

SUBCONTRACTOR'S SCOPE OF WORK		
Job	Capital Overhauling of Turbine and Generator, 210 MW, Unit#4 , KSTPS KOTA	
	Completion Period : 30 Days from barring gear stop to start date of oil flushing excluding additional time for extra/optional works	
Sl. No.	Description of Work	%age of Work allotted
I	Mandatory Work- Turbine	
A	HP Module	14%
B	IP Module	10%
C	LP Turbine	13%
D	Bearing Inspection	14%
E	Overhauling of Turbine Valves	9%
F	MS & HRH Strainers	2%
G	Main Governing and LP Bypass Governing System	2%
H	Hanger Inspection	1%
J	INSULATION OF HP, IP CASINGS, VALVE BODIES - Mineral Wool Spray	10%
K	Miscellaneous	4%
II	Mandatory Work- Generator	21%
	GRAND-TOTAL	100%
III	Optional Work (Turbine)	%age of Work allotted
1	Cutting of breech nut for removal of HP Module (up to 02 No.)	3.655% of CV per Breech Nut
2	Cutting and Welding of MS Pipe Line (up to 02 No.)	1.424% of CV per Joint
3	Replacement of LP Casing inlet bellows LHS & RHS (up to 02 No.)	3.456% of CV per Bellow
4	Replacement of LP Casing inlet bellows between inner outer and Inner Inner Casing (up to 02 No.)	2.968% of CV per Bellow
5	Optional Work - Providing One vehicle Exclusively for BHEL Staff use at RRVUNL KOTA STPS (RAJ.) - tentatively for 45 days	As per Actual Usage

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Sl. No.	Description of Work	% Allocation
I	Mandatory Work (Turbine)	
A.	HP MODULE	
1	Dismantling of steam inlet and exhaust pipes of HP turbine (after locking of hangers and supports). Removal of insulation from HP casing and its disposal to scrap yard.	1
2	Checking parallelism of HP inlet and exhaust flanges with casing flanges and rectification by adjustment of hangers and supports, if required.	
3	Dismantling of seal steam supply/leak off lines/drain lines and exhaust pipes connected to HP turbine. Replacement of breach nut if required.	
4	Roll check, horn drop test & bump check and locking of rotor with casing.	1
5	Support of turbine shaft to casing. Lifting of HP module from pedestals and placing it on stands.	
6	Tilting of HP module & placing it in vertical position on fixture after removal of seal segments.	
7	Removal of threaded ring from barrel and removal of inner casing guide keys.	1
8	Removal of inner casing with rotor from barrel and placing the same in horizontal position on fixture.	
9	Inspection of U-ring and I-ring and repairs, if any, to the extent possible at site.	
10	Removal of top half of inner casing and its inspection. Repair/replacement of sealing rings, if required. Opening of PP studs of inner casing	
11	Removal of rotor from bottom half and inspection of bottom half of inner casing. Repair / replacement of sealing fins, if required.	
12	Cleaning of rotor and inner casing halves by alumina blasting with alumina powder of 80 or 100 microns grade with air at a pressure of 4-6 kg for directing the same. The job shall be carried out in an enclosure made with scaffolding pipes and covered with tarpaulin. Air pressure at 4-6 kg pressure, scaffolding material and polythene, etc. shall be arranged by agency.	3
13	Inspection of rotor and repairs, if required, to the extent possible at site. Any reblading of the rotor , if required , is excluded from scope of work	2
14	Parting plane stud length measurement and replacement.	
15	Placement of top half on bottom half and tightening of parting plane bolts. Fixing of centering device in barrel and inner casing.	
16	Placement of inner casing with centering device in barrel and centering of inner casing in barrel by correction of fitted guide keys.	
17	Placing top and bottom halves of inner casing one by one on assembly fixture, leveling it, placement and centering of rotor in casing half and checking of axial and radial clearances with each half of casing.	2
18	Placement of rotor in bottom half inner casing for final assembly and tightening of top and bottom halves	
19	Roll check and bump check after tightening and corrections.	2
20	Locking of rotor with inner casing and insertion of inner casing assembly into the barrel after placement of U-ring in position. Fitting of centering keys and tightening of threaded ring.	
21	Lifting the barrel and placing it in horizontal position, removal of locking devices after supporting the rotor on fixture.	
22	Check shaft seals and labyrinth glands for abrasion and scaling. Check springs of spring mounted ring segments. Replacement of springs of high temperature zone. Fitting of seal segments in barrel maintaining the required clearances.	
23	Assembly of outer glands in barrel maintaining the centering of glands with barrel.	2
24	Final axial and radial clearances checks.	
25	Shifting of HP module from fixture to pedestals.	
26	Connection of all piping with casing to be carried out.	
27	Bump check to be carried out before and after connection of piping.	2
28	Assistance in Removal / fixing of HP TSE thermocouples , absolute shaft vibration pick up , speed pick up , differential expansion , axial shift pickups , limit switches , HP turbine thermocouples.	
B.	IP MODULE	
1	Removal of complete IP turbine insulation and its disposal to designated area.	1
2	Dismantling of inlet, gland sealing steam , exhaust and extraction line of top casing after properly supporting them including cutting and welding if required	
3	Dismantling of exhaust steam lines from top casing,if required cutting and welding of lines	
4	Bump check of IP turbine.	1
5	Roll check and horn drop test of IP turbine.	
6	Removal of top halves of front and rear gland boxes.	
7	Supporting of IP outer casing on jack bolts, heating and loosening of joint bolts and lifting of top half of IP outer casing.	
8	Supporting of IP inner casing on jack bolts, heating and loosening of joint bolts and lifting of top half of IP inner casing.	2
9	Measure axial and radial blade and shaft seal clearances and radial and facial run out of IP rotor coupling. Removal of IP rotor and IP inner casing.	
10	Cleaning / sand blasting of IP turbine internals and DP testing of blades, wherever required. Cleaning shall be carried out by alumina blasting.	
11	Checking of parting plane gaps of inner and outer casings and rectifications, if required. Measure casing distortion, check casing joints for erosion check of cracks. Checking guides of inner casing for freedom of movement and wear.	
12	Replacement of gland fins, seal segments wherever required.	
13	Parting plane studs length measurement for permanent elongation DPT checks for embrittlement & cracks. Replacement of studs if required.	2
14	Assistance in removal and assembly of thermo couple for IP casing.	
15	Box-up of IP inner casing, roll check and heat tightening of joint bolts. Bump check of IP inner casing.	

16	Box-up of IP outer casing, roll check and heat tightening of joint bolts. Bump check of IP outer casing. Box up of front and rear gland boxes.	4
17	Checking of casing centering.	
18	Assembly of inlet, gland sealing steam, extraction lines and exhaust steam pipes.	
19	Cleaning and lubrication of all radial and axial keys, packers, etc. of casing and bearing pedestals.	
20	Setting of gland box clearances, key clearances and assembly of gland boxes including refitting of gland segment of springs and making of clearances.	
21	Run out checking and matching of IP rotor coupling face with HP and LP rotor coupling.	
22	Cutting / opening of all casing drain pipes and gland steam pipes in lower half of casing, blowing of air through these pipes to clear the foreign material and re-fixing of these pipes by TG welding and replacement of gaskets of flange connections.	
23	Replacement of all gland steam piping flanges gaskets in both upper and lower halves.	
C. LP MODULE		
1	Removal of LP gland box upper halves and checking of seal clearances.	2
2	Loosening of LP casing parting plane bolts and lifting of outer casing top half.	
3	Proper covering of condenser opening and condenser tubes suitably over tube support plates. For this, GI sheets are to be provided by RRVUNL.	
4	Roll check of LP casing . Removal of diffuser cones (top half) supporting inner-outer casing at the bottom by jack bolts and loosening PP bolts.	2
5	Removal of LP inner-outer casing top half.	
6	Roll check of inner-casing and its dismantling.	
7	Checking and rectification of axial and radial clearances of LP casing/rotor.	
8	Lifting of LP rotor and placement on rotor stand after supporting properly.	5
9	Checking for looseness of blades of LP rotor and DP testing, wherever necessary. Rectification of loose blades if any.	
10	Inspection of LP Turbine expansion bellows , LPT inlet pipe (LHS & RHS) , bellow protection pipe welding seams and LP casing to pedestal expansion bellows by DPT.	
11	Remove LP free standing blades from fir tree grooves , clean root & groove , check complete blade with specific attention to blade root for crack by carrying out MPI and carry out NFT(arrangement of instrument for MPI & NFT is under vendor scope). Replacement of LP rotor last stages blades (Blade sequencing chart to be arranged by RRVUNL from BHEL Haridwar). Fitting of locking strips and weld-locking.	2
12	Cleaning of LP turbine internals taken out from assembly by alumina blasting method.	
13	Inspection of LP rotor and inner casing.	2
14	Correction in axial and radial clearances of LP turbine.	
15	Check parting plane gaps and ovality of inner-inner and inner-outer casings and rectification, if required. Placement of LP rotor back in position after cleaning work.	
16	Box up and roll check of inner-inner casing and correction.	2
17	Box up and roll check of inner-outer casing and correction.	
18	Box up LP outer casing after complete inspection of condenser internals (Steam space).	
19	Setting of gland box clearances, key clearances and assembly of gland boxes including replacement of segments.	
20	Replacement of eroded balancing weights of LP Rotor.	
D BEARING INSPECTION		
1	Measurement of bearing throttle heights. Removal of Pedestal covers and bearing halves of turbine (Brgs No. 01 to 04) after checking existing bearing/ key clearances. Opening of enclosure, if any.	2
2	Coupled run out checks of all rotors and couplings. Decoupling of all rotors and measurement of free run outs. Measurement of existing casing/pedestal key clearances.	
3	Decoupling of HP/MOP. Overhauling of MOP, DPT and UT of MOP bearings and replacement of worn out/ damaged parts (including machining of wear rings and bearings), reassembly, realignment of HP/MOP and coupling.	
4	Measurement of catenary of TG rotors using pot levels.	2
5	Roll check and bump check of HP, IP and LP casing. Swing check of HP rotor. Decoupling of HP-IP, IP-LP .	
6	Ultrasonic/DP testing of all bearings. Checking of bearing clearances, rectification of bearing clearances, replacement of bearings and keys (including matching of new keys). Hydraulic test of all jacking oil hoses and replacement.	
7	Checking of rotor float on thrust bearing and adjustment including replacement/ repair of pads, if required.	
8	Checking of contact of bearing torus pieces with spherical/ cylindrical supports. Replacement of bearings, torus and support, if required including doweling of the new support. Measurement of facial run outs of all couplings and rectification.	2
9	Alignment of HP/IP, IP/LP couplings, and coupling of rotors including reaming, honing, if required. Cleaning of coupling spigots.	
10	Adjustments in packers, bearing supports, bearing keys, etc. and their blue matching, lubrication of keys, packers etc. as per requirement of casing. Removal of all sliding keys and packers , cleaning , lubricating and re-fixing in bearing pedestals , LP guides etc.	
11	Roll check, bump check and centring of HP , IP and LP casings . Adjustment of axial and radial keys and packers, including their matching and lubrication. Horn drop test of HP and IP casing and correction. Servicing / replacement of jacking oil pump relief valve.	4
12	Resetting of all bearings, oil catchers and pedestal oil guard rings, replacement of sealing strips as per requirement. Refitting of bearings and setting/matching of bearings, yoke keys, etc.	
13	Dismantling and overhauling of over speed trip and thrust bearing trip devices checking and adjustment, if required.	
14	Barring gear nozzle removal ,inspection , repair/replacement of fins and resetting and assembly.	
15	Box up of bearings 1 to 4.	
16	Preparation for oil flushing cleaning of oil filters, basket strainers, duplex filters and resetting of throttles on completion of the flushing.	
17	Putting the machine on barring gear, adjustment of jacking oil pressure at bearings. Checking and setting of hangers in critical piping.	
		0.5

18	Assistance in steam rolling and synchronization and attending to any defects observed during the same with respect to the above scope work.	0.5
19	Deputation of vibration Expert along with Vibration analysis kit & Trim Balancing of Unit as per requirement.	3
E	OVERHAULING OF TURBINE VALVES	
	HP main steam stop & control valves along with their servomotors - 2 sets	9
	IP reheat stop & control valves along with their servomotors - 2 sets	
	LP bypass stop and control valves along with their servomotors - 2 sets	
	LP bypass water injection valves along with their servomotors - 4nos.	
	NRV's in CRH line along with their servomotors - 2 nos.	
1	Scaffolding for valves as required & removal insulation and recording of reference dimensions, valve travel in cold condition prior to dismantling, gap between coupling nut collar and servo spindle.	
2	Draining of servomotor/ actuator housing. Removal of oil lines and steam leak off line. Decoupling and removal of actuators/ servomotor.	
3	Measurement of valve spindle travel before dismantling and measurement of servomotor spindle compression.	
4	Removal and dismantling of valve and actuator assembly.	
5	Cleaning and descaling of component parts.	
6	Inspection of valves, valve stems, studs, bushes and pilot disc including NDT and checking of valves stems run out. Rectification / replacement of components, if required.	
7	Inspection of all sealing faces at the valve seats, back seat, sealing ring, etc. and stop valve servomotor disc top and rectification, as necessary.	
8	Checking of clearances and rectification/replacement of components, if required.	
9	Inspection of back seat bushings, packing rings, gland packings and servomotor oil seal rings and their replacement.	
10	Assembly of complete valves including servomotors and connection of all piping. Checking of valves for any leaks and proper functioning. Measurement of valve stem lifts/ travel/compression. Adjustment of valves during final setting.	
F	MS and HRH Strainers (04 nos.)	
	Making of platforms and supporting devices to facilitate strainer works with materials i.e. plates, angles, beams etc to be provided by RVUNL. Cutting of strainer drain lines, dismantling of main steam and HRH strainers, inspection/ NDT, cleaning and rectification, replacement of gaskets and re-assembly. TIG welding of strainer drain lines, rectification after radiography, if required.	2
G	Main Governing and LP Bypass Governing System (Test Valves, Changeover valves for extraction NRVs and Servomotor of CRH NRVs and hydraulic protection devices axial shift , over speed etc.)	
	Revisioning of all the components feedback assemblies, their inspection and cleaning. Replacement of components, O-rings, oil seals and other parts, if required. Commissioning and resetting of Governing and LP Bypass racks vis-à-vis respective stop & control valves, CRH NRVs, water injection valves, etc. Checking and setting of governing characteristics and recalibration. Arrangement of governing expert during the work of governing system is to be done by vendor. Deputation during synchronization and loading of unit for characteristics setting, if required.	2
H	Hanger Inspection	
	Overhauling and servicing of hanger supports of critical pipe lines and their resetting on cold set values	1
1	Locking of pipes and supports properly	
2	Servicing the inner parts of spring hangers and its proper cleaning and greasing etc.	
3	Reassembling the components after replacing damaged parts.	
4	Replacement of complete assembly , if required.	
5	Putting repaired/new spring support in position and providing pin in the lug.	
6	Final adjustment of the spring and setting the hanger on cold set value.	

J	INSULATION OF HP, IP CASINGS, VALVE BODIES - Mineral Wool Spray	
	The scope of work shall include the supply & application of Thermal insulation on the following components.	
	a) HP Casing	
	b) IP Casing	
	c) Valve Bodies of HP, IP and LP Bypass Valves	
	The working parameters of the machine are 150 kg/sq. cm. Steam pressure and steam temperature of 535 degrees Centigrade.	
	1. Before taking up the above jobs, all the remaining old insulation on the equipment listed above will have to be removed surface thoroughly cleaned, new charge and new insulation applied as per specification described hereafter.	
	1.2 Insulation Specifications	
	The spray mineral wool insulation will be carried out with superfine mineral wool as insulation material mixed with sodium silicate as binder in appropriate ratio for complete thickness, over HP casing, IP casing CV's and their omega pipes, mineral wool shall confirm to IS:3677:1973.	
	1.3 Method of Application	
	1.3.1 Spray Insulation	
	Fixing of thermal insulation will be done by the modern spray techniques as per standard procedure and practice, so as to contain the top and bottom casing temp. difference within 20°C during normal operation of the turbine. Each subsequent layer of spray insulation is to be applied only when initial layers are dried up. A protective coating of finishing cement of 12.5 mm reinforced with S.S. wire netting is to be applied after the required thickness of insulation is achieved and finally covered with oil and fire resistance coating, so as to protect the insulation from soaking of oil in case it accidentally falls on the insulation.	
	1.3.2. Welding of supports	
	a) Welding of the supports wherever required, shall be done on M.S. Strips already provided on the casing. If required extra M.S. strips of size 25 mm X 3 mm have to be welded to make a network so as to maintain welding case for the supports.	
	b) To support the insulation M.S. Rods of 6 mm dia shall be welded over the framework wherever not already provided. The length of supports shall be 200 mm/ 240 mm approx. extra supports shall be provided wherever negative contour exists.	10
	1.4. Mineral wool shall then be sprayed over the casing for a thickness of 50 mm after which shall be wrapped and wire netting of size 22SWGx20. This wire netting shall be provided in three parts i.e. separately for upper half, lower half and the finger portion respectively. The wire netting shall be held in position with M.S. retainer of size 65mm X 65mm X 3mm which shall be tack welded on M.S. rods. The total thickness shall be then built up by spraying mineral wool in layers of 50/60 thickness and intermittent layers of S.S. Wire netting of size 22 SWG x 20 mm shall be provided as reinforcement. After first 100mm thickness, M.S. flat supports in both directions in a closer pitch shall be provided on the bottom portion only so as to support the insulation. The above process shall be carried out to build up total thickness of insulation for the bottom portion.	
	1.5. The sprayed insulation shall be covered with cement asbestos fluff plaster mixed in ratio of 4:1 and applied all over in average thickness of 12.5 mm. The same shall be finally covered with Aluminium foil of 0.1 mm thick duly pasted with adhesive sodium silicate or equivalent. Before, Aluminium foil bituminous varnish layer shall be applied on the whole insulation-plastered surface.	
	1.6. The insulation of the connected piping shall be carried out with standard mineral wool mattresses finally covered with 22 SWG Aluminium sheeting.	
	1.7: NOTE	
	1.7.1. Compressed air at 5 to 6 kg/sq. cm. will be provided by customer free of cost.	
	1.7.2. Each operation shall be completed and inspected by the site engineer-in-charge before start of the next one.	
	1.7.3. The finished-sprayed surface shall be re-aligned and not stored. A thin layer of sodium silicate shall however be sprayed after building up of each layer so as to give it a stiff finish.	
	1.7.4. All the sliding surfaces like servo-motors and shaft should be properly covered with cloth/polythene, so as to protect them from sprayed mineral wool.	
	1.7.5. The insulation shall be carried out in such a manner that a parting membrane provided in the insulation just under the main flange thus separating the top and bottom of the sprayed portion over the turbine casing. The membrane (Al. Foil) to be inserted in the insulation while spraying.	
K	Miscellaneous Works	
1	The sub-contractor has to deploy one EOT Crane operator & safety officer round the clock basis for the entire duration of the Job. .	1.5
2	The Sub-contractor shall provide 1 Laptop/Desktop Computer of latest configuration along with 3-in-1 printer (PSC Laser printer), UPS, Data card for accessing internet (Modem), other peripherals, accessories, Stationary & cart ridges Exclusively for BHEL use from start till completion of work. The Sub-contractor shall also provide one office assistant and 1 attendant for BHEL Site Office/ colony on round the clock basis. All charges shall be borne by Sub-contractor. Arrangement of potable packaged mineral drinking water for BHEL site office during entire duration of work as per site requirement.	2
3	The subcontractor has to ensure availability of 5KV Digital Insulation Tester of Reputed company at site for the entire duration of the Job.	0.5

II	Mandatory Works (Generator)	
1	Generator air tightness test to identify leakage areas if any when the machine is in barring gear . Rectification of all leakages as found during the overhauling.	1
2	Removal of Bearing no. 5,6,pedestal covers and bearing liner top halves after checking all clearances. All turbovisory instruments, brush gear assembly to be removed before bearing dismantling.	
3	Checking of coupled run out	
4	Decoupling of LP-Generator, removal of jammed coupling bolts ,checking of initial alignment and free run out of rotor coupling and journals. Rotor facial run out to be measured .	2
5	Dismantling of seal body ,seal ring ,oil catchers , end shields ,fan shields and rotor fan blades after recording all requisite clearances and insulation resistance values.	
6	Measurement of air gap and magnetic offset and IR values of rotor and stator winding	
7	Removal of bearing no. 5 & 6 after taking necessary values.	
8	Necessary arrangement for rotor thread out by attachment of special fixtures. Threading out of rotor. Necessary care to be taken during rotor thread out to avoid ingress of foreign materal inside generator rotor and stator.	
9	Covering of Generator stator by tent of tarpaulin and covering of Generator Rotor after thread out in separate tent of tarpaulin.Both tents are covered by tarpaulin cover and erected with truss support . All required tent material alongwith truss support is to be arranged by agency.	2
10	Hydraulic test of stator winding after removing water header spool pieces immediately after the rotor thread out . Repair/replacement of rubber grommets,teflon pipes,joints and insulation covers etc and plugging of leaking conductors if any in the stator water system. Hot water circulation and checking of each teflon tube for water flow.	
11	Removal, dismantling, cleaning (by cleaning by ACID soaking method) ,painting of water boxes (Paint will be arranged by RRVUNL), hydraulic test, reassembly if and fitting back to original position of all Hydrogen coolers including replacement of all side and front gasketstrubber items.	
12	Opening of generator manhole and cleaning from inside.	
13	Inspection of looseness of of stator slot wedges and rewedging . Wedge deflection test shall be provided.	
14	Checking of RTDs and replacement	
15	Checking of back side of the core and its support area to detect evidence of overheating , winding rubbing , core loseness and any other abnormalities. Inspection of anchoring bolts . Checking of stator winding , core looseness,clamping nuts bolts,washers,ventilating spacers ,bracing cords ,support brackets, fasteners etc and correction of defects as per requirement.	2
16	Inspection of stator core bars for absence of technological bolts and removal of same.	
17	Dismantling of stator terminal bushings and water header bushings for inspection of porcelain insulators , replacement of all rubber items and reassembly including filling of silicon putty and reinsulation around the bushings.	2
18	Repair of minor defects in stator core like looseness , mechanical damage , rusting etc.	
19	Checking and cleaining of stator core and overhang winding with Trichloroethene , glue injection , varnishing of core and winding and drying of the same. Glue & varnish will be provided by RRVUNL.	
20	Final hydraulic test of the stator winding	
21	Improving stator winding IR/PI value by puffing hot dry compressed air through water headers and filament lamp heating simultaneously.	1
22	Removal of rotor fan blades and fan hub , servicing and replacement of CC bolts , sealing washers , rotor gas tightness test and remounting of fan hub. CC bolts spares shall be provided by RRVUNL.	
23	Rotor purge test with Test Kit for inspection of rotor slot ventilating canals.	
24	Inspection of rotor slot wedge, balancing weights , rotor cooling holes for any deposition	
25	Inspection of insulating spacers below retaining rings	
26	DPT of bearing babbit , seal babbit , coupling bolts , reatining rings , RR nuts and fan blades , seal body welding & seal oil pipe line welding joints & UT of bearing babbit & seal babbit. DPT Kit & UT instruments shall arrange by contractor	1
27	Dry out and varnishing of rotor. Bectol red or other varanishing material will be arranged by RRVUNL.	
28	Cleaning of slip ring holes and fan. Polishing of slip ring , rotor journals and coupling face and dimensional measurement of slip ring and rotor journals	1
29	Cleaning and parting plane matching of bearings , oil guards , oilcatchers , sealing covers , end shields and seal bodies.	
30	Replacement of oil catchers/guard fins and setting of clearances with rotor.	
31	Checking of matching of bearing with respective housing and rotor journals. Requisite clearances and dimensional measurements to be maintained.	1
32	Threading in of rotor, placement of bearing no.5&6 . Achieving IR value of pedestal no. 6	
33	Alignment of LP/Generator . Measurement of air gap , magnetic offset after alignment.	
34	Reassembly of generator including fixing of rotor fan blades , end shields , fan shields , oil catchers , shaft seals , oil and water pipelines after ensuring proper IR values.	
35	Achieve clearance between fan blades and fan shields to be corrected to avoid fouling.	2
36	Box up of bearing 5 &6	
37	Coupling of LP generator including stretching of coupling bolts. Reamimng and honing.	
38	Checking of lifting of rotor at bearing no. 5,6	
39	Placement of all bearing pedestals , beaing pedestal machining with sole plate and box up of bearing	
40	Oil flushing of bearings with filters , normalization of lube oil system and normalization of seal oil system	1
41	Air tightness of generator in barring gear and arrest leakages	
42	Assistance in rolling of machine	
43	ELECTRICAL TESTS to be performed by contractor including arrangement of test Kits	
e	ELCID Test of stator core. Repair of core packets in case of higher leakage current to the extent possible and repetition of tests on those packets.	
a	Tan delta test of core winding	
b	Partial discharge measurement/ analysis.	
	IR/PI Measurement and DC resistance measurement of Stator and rotor winding.	5
c	AC impedance test of rotor. PI measurement of stator winding.	
d	RSO test of rotor.	
44	Assistence in Natural Frequency Test (NFT) of stator winding and attending winding looseness / strengthening of supports if required during NFT.	
	Sub-Total	21

III	Optional Works- Turbine	
	<p>Following optional job would arise in the case when Breech nut of HP Turbine gets stuck during dismantling/ assembly. In this case there is only one solution that is cutting of Breech Nut to remove connection between Main steam Pipe and HP Module. This event, in turn, would require three activities to be carried out:</p> <p>i. Cutting of breech nut ii. Cutting & Welding of MS Pipe line below valve bodies.</p> <p>Activities shall be carried out at site. Since above activities can occur in one or both breech nuts, hence per activity and per breech nut rates are being given.</p>	
1	Cutting of Breech Nut of HP Module (up to 02 No.)	
	<p>Following Works, if required, shall be carried out at extra cost and additional time basis: The requirement of optional job would arise in the case when Breech nut of HP Turbine gets stuck during dismantling. In this case there is only one solution that is cutting of Breech Nut to remove connection between Main steam Pipe and HP Module. This event in turn would require three activities to be carried out:</p> <p>a. Cutting of breech nut b. Cutting and Welding of MS Pipe line</p> <p>Additional 10 days per Breech Nut shall be given.</p>	3.655% of CV per breech nut
2	Cutting and Welding of MS Pipe Line (up to 02 HP Joints)	
	<p>Cutting of MS Pipe Line. HP welding, preheating, post heating, radiography, post weld heat treatment of MS inlet line. Radiography/NDT of joint will be in Agency scope. Additional 05 days per HP Joint shall be given.</p>	1.424 % of CV per Joint
3	Replacement of LP Casing inlet bellows LHS & RHS (up to 02 Nos.)	
a	Preparation of scaffolding.	3.456% of CV per bellow
b	Dismantling of protection covers.	
c	Locking of pipes.	
d	Cutting and removal of old bellows.	
e	Edge preparation and welding of new bellow.	
f	NDT and radiography of joints and rectification.	
g	Assembly of protection cover and removal of scaffolding.	
4	Replacement of LP Casing inlet bellows between inner outer and Inner Inner Casing (up to 02 Nos.)	
a	Removal of covers of both outlet bellows (L&R) and DPT of the bellows.	2.968% of CV per bellow
b	Opening of manholes in steam admission pipes(L&R) & insp. of the inner bellows.	
c	Cutting of weld joint of protection pipe of outer bellow (RHS) and pushing it towards the cross-around pipe.	
d	Cutting of weld joints of outer compensating bellow and taking out the same.	
e	Cutting open flanges in the steam admission pipe (RHS) and a portion of the pipe to facilitate removal of the inner compensator.	
f	Removal of protection pipe and broken portion of inner compensator (RHS).	
g	Cutting open lip joint of inner bellow of LHS to facilitate removal of inner-inner casing & cutting weld joint of protection pipes of both inner & outer compensators on LHS.	
h	Cutting weld joint and taking out damaged inner compensator (LHS).	
III	Cutting out ring from damaged inner compensator (RHS).	
j	Edge preparation of all joints as per drawing.	
k	Assembly and welding of ring and protection pipe in inner compensator LHS & DPT of the joints. Welding of horizontal joint in the ring.	
l	Assembly and welding of ring and protection pipe in inner compensator RHS & DPT of the joints. Welding of horizontal joint of the protection pipe.	
m	Welding of dents in steam admission pipe RHS and grinding the same.	
n	TIG welding of removed portion of steam admission pipe of RHS after preparation of the joints.	
o	Keeping inner compensator L&R in position.	
p	Grinding of lip joints to the extent required cutting extra length of the bellows.	
q	Preparation of lip joints of inner compensators of both LHS & RHS with inner casing and TIG welding of the joints. Welding of flanges in both sides with the steam admission pipe outside and the compensator inside.	
r	Preparation and TIG welding of joint between inner and outer compensator in both LHS & RHS and TIG welding of the same.	
s	Preparation and TIG welding of joint between outer compensator RHS and steam admission pipe.	
t	Welding of protection pipe in outer compensator L&R and DPT of the same.	
u	Cleaning and DP testing of all bellows in extraction lines in LP Casing.	
v	NDT including DP test and Radiography test to be carried out of welding joints as per instructions of BHEL site –in- charge. Arrangement of all NDT shall be in Vendor scope.	
5	Optional Work - Providing One vehicle Exclusively for BHEL Staff use at RRVUNL KOTA STPS (RAJ.)	AS PER SUB-ANNEX-A3

SPECIAL INSTRUCTIONS/ TERMS & CONDITIONS FOR SUB-CONTRACTOR	
1	Completion Period shall be 30 Days from barring gear stop to start date of oil flushing excluding additional time for preparatory, extra/optional & finishing works which shall be extra at actual subject to Force Majeure and Availability of Customer Inputs & Facilities in time.
2	Experienced manpower including EOT crane operators for round the clock work, general tools & tackles required for the job to complete the work satisfactory and in time. All material handling equipments duly supported by Load testing certificates.
3	Sub-contractor has to arrange at least 1 Site-in-charge, Shift Engineers, Supervisors (for arranging Vehicle, Gate passes, Sunday, holiday Night & OPI permissions / Fire & Safety training / Transportation arrangement), Industrial safety monitoring, Supervisors / Foreman, Mill right fitters, riggers, Crane Operators, winder, brazer, Electricians, helpers etc. along with experts for hanger inspection, core repair, cc bolt etc.
4	Deputation of Governing Expert, Vibration Analyser machine with operator during defect liability period in case of high vibration reprotting is to be done by vendor without additional charge of deputation; however, such requirement shall be totally based on requirement.
5	Safety officer to monitor industrial safety and ensure industrial safety of his workmen, machinery and plant. Wearing of safety shoes and helmets is a must for this work. He shall ensure proper housekeeping at all point of time.
6	sub-contractor has to submit estimated manpower commitment at the time of quoting for the total work for the purpose of obtaining labour license well in advance and arranging security permits as required.
7	The sub-contractor has to depute minimum man power for coverage duty in round the clock shift for attending to break-in maintenance like oil filter cleaning etc for a period of at least 3 days after synchronization.
8	Detailed sequence of overhauling activities indicating time of Start & duration in days should be submitted along with offer.
9	sub-contractor manpower must bring Photos, and Address Proof, Voter Identity Card documents for making the photo gate pass of their staff and this is must.
10	All consumables i.e. electrodes including special electrodes, filler wires, gases like DA, Oxygen, Argon and other consumables including cleaning agents, cotton waste, waste cloth, markin cloth, asbestos cloth, asbestos powder, acetone, Hylomer, omega compound, various sealants , jointing compounds, lubricants, Silastic RTV, brazing torch/heating torch, vaccum cleaner etc. shall be arranged by the subcontractor. Arrangement of tarpulin for coverage of dismantled components. LPG is not allowed inside the plant premises for cutting/ welding.
11	All efforts shall be made by the subcontractor to save time in all activities and achieve reduction in time period.
12	All preheating, H.P. welding and stress relieving as required shall be carried out by the subcontractor as per BHEL norms. Root run shall be done by Argon and subsequent runs by argon/ manual arc welding as per BHEL norms.
13	All H.P. Welding shall be done by IBR qualified and approved H.P. welders, using BHEL approved consumables, equipment and processes.
14	Subcontractor shall ensure use of only calibrated Inspection, Measuring & Testing equipment (i.e. micrometers, slip gauge, dial gauges, telescopic gauges, dial bore gauges, measuring tape, vernier calipers, megger, multimeter, clamp on meter etc.), confirming to national standards. Valid calibration certificates shall accompany these equipments.
15	Transportation of spares from stores to site and scrap from site to scrap yard, including making all necessary arrangements for the same, shall be done by the subcontractor.
16	Hydraulic jacks 100 Tonnes 04 Nos. with valid test report shall be arranged by sub-contractor. 24V DC source & handlamp etc. for working in Generator shall be arranged by sub-contractor.
17	To & fro arrangement of testing kit as required from BHEL office to site.
18	Cutting of tubes and edge preparation on all tubes shall be done by grinders only. No gas cutting shall be allowed.
19	Arrangement of MPI, DP and UT consumables of reputed make and the kits and qualified level II operators for all jobs in the scope of work shall be done by the subcontractor. The quantity of consumables required to be supplied free of cost. All NDT testing will be done by agency. All consumables required for NDT along with expert will be arranged by agency.
20	One attendant each in day and night shift is to be provided in BHEL site office.
21	All the tools and tackles required for execution of all the jobs mentioned in scope of work are to be arranged by the Sub-Contractor. All electrical testing equipments as per scope along with experts are to be arranged by the sub-contractor within this scope of work and no extra charge will be paid.
22	Any other consumables/material required for execution and completion of mentioned jobs, other than mentioned above, shall be in the scope of contractor. Any internal work if not written but required to perform for completion of overhauling have to be done without extra cost.
23	SUB-Contractor has to comply with guidelines issued by central and state government/ local administration . All expenditure for same to be borne by sub-contractor.
24	In case of contradiction between GSCC & Annexure-I, Conditions in Annexure-I will prevail & be final.

Optional Work - Providing One vehicle Exclusively for BHEL Staff use at RRVUNL KOTA STPS (RAJ.)

Job: Capital overhauling of Turbine and Generator, 210 MW, Unit#4, KSTPS KOTA

Vehicle Scope of Work and Terms and Conditions

A. Scope: “Providing one vehicle Exclusively for BHEL Staff use as per site requirement at KOTA STPS from start of work till completion of work as per BHEL Site Engineer requirement. (Tentatively for 45 Vehicle days).

B. Payment: Payment for providing the vehicle shall be done as per actual usage of vehicle days including running charges, OT & Night Charges after completion of work and as per following rate and Terms & conditions detailed as below.

C. Schedule of Rates and Prices:

S No.	Description	Tentative quantity	Rates (In Rs.)/ P
1	Type of Vehicle		(4+1) Dzire/Indigo/SUV or Higher or any equivalent type of Vehicle
2	Daily Hire Charges Rate for 12 hours duty	45 Vehicle days	Rs. 1134/ - per day
3	Running charges	5400 KMs	Rs 10.50 per KM
4	Overtime charges per hour (after 12 hours duty)	135 hrs	Rs. 70/ - per hour
5	Night Charges per night for stay beyond 11 PM	25 Nights	Rs. 332/ - per night

*** Note: Above Quantity is tentative and likely to be varied, payment shall be made as per actual usage of Quantity.**

D. Terms and Conditions:

- Type of Vehicle must be 5-Seater or above or any equivalent type of Vehicle and with excellent running conditions.**
- The vehicle is to be arranged by bidder after duly verifying all relevant documents and statutory compliances at his own end. BHEL shall not be held responsible for any unlawful act, non-compliance, or violation arising from the operation, ownership, or use of the said vehicle.
- Distance and time shall be taken into the account from garage to garage. However, these will be limited to 10 km and half an hour each way for the payment of purpose.
- The above rates are inclusive of all charges towards driver, fuel, maintenance, lubricants, Insurance and statutory taxes etc. No other charges shall be payable.
- Duty hours shall be 12 hours/ day. Depending on the site condition vehicle can be retained at Site throughout the night and continued next morning in which case overtime (OT) beyond 12 hours will be paid as per agreed rates.
- Night charges and overtime charges shall not be paid concurrently beyond 11 pm.
- The vehicle shall be petrol/ diesel driven and in excellent running condition. In case of break down alternate replacement vehicle shall have to be provided by the contractor otherwise BHEL will arrange the vehicle at the risk and cost of the contractor.
- For running charges receipt of Fuel shall be attached along with bill.
- The maintenance of vehicle shall be responsibility of Contractor. However suitable breaks for maintenance of vehicle shall be given as per convenience of BHEL, during this Contractor shall provide alternate vehicle.

10. All expenses towards state taxes/road tax, passenger taxes, road permits, pollution control certificate, insurance, driver's license etc. shall be borne by the Contractor. No claim in this regard will be entertained by BHEL.
11. Mobile Phone is compulsory for each driver who is on duty.
12. All legal responsibility of the vehicle shall be of Contractor. Photocopy of all statutory requirements i.e. pollution test certificate, challan, vehicle registration book, driving license, ownership documents etc. will have to be made available/submitted to BHEL by the Contractor.
13. Toll tax and parking charges shall be paid by Contractor which will be reimbursed to him by BHEL, as per actual, on submission of receipt.
14. Vehicle shall be used at site as per requirement till completion of work, if work completed before the contract period BHEL reserves the right to terminate the contract.
15. The vehicle may be required to be taken, outside KOTA STPS plant area whereby the same rates will be applicable.
16. During contract, if there is any dispute then the decision taken by the legal advisor appointed by BHEL shall be binding on both parties.
17. The meter reading shall be checked at random intervals to ensure its correctness.
18. Driver engaged shall be courteous and well behaved. Safety of driver, his accommodation, food and other facilities for the driver have to be arranged by Contractor.
19. All bills shall be accompanied by vehicle Log book, duly completed and signed by the users.
20. No payments shall be made for the unsigned mileage reflected in the Log book.
21. Payment shall be made after completion of work on receipt of bills and duly verified by BHEL engineer in-charge by electronic transfer to the account in the bank identified by the Contractor.