
11.	Auxiliary Switch Assembly	set	1
B.	220 kV Isolators		
1	One complete pole including support insulator ,motor operating mechanism (MOM) with box but excluding structure {highest rating}	Pole	1 Pole (1 E/S)
2	Copper contact fingers for female & male contacts	sets	2
3	Open/Close Contactor Assembly, Timer, Key Interlock push button switch & auxiliary switches	Set	1

ANNEXURE –III LIST OF MANDATORY SPARES			
Sl.N	Description	Unit	Quantity
4	Limit switch	Set	2
5	Terminal pads & Connectors	Nos.	3
6.	Corona shield rings	Nos.	3
C.	220 kV Current Transformers		
1a.	1600A 40kA with 120% extended current rating	Nos.	1
D.	220kV CVT		
1	4400pF CVT	Nos.	1
E.	216 KV Surge Arrester		
1.	Complete LA	Nos.	1
2.	Surge counter/monitor	Nos.	5
F.	CONTROL AND RELAY PANEL		
(i)	Line Protection Panel equipment Spares		
1	Numerical distance relay	Set	1
H.	Common Spares		
1	Power supply module for bus bar protection	No.	1
2	Bay Unit module	Set	1
J	PLCC		
1.	Set of prints for carrier terminal	Set	1
2.	Set of prints for protection coupler	Set	1

ANNEXURE –II LIST OF DRAWING		
SL. No.	DRAWING NO.	TITLE
1.	C/ENGG-SS/NR-3/Mainpuri-Extn/SLD/00 Rev-0	Single Line Diagram 220kV Mainpuri (Bhogaon) substation Extension
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5.	C/ENGG/STD/PR/2017, REV 1 (SHEET 01 OF 03)	STANDARD PANEL ROOM (9M): Standard Switchyard Panel Room General Arrangement Detail of Panel Room
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	REV0	
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12.	C/ENGG/CVL/SYD/GATE/2016/01 OF 01, REV 0	DETAILS OF SWITCHYARD GATE
13.	C/ENGG/STD/ROAD CULVERTS/2016/01 OF 01, REV 0	DETAILS OF ROAD CULVERTS
14.	C/ENGG/STD/DRAIN/2016/(SHEET 01 OF 02), REV 0	DETAILS OF DRAIN
15.	C/ENGG/STD/DRAIN/2016/(SHEET 02 OF 02), REV 0	DETAILS OF DRAIN
16.	C/ENGG/STD/2016/RCT/01, REV 0 (NO OF SHEETS-4)	DETAILS OF CABLE TRENCHES AND CABLE TRENCH ROAD CROSSINGS
17.	C-ENGG-STD-STR-100, REV 1	Detail of 28 mm Dia. Foundation Bolt
18.	C-ENGG-STD-STR-101, REV 1	Detail of 40 mm Dia. Foundation Bolt
19.	C-ENGG-STD-STR-102, REV 1	Detail of 56 mm Dia. Foundation Bolt
LATTICE & PIPE STRUCTURE DRAWING		
20.	C-ENGG-STD-220-EQ-FAB -474001, REV 0	FABRICATION DETAIL OF 220 KV BPI SUPPORT STR. MKD. 2BPI
21.	C-ENGG-STD-220-EQ-FAB -474002, REV 0	FABRICATION DETAIL OF 220 KV BPI SUPPORT STR. MKD. 2WT
22.	C-ENGG-STD-220-EQ-FAB -474003, REV 0	FABRICATION DETAIL OF 220KV CVT SUPPORT STR. MKD. 2CVT
23.	C-ENGG-STD-220-EQ-FAB -474004, REV 0	FABRICATION DETAIL OF 220 KV LA SUPPORT STR. MKD. 2LA
24.	C-ENGG-STD-220-EQ-FAB -474005, REV 0	FABRICATION DETAIL OF 220 KV ISO SUPPORT STR. MKD. 2ISO
25.	C-ENGG-STD-220-EQ-FAB -474006, REV 0	FABRICATION DETAIL OF 220 KV CT SUPPORT STR. MKD. 2CT
26.	C-ENGG-STD-220 -FAB -474038, REV 0	FABRICATION DETAIL FOR 220 KV COLUMN PEAK MKD.2PI

30.	C-ENGG-STD-220-FAB -474045, REV 0	FABRICATION DETAIL FOR 220 KV COLUMN MKD.CC
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34.	C-ENGG-STD-220-FAB -474055, REV 0	FABRICATION DETAIL FOR 220 KV COLUMN MKD.CTH
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36		FABRICATION DETAIL FOR 220 KV Beam MKD.BA
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पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)
POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

TECHNICAL SPECIFICATION
FOR SUBSTATION EXTENSION PACKAGE
EXTENSION OF 220 KV BAYS AT 400/220KV MAINPURI S/S FOR
RAILWAYS;

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Annexures:

Annexure-1 Specific Requirements – Rev02

Annexure-2 : List of Drawing

Annexure-3 : List of Mandatory Spares

1. GENERAL

1.1 Power Grid Corporation of India Ltd. (POWERGRID), a Govt. of India Enterprise is responsible for bulk Power transmission of electrical energy from various Central Govt. Power Projects to various utilities/beneficiaries and interconnecting regional grids, operating and maintaining the National electrical grid of India. It is established with mandate of "We will become a Global Transmission Company with Dominant Leadership in Emerging Power Markets with World Class Capabilities by:

- World Class: Setting superior standards in capital project management and operations for the industry and ourselves.
- Global: Leveraging capabilities to consistently generate maximum value for all stakeholders in India and in emerging and growing economies.
- Inspiring, nurturing and empowering the next generation of professionals.
- Achieving continuous improvements through innovation and state of the art technology.
- Committing to highest standards in health, safety, security and environment." as its mission

1.2 The Northern Central Railway intends to construct 2 Nos. 220kV Bays at 400/220kV Bhogaon Substation of PG. Accordingly the Bay extension work for 2 Nos. 220kV bays at Bhogaon (Mainpuri) substation is envisaged.

2. INTENT OF SPECIFICATION

The specification includes design, engineering, manufacture, fabrication, testing at manufacturer's works, delivery, unloading at site, storage, erection, testing and commissioning at site. It is the intent of this specification to describe primary features, materials, and design & performance requirements and to establish minimum standards for the work. The specification is not intended to specify the complete details of various practices of manufactures/ bidders, but to specify the requirements with

regard to performance, durability and satisfactory operation under the specified site conditions.

3. SCOPE

The scope of this specification covers the following:

220 kV Bay Extension Package under consultancy work to Railways:

- i. Extension of 400/220 kV Mainpuri (Bhogaon) substation with the provision of following bays as per Single Line Diagram:
 - a. Two number of 220kV Line bays (Bay#212 and Bay#213)

The detailed scope of work is brought out in subsequent clauses of this section.

3.1 Extension of 400/220 kV Mainpuri (Bhogaon) substation:

- a) Design, engineering, manufacture, testing, supply including transportation & insurance, storage, erection, testing and commissioning of the following equipment's/items, complete in all respects:
 - i. 220kV Circuit breakers, isolators, current transformers, capacitor voltage transformers, surge arresters and wave traps complete.
 - ii. Complete Relay & Protection System for 220kV bays under present scope as per Section- Control & Relay panel of the Technical Specifications including augmentation of existing bus bar protection scheme for the bays under present scope.
 - iii. The supply of the control panels (Control panel with BCU) for terminating 220kV lines are in present scope. The control panels shall be placed in the existing control room whereas the associated relay panels shall be placed in new switchyard panel room (under present scope) due to space constraint in existing control room building. The entire integration between control and relay panel is also in the present scope of work.
 - iv. 220kV Bus bar protection Augmentation: The existing 220kV bus bar protection scheme is High Impedance Differential relay type RADHA of ABB make. Present scope includes the supply of bus bar protection panels along with bus bar protection relays, CT switching relays, trip relay, auxiliary relays (if required) and necessary wiring cabling for augmentation of Bus bar protection for 2 Nos. 220kV Bays.
 - v. Augmentation of existing RTUs based operation system for bays under present scope. Necessary hardware and software to augment the existing RTUs for control & monitoring of the bays under present scope shall be in bidder's scope. Make and type of RTU are as follows:

- (i) M/s ALSTOM make S900 for data transfer to NRLDC
- (ii) M/s ALSTOM make C264 for remote operation

It is responsibility of contractor to successful integrate protection IED's with BCU including updating of database, display's and development of additional displays and reports as requirement for the 220kV bays covered under present scope. Any up-gradation of hardware and software is in scope of contractor including license fee (if any). Necessary configuration of data at Gateway for remote operation from NTAMC, Backup NTAMC & supervision from NRLDC (RSCC) is included in present scope.

Further, the preparation of the signal list of NTAMC in consultation with PG for integration with NTAMC/RTAMC is in the present scope of the work.

- vi. One no. portable fire extinguisher (CO2 type) of 4.5 kg shall be provided for the Switchyard Panel Room as per Bid Proposal Sheet (BPS). Fire Detection & Alarm System shall be provided for the Switchyard Panel Room & integration of same with existing system is in present scope of work, as per BPS.
- vii. 1.1 kV grade Power & Control cables along with the cable glands and lugs with complete accessories.
- viii. Main Earthmat as per requirement at site
- ix. Lattice and pipe structures (galvanized)-Towers, Beams and equipment support structure shall be provided as per Employer's drawings enclosed except for Circuit Breaker support structure which will be as per manufacturer's design.
- x. Bus Post Insulators and High Bus post insulators including support structures. The drawing of HBPI support structure shall be submitted by the party for approval.
- xi. Erection hardware such as insulators, insulator strings and hardware, clamps & connectors, Aluminum tubes, conductors, Bus bar and earthing materials, risers, insulating mats, cable sealing arrangement, Bay marshaling box, Junction box, spacers, cable supporting angles/channels, cable trays & covers, buried cable trenches, PVC pipes for cabling etc. as required.
- xii. Complete Lighting for the switchyard area under present scope of bay work.
- xiii. Illumination and Air conditioning of Switchyard panel room as per BPS.

- xiv. Dismantling and re-erection of the Street Lights including electric poles and its foundation, cables, panels, junction boxes etc.
 - xv. DTPC and PLCC Equipment for both ends as per BPS
 - xvi. Telecom equipment as detailed in BPS
 - xvii. Any other equipment/material required to complete the specified scope.
- b) Design, Engineering, manufacture, testing, supply including transportation & insurance, storage at site of mandatory spares Annexure-III.
- c) Civil Works

I. Based on Owner supplied drawings

The scope of work shall include but shall not be limited to the following:

- i. Foundation for all standard Lattice, pipe structures
- ii. All roads as shown in GA including culverts.
- iii. Switchyard Panel Rooms
- iv. Cable trenches along with covers, road / rail crossings, sump pits, drains etc. However, the cable trench layout drawing including invert levels shall be prepared by the Contractor.

II. Civil work including design and drawing by the contractor:

- i. Foundation for bay marshaling boxes, panels, control cubicles etc.
- ii. Extension of existing drainage system layout using standard sections
- iii. Contouring and leveling of the plot including supply of borrowed earth if any.
- iv. stone spreading along with anti-weed treatment & PCC as per Section-Civil Works
- v. Repair of roads, cable trenches and drains damaged during construction works shall also be in contractor's scope.
- vi. Dismantling and re-erection of the main Boundary walls and main gate. The sifting of main gate is also under present scope of work.

3.5 The work to be done under this specification shall include all labour, plant, equipment, material and performance of all work necessary for the complete design, installation and commissioning of switchyard. All apparatus, appliances, material and labour etc. not specifically mentioned or included, but are necessary to complete the entire work or any portion of the work in compliance with the requirements implied in this specification is deemed to be included in the scope of contractor.

- 3.5 Before proceeding with the construction work the Contractor shall fully familiarize himself with the site conditions, general Arrangements, philosophy & scheme etc. Though the Employer shall endeavor to provide the information, it shall not be binding for the Employer to provide the same. The bidders are advised to visit the substation sites and acquaint themselves with the topography, infrastructure and also the design philosophy. The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the construction and successful commissioning, operation & maintenance of the substation in all respects. All materials required for the Civil and construction/installation work including cement and steel shall be supplied by the Contractor.
- 3.6 Complete design (unless specified otherwise in specification elsewhere) and detailed engineering shall be done by the Contractor based on conceptual tender drawings, standard practice and site conditions.
- 3.7 Design of substation and its associated electrical & mechanical auxiliaries systems includes preparation of single line diagram, electrical layout, foundation & cable trench layouts (including invert levels), erection key diagrams, earthing design, electrical and physical clearance diagrams, Control and protection schematics, wiring and termination schedules, design of fire-fighting system, outdoor lighting/illumination and other relevant drawings & documents required for engineering of all facilities within the fencing to be provided under this contract, are covered under the scope of the Contractor.
- 3.8 Any other items not specifically mentioned in the specification but which are required for erection, testing and commissioning and satisfactory operation of the substation are deemed to be included in the scope of the specification unless specifically excluded. The contractor shall arrange all T&P (such as necessary supports, cranes, ladders, platforms etc.) for erection, testing & commissioning of the system at his own cost. Further, all consumables, wastage and damages shall be to the account of contractor.
- 3.9 Employer has standardized its technical specification for various equipment, sections of Technical Specification and works for different voltage levels. The same shall be referred for the present scope of work. Items, which are not applicable for the scope of this package, the technical specification for the items shall not be referred to.

4. SPECIFIC EXCLUSIONS

The following items of work are specifically excluded from the scope of the specifications

- i. Employer's site office and stores
- ii. Approach Road upto Sub-station boundary

5. PHYSICAL AND OTHER PARAMETERS

- i. Location of the Substation - The location of substation is indicated below:

S.No	Name of Substation	Name of State	Nearest Rail Head
1	400/220KV (Bhogaon) S/S	Mainpuri Uttar Pradesh	Etawah

- ii. Meteorological data:

Sl. No.	Parameter	Data
	Snow Fall	Nil
	Wind Zone	As per IS 875 (part-3) Latest Revision
	Seismic Zone	As per IS 1893 (part-1) Latest Revision
	Short Circuit Level	40kA / 1Sec
	Creepage (Except Insulator String)	25mm/kV min

6. SCHEDULE OF QUANTITIES

The requirement of various items/equipments and civil works are indicated in Bid Price Schedules (BPS). All equipments/items and civil works for which quantities have been given in the BPS shall be payable on unit rate basis. During actual execution, any variation in such quantities shall be paid based on the unit rate under each item incorporated in Letter of award.

Wherever the quantities of items/works are indicated in Lot/Set, the bidder is required to estimate the quantity required for entire execution and completion of works and incorporate their price in respective Bid price schedules. For erection hardware items, Bidders shall estimate the total requirement of the works and indicate module-wise lump sum price bay wise and include the same in relevant Bid price schedules. Any material/works for the modules not specifically mentioned in the description in BPS, as may be required shall be deemed to be included in the module itself.

Bidder should include all such items in the bid proposal sheets, which are not specifically mentioned but are essential for the execution of the contract. Item which explicitly may not appear in various schedules and required for successful commissioning of substation shall be included in the bid price and shall be provided at no extra cost to Owner.

7. BASIC REFERENCE DRAWINGS

- i. Mainpuri (Bhogaon) substation extension is proposed with double main and transfer switching scheme for 220kV voltage level. For 220kV system, Quad Moose ACSR conductor shall be used for Main bus and Twin Moose ACSR for transfer bus and for equipment interconnections, Twin Moose ACSR conductor / Al tube of 120mm OD and 96mm ID shall be used.
- ii. The reference drawings, which form part of the specifications, are given at **Annexure-II**. The bidder shall maintain the phase to earth clearance, phase to phase clearance and sectional clearances, clearances between buses, bus heights as per Technical Specification and Standard practice of the Employer but may alter the locations of equipment to obtain the statutory electrical clearances required for the substation.
- iii. The enclosed drawings give the basic scheme, layout of substation, substation buildings, associated services etc. In case of any discrepancy between the drawings and text of specification, the requirements of text shall prevail in general. However, the Bidder is advised to get these clarified from Owner.

8. DIFFERENT SECTIONS OF TECHNICAL SPECIFICATION

For the purpose of present scope of work, Technical Specification (TS) (Vol. II) shall consist of following sections and they should be read in conjunction with each other.

- 1) Section-Project. (Rev.0)
- 2) Section-General Technical Requirement (GTR) (Rev.14)
- 3) Section-Switchgear [(Rev.11 for CB, CT, CVT & LA) & (Rev.11B for ISO),]
- 4) Section-Power and Control Cables (Rev.06)

- | | |
|--|------------|
| 5) Section-LT Switchgear | (Rev.05) |
| 6) Section-Lighting System | (Rev.07) |
| 7) Section-Fire Protection System | (Rev.06) |
| 8) Section-Air Conditioning System | (Rev.04) |
| 9) Section-Switchyard Erection | (Rev.10) |
| 10) Section- Structures | (Rev.06) |
| 11) Section-Civil Works with latest SFQP | (Rev.11A) |
| 12) Section-Control and Relay Panels | (Rev.09) |
| 13) Section-Substation Automation System | (Rev.04) |
| 14) Section: Telecommunication system | (Rev – 02) |
| 15) Section : PLCC | (Rev – 05) |
| 16) Section : RTU | (Rev-03) |

In case of any discrepancy between Section-PROJECT and Section-GTR and other Technical specifications on scope of works, Section-PROJECT shall prevail over all other sections.

In case of any discrepancy between Section-GTR and individual sections for various equipment, requirement of individual equipment section shall prevail.

9. MANDATORY SPARES

The Mandatory Spares shall be included in the bid proposal by the bidder. The prices of these spares shall be given by the Bidder in the relevant schedule of BPS and shall be considered for evaluation of bid. It shall not be binding on the Owner to procure all of these mandatory spares. The bidder is clarified that no mandatory spares shall generally be used during the commissioning of the equipment. Any spares required for commissioning purpose shall be arranged by the Contractor. The unutilized spares if any brought for commissioning purpose shall be taken back by the contractor.

Wherever spares in BPS/Technical Specification have been specified as “each type/each rating/each type & rating”: If the offered spare/spares are sufficient

to replace the respective main equipment of all types/ratings, then such offered spare/spares shall be acceptable. It implies that common spare/spare set fulfilling the spare requirement of all types/ratings shall also be acceptable, provided it is configurable at site itself without special assistance of OEM.

10.SPECIFIC REQUIREMENT

Refer Annexure-1.

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