T E N D E R S P E C I F I C A T I O N
No: BHE/PW/PUR/KKRN-STG U#3/1206

COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD, TRANSPORTATION OF MATERIALS TO SITE, ERECTION, TESTING, COMMISSIONING, APPLICATION OF THERMAL INSULATION, FINAL PAINTING INCLUDING SUPPLY OF PAINTS & PRIMERS, PERFORMANCE TESTING, TRIAL OPERATION AND HANDING OVER OF TG PLANT PACKAGE COMPRISING OF TURBINES, GENERATOR, MSRs, CONDENSERS WITH INBUILT FEED WATER HEATER, TG AUXILARIES, INTEGRAL PIPING INCLUDING HP-MSR-LP STEAM PIPING, TANKS, VESSELS, LP HEATERS ETC. WITH HANGERS & SUPPORTS AND ASSOCIATED VALVES, FITTING ETC. FOR UNIT-3 OF 2X700 MWe NPCIL KAKRAPAR ATOMIC POWER PROJECT AS PER TENDER SPECIFICATIONS

AT

NPCIL (NUCLEAR POWER CORPORATION OF INDIA)
KAKRAPAR ATOMIC POWER PROJECT
KAKRAPAR, DIST. SURAT, STATE- GUJARAT

TECHNICAL BID - VOLUME- I

Tender Specifications consists of:

- **Notice Inviting Tender**
- **Volume 1 A - Technical Conditions of Contract,**
- **Volume 1 B - Special conditions of Contract,**
- **Volume 1 C - General conditions of Contract**
- **Volume 1 D - Forms & Procedures**
- **Volume 1 E- Drawings and Specifications for Safety & Welding by NPCIL (#)**

Note-(#)- The tender document Vol I E shall be considered as a part of Vol IA 'TCC'. However same is not uploaded in website due to its bulkier file size. Bidders are requested to purchase the same from BHEL –PSWR office separately.

Bharat Heavy Electricals Limited
(A Government of India Undertaking)
Power Sector - Western Region
345-Kingsway, Nagpur-440001

T E N D E R S P E C I F I C A T I O N
No: BHE/PW/PUR/KKRN-STG U#3/1206

COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD, TRANSPORTATION OF MATERIALS TO SITE, ERECTION, TESTING, COMMISSIONING, APPLICATION OF THERMAL INSULATION, FINAL PAINTING INCLUDING SUPPLY OF PAINTS & PRIMERS, PERFORMANCE TESTING, TRIAL OPERATION AND HANDING OVER OF TG PLANT PACKAGE COMPRISING OF TURBINES, GENERATOR, MSRs, CONDENSERS WITH INBUILT FEED WATER HEATER, TG AUXILARIES, INTEGRAL PIPING INCLUDING HP-MSR-LP STEAM PIPING, TANKS, VESSELS, LP HEATERS ETC. WITH HANGERS & SUPPORTS AND ASSOCIATED VALVES, FITTING ETC. FOR UNIT-3 OF 2X700 MWe NPCIL KAKRAPAR ATOMIC POWER PROJECT AS PER TENDER SPECIFICATIONS

AT

NPCIL (NUCLEAR POWER CORPORATION OF INDIA)
KAKRAPAR ATOMIC POWER PROJECT
KAKRAPAR, DIST. SURAT, STATE- GUJARAT

EARNEST MONEY DEPOSIT: Refer Notice Inviting Tender
LAST DATE FOR Refer Notice Inviting Tender
TENDER SUBMISSION .

THESE TENDER SPECIFICATION DOCUMENTS CONTAINING VOLUME-I AND VOLUME- II ARE ISSUED TO:

M/s. ……

…….

PLEASE NOTE:
THESE TENDER SPECS DOCUMENTS ARE NOT TRANSFERABLE.

For Bharat Heavy Electricals Limited

ADDITIONAL GENERAL MANAGER (Purchase)
Place: Nagpur
Date :

CONTENTS			
Volume No	Description	Hosted in website bhel.com as files titled	No. of pages
NIL	Tender Specification Issue Details	(Part of **Vol-IA-1206**)	1
NIL	Notice Inviting Tender	(Part of **Vol-IA-1206**)	21
I-A	Technical Conditions of Contract	Vol-IA-1206	126
I-B	Special Conditions of Contract	Vol-IBCD-1206	47
I-C	General Conditions of Contract	(Part of **Vol-IBCD-1206**)	29
I-D	Forms & Procedures	(Part of **Vol-IBCD-1206**)	71
I-E	**Drawings and Specifications for Safety & Welding by NPCIL**	**	
II	Price Bid Specification	Vol-II-1206	5

Note:

**** The tender document Vol I E shall be considered as a part of Vol IA 'TCC'. However same is not uploaded in website due to its bulkier file size. Bidders are requested to purchase the same from BHEL –PSWR office separately.**

Rev 01
1st Jun
2012

NOTICE INVITING TENDER

(Document No PS:MSX:NIT)

Bharat Heavy Electricals Limited

Ref: **BHE/PW/PUR/KKRN-STG U # 3 /1206** Date: 29/11/2013

NOTICE INVITING TENDER (NIT)

NOTE: BIDDER MAY DOWNLOAD FROM WEB SITES OR PURCHASE TENDERS FROM THIS OFFICE ALSO

==========

To

Dear Sir/Madam

Sub : NOTICE INVITING TENDER

Sealed offers in two part bid system are invited from reputed & experienced bidders (meeting PRE QUALIFICATION CRITERIA as mentioned in Annexure-I) for the subject job by the undersigned on the behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender document. Following points relevant to the tender may please be noted and complied with.

1.0 Salient Features of NIT

SL NO	ISSUE	DESCRIPTION	
i	**TENDER NUMBER**	**BHE/PW/PUR/KKRN-STG U # 3/1206**	
ii	**Broad Scope of job**	COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD, TRANSPORTATION OF MATERIALS TO SITE, **ERECTION, TESTING, COMMISSIONING**, APPLICATION OF THERMAL INSULATION, FINAL PAINTING INCLUDING SUPPLY OF PAINTS & PRIMERS, PERFORMANCE TESTING, TRIAL OPERATION AND HANDING OVER OF TG PLANT PACKAGE COMPRISING OF **TURBINES, GENERATOR, MSRs, CONDENSERS**WITH INBUILT FEED WATER HEATER, TG AUXILARIES, INTEGRAL PIPING INCLUDING HP-MSR-LP STEAM PIPING, TANKS, VESSELS, LP HEATERS ETC. WITH HANGERS & SUPPORTS AND ASSOCIATED VALVES, FITTING ETC. **FOR UNIT-3 OF 2X700 MWe NPCIL KAKRAPARATOMIC POWER PROJECT**AS PER TENDER SPECIFICATIONS AT NPCIL (NUCLEAR POWER CORPORATION OF INDIA) KAKRAPAR ATOMIC POWER PROJECT KAKRAPAR, DIST. SURAT, STATE-GUJARAT	
iii	**DETAILS OF TENDER DOCUMENT**		
a	Volume-IA	*Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc*	*Applicable*
b	Volume-IB	*Special Conditions of Contract (SCC)*	*Applicable*
c	Volume-IC	*General Conditions of Contract (GCC)*	*Applicable*
d	Volume-ID	*Forms and Procedures*	
e	Volume-II	*Price Schedule (Absolute value).*	*Applicable*
iv	**Issue of Tender Documents**	***1. Sale from BHEL PS Regional office at :*** ***Start : 29/11/2012 ,*** ***Closes: 21/12/2013 , Time : 16.00 Hrs*** **2. From BHEL website (www.bhel.com)**	*Applicable/ Not applicable*

		Tender documents will be available for downloading from website till due date of submission	
v	**DUE DATE & TIME OF OFFER SUBMISSION**	***Date : 23/12/2013, Time 15.00 Hrs*** ***Place : BHEL PS Regional office at :Nagpur*** Tenders being submitted through representative shall be submitted at dispatch section of of PSWR HQ Office after making entry/registration at the reception. For any assistance on the matter kindly contact following officials: Pratish Gee Varghese/Sr Engineer(Purchase Shivkesh Meena / Engineer (Purchase)	*Applicable*
vi	**OPENING OF TENDER**	***1 hours after the latest due date and time of Offer submission*** *Notes:* *(1) In case the due date of opening of tender becomes a non-working day, then the due date & time of offer submission and opening of tenders get extended to the next working day.* *(2) Bidder may depute representative to witness the opening of tender*	*Applicable*
vii	**EMD AMOUNT**	*Rs 2,00,000/- (Rupees Two Lakhs Only)*	*Applicable*
viii	**COST OF TENDER**	*Rs 2000/-.*	*Applicable*
ix	**LAST DATE FOR SEEKING CLARIFICATION**	*Five days before the due date of offer submission. Along with soft version also, addressing to undersigned & to others as per contact address given below*	*Applicable*
x	**SCHEDULE OF Pre Bid Discussion (PBD)**	*Date :*	*Not applicable.*
xi	**INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)**		*Not Applicable*
xii	**Latest updates**	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage (www.bhel.com -->Tender Notifications →View Corrigendums) **and not in the newspapers**. Bidders to keep themselves updated with all such information	

2.0 The offer shall be submitted as per the instructions of tender document and as detailed in this NIT. Bidders to note specifically that all pages of tender document, including these NIT pages of this particular tender together with subsequent correspondences shall be submitted by them, duly signed & stamped on each page, as part of offer. **Rates/Price including discounts/rebates, if any, mentioned anywhere/in any form in the techno-commercial offer other than the Price Bid, shall not be entertained.**

3.0 Unless specifically stated otherwise, bidder shall remit cost of tender and courier charges if applicable, in the form of Demand Draft drawn in favour of Bharat Heavy Electricals Ltd, payable at Power Sector Regional HQ at Nagpur issuing the Tender, along with techno-commercial offer. Bidder may also choose to deposit the Tender document cost by cash at the Cash Office as stated above against sl no iv of 1, on any working day; and in such case copy of Cash receipt is to be enclosed with the Techno Commercial offer. Sale of tender

Documents shall not take place on National Holidays, holidays declared by Central or State Governments and BHEL PS HQ at Nagpur, Sundays and second/ last Saturdays

4.0 Unless specifically stated otherwise, bidder shall deposit EMD through Demand Draft/Pay Order in favour of Bharat Heavy Electricals Ltd, payable at Nagpur. For other details and for 'One Time EMD' please refer General Conditions of Contract.

5.0 **Procedure for Submission of Tenders**: The Tenderers must submit their Tenders to Officer inviting Tender, as detailed below:

- PART-I consisting of 'PART-I A (Techno Commercial Bid)' & 'PART-I B (EMD/COST of TENDER)' in two separate sealed and superscribed envelopes (ENVELOPE-I & ENVELOPE-II)
- PART-II (Price Bid) – in sealed and superscribed envelope (ENVELOPE-III)
- One set of tender documents shall be retained by the bidder for their reference

6.0 The contents for ENVELOPES and the superscription for each sealed cover/Envelope are as given below. **(All pages to be signed and stamped)**

Sl no	Description	Remarks
	Part-I A	
	ENVELOPE – I superscribed as : PART-I (TECHNO COMMERCIAL BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION: **CONTAINING THE FOLLOWING**:-	
i.	Covering letter/Offer forwarding letter of Tenderer.	
ii.	Duly filled-in `No Deviation Certificate' as per prescribed format to be placed after document under sl no (i) above. **Note:** a. In case of any deviation, the same should be submitted separately for technical & commercial parts, indicating respective clauses of tender against which deviation is taken by bidder. The list of such deviation shall be placed after document under sl no (i) above. It shall be specifically noted that deviation recorded elsewhere shall not be entertained. b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding. i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender	
iii.	Supporting documents/ annexure/ schedules/ drawing etc as required in line with Pre-Qualification criteria. It shall be specifically noted that all documents as per above shall be indexed properly and credential certificates issued by clients shall distinctly bear the name of organization, contact ph no, FAX no, etc.	
iv.	All Amendments/Correspondences/Corrigenda/Clarifications/Changes/ Errata etc pertinent to this NIT.	
v.	Integrity Pact Agreement (Duly signed by the authorized signatory)	If applicable
vi.	Duly filled-in annexures, formats etc as required under this Tender Specification/NIT	
vii.	Notice inviting Tender (NIT)	

viii.	Volume – I A : Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc	
ix.	Volume – I B : Special Conditions of Contract (SCC)	
x.	Volume – I C : General Conditions of Contract (GCC)	
xi.	Volume – I D : Forms & Procedures	
xii.	Volume – II (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item	
xiii.	Any other details preferred by bidder with proper indexing.	

	PART-I B	
	ENVELOPE – II superscribed as: PART-I (EMD/COST of TENDER) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION: **CONTAINING THE FOLLOWING**:-	
i.	1. Earnest Money Deposit (EMD) in the form as indicated in this Tender **OR** Documentary evidence for 'One Time EMD' with the Power Sector Region of BHEL floating the Tender 2. Cost of Tender (Demand Draft or copy of Cash Receipt as the case may be)	

	PART-II	
	PRICE BID consisting of the following shall be enclosed	
	ENVELOPE-III superscribed as: PART-II (PRICE BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION: **CONTAINING THE FOLLOWING**	
i	Covering letter/Offer forwarding letter of Tenderer enclosed in Part-I	
ii	Volume II – PRICE BID (Duly Filled in Schedule of Rates – rate/price to be entered in words as well as figures)	

	OUTER COVER	
	ENVELOPE-IV (MAIN ENVELOPE / OUTER ENVELOPE) superscribed as: TECHNO-COMMERCIAL BID, PRICE BID & EMD TENDER NO: NAME OF WORK: PROJECT: DUE DATE OF SUBMISSION:	

	CONTAINING THE FOLLOWING:	
i	o Envelopes I o Envelopes II o Envelopes III	

SPECIAL NOTE : All documents/ annexures submitted with the offer shall be properly annexed and placed in respective places of the offer as per enclosure list mentioned in the covering letter. BHEL shall not be responsible for any missing documents.

7.0 Deviation with respect to tender clauses and additional clauses/suggestions in Techno-commercial bid / Price bid shall NOT be considered by BHEL. Bidders are requested to positively comply with the same.

8.0 BHEL reserves the right to accept or reject any or all Offers without assigning any reasons thereof. BHEL also reserves the right to cancel the Tender wholly or partly without assigning any reason thereof. Also BHEL shall not entertain any correspondence from bidders in this matter (except for the refund of EMD).

9.0 Assessment of Capacity of Bidders:

Bidders capacity for executing the job under tender shall be assessed 'LOAD' wise and 'PERFORMANCE' wise as per the following:

I. **LOAD**: Load takes into consideration **ALL** the contracts of the Bidder under execution with BHEL Regions, irrespective of whether they are similar to the tendered scope or not. The 'Load' is the sum of the unit wise identified packages (refer Table-1) for contracts with BHEL Regions. The cut off month for reckoning 'Load' shall be the month, two (2) months preceding the month corresponding to the 'latest date of bid submission', in the following manner:

(Note: For example if latest bid submission is in Aug 2011, then the 'load' shall be calculated upto and inclusive of June 2011)

i). Total number of Packages

Total number of Packages in hand = P

Where

- 'P' is the sum of all unit wise identified packages under execution with BHEL Regions as of the cut off month defined above, including packages yet to be commenced, excepting packages which are on HOLD due to reasons not attributable to Bidder..

II. **PERFORMANCE**: Here 'Monthly Performance' of the bidder for all the packages (**under execution**/ executed during the 'Period of Assessment' in all the Power Sector Regions of BHEL) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced shall be taken into consideration. The 'Period of Assessment' shall be 6 months preceding the cut off month. The cut off month for reckoning 'Period of Assessment' shall be the month two (2) months preceding the month corresponding to the 'latest date of bid submission', in the following manner:

(Note: For example if 'latest date of bid submission' is in Aug 2011, then the 'performance' shall be assessed for a 6 month period upto and inclusive of June 2011, for all the unit wise identified packages (refer Table I)

i). Calculation of Overall 'Performance Rating' for 'similar Package/Packages' for the tendered scope under execution at Power Sector Regions for the 'Period of Assessment':

This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for all the similar Package/packages', divided by the total number of Package months for which evaluation should have been done, as per procedure below:

a) P_1, P_2, P_3 , P_4 , P_5 , …. P_N etc be the packages (**under execution**/ executed during the 'Period of Assessment' in all Regions) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced. Total number of similar packages for all Regions = $\mathbf{P_T}$ (ie $P_T = P_1 + P_2 + P_3 + P_4 + .. P_N$)

b) Number of Months 'T_1' for which 'Monthly Performance Evaluation' as per relevant formats, should have been done in the 'Period of Assessment' for the corresponding similar package P_1. Similarly T_2 for package P_2, T_3 for package P_3, etc for the tendered scope. Now calculate cumulative total months '$\mathbf{T_T}$' for total similar Packages '$\mathbf{P_T}$' for all Regions (i.e $\mathbf{T_T} = T_1 + T_2 + T_3 + T_4 + .. T_N$)

c) Sum 'S_1 ' of 'Monthly Performance Evaluation' Scores ($S_{1\text{-}1}$, $S_{1\text{-}2}$, $S_{1\text{-}3}$, $S_{1\text{-}4}$, $S_{1\text{-}5}$,…. $S_{1\text{-}N}$) for similar package P_1, for the 'period of assessment' 'T_1' (i.e $S_1 = S_{1\text{-}1} + S_{1\text{-}2} + S_{1\text{-}3} + S_{1\text{-}4} + S_{1\text{-}5} + \ldots S_{1\text{-}N}$). Similarly S_2 for package P_2 for period T_2, S_3 for package P_3 for period T_3, etc for the tendered scope for all Regions. Now calculate cumulative sum 'S_T' of 'Monthly Performance Evaluation' Scores for total similar Packages '$\mathbf{P_T}$' for all Regions (i.e 'S_T'$= S_1 + S_2 + S_3 + S_4 + S_5 + \ldots S_N$.)

d) **Overall Performance Rating 'R_{BEHL}' for the similar Package/Packages** (**under execution**/ executed during the 'Period of Assessment') in all the Power Sector Regions of BHEL)**:**

$$= \frac{\text{Aggregate of Performance scores for all similar packages in all the Regions}}{\text{Aggregate of months for each of the similar package for which performance should have been evaluated in all the Regions}}$$

$$= \frac{S_T}{T_T}$$

e) Bidders to note that the risk of non evaluation or non availability of the 'Monthly Performance Evaluation' reports as per relevant formats is to be borne by the Bidder

f) Table showing methodology for calculating 'a', 'b' and 'c' above

Sl no	Item Description	Details for all Regions							Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
1	Similar Packages for all Regions → (under execution/ executed during period of assessment)	P_1	P_2	P_3	P_4	P_5	…	P_N	Total No of similar packages for all Regions = $\mathbf{P_T}$ ie Sum (Σ) of columns (iii) to (ix)
2	Number of Months for which 'Monthly Performance Evaluation' as per relevant formats should have been done in the 'period of	T_1	T_2	T_3	T_4	T_5	…	T_N	Sum (Σ) of columns (iii) to (ix) = $\mathbf{T_T}$

	assessment for corresponding similar Package (as in row 1)								
3	Monthly performance scores for the corresponding period (as in Row 2)	S_{1-1}, S_{1-2}, S_{1-3}, S_{1-4}, … S_{1-T1}	S_{2-1}, S_{2-2}, S_{2-3}, S_{2-4}, … S_{2-T2}	S_{3-1}, S_{3-2}, S_{3-3}, S_{3-4}, … S_{3-T3}	S_{4-1}, S_{4-2}, S_{4-3}, S_{4-4}, … S_{4-T4}	S_{5-1}, S_{5-2}, S_{5-3}, S_{5-4}, … S_{5-T5}	.. … … … …	S_{N-1}, S_{N-2}, S_{N-3}, S_{N-4}, … S_{N-TN}	---
4	Sum of Monthly Performance scores of the corresponding Package for the corresponding period (as in row-3)	S_1	S_2	S_3	S_4	S_5	…	S_N	Sum (Σ) of columns (iii) to (ix) = $\mathbf{S_T}$

ii) Calculation of Overall 'Performance Rating' ($\mathbf{R_{BHEL}}$) in case 'similar Package/Packages' for the tendered scope ARE NOT AVAILABLE, during the 'Period of Assessment':

This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for ALL the packages, divided by the total number of Package months for which evaluation should have been done. 'R_{BHEL} ' shall be calculated subject to availability of 'performance scores' for at least.6 'package months' in the order of precedence below:

a) 'Period of Assessment.
b) 12 months preceding the cut-off month
c) 24 months preceding the cut-off month
d) 36 months preceding the cut-off month

In case, R_{BHEL} cannot be calculated as above, then Bidder shall be treated as 'NEW VENDOR'. Further eligibility and qualification of this bidder shall be as per definition of 'NEW VENDOR' described in 'Explanatory Notes'

iii) Factor "L" assigned based on Overall Performance Rating (R_{BHEL}) at Power Sector Regions,:

Sl no	Overall Performance Rating (R_{BHEL})	Corresponding value of 'L'
1	=60	NA
2	> 60 and ≤ 65	0.4
3	> 65 and ≤ 70	0.35
4	> 70 and ≤ 75	0.25
5	> 75 and < 80	0.2
6	≥ 80	NA

III. 'Assessment of Capacity of Bidder':

'Assessment of Capacity of Bidder' is based on the Maximum number of packages for which a vendor is eligible, considering the performance scores of similar packages, as below:

Max number of packages P_{Max}= (R_{BHEL}- 60) divided by corresponding value of 'L'
i.e. (R_{BHEL}- 60)/L

Note:

i. In case the value of P_{Max} results in a fraction, the value of P_{Max} is to be rounded off to next whole number
ii. For $R_{BHEL} = 60$, $P_{Max} =$ '1'
iii. For $R_{BHEL} \geq 80$, there will be no upper limit on P_{Max}

The Bidder shall be considered 'Qualified' as per 'Assessment of Capacity of Bidder' for the subject Tender if $P \leq P_{Max}$
(where P is calculated as per clause 9.I)

IV. **Explanatory note**:

a) Similar package means Boiler or ESP or Piping or Turbine or Civil or Structure or Electrical or CI, etc at the individual level irrespective of rating of Plant, and irrespective of whether the subject tender is a single package or as part of combined/composite packages. Normally Boiler, ESP, Piping, Turbine, Electrical, CI, Civil, Structure, etc is considered individual level of package. For example in case the tendered scope is a Boiler Vertical Package comprising of Boiler, ESP and Power Cycle Piping (i.e the 'identified packages as per Table-1 below), the 'PERFORMANCE' part against sl no II above, needs to be evaluated considering all the identified packages (ie Boiler, ESP and Power Cycle Piping) and finally the Bidder's capacity to execute the tendered scope is assessed in line with III above

b) Identified Packages (Unit wise)

Table-1

	Civil	Electrical & CI	Mechanical
	i). Enabling works ii). Pile and Pile Caps iii). Civil Works including foundations iv). Structural Steel Fabrication & Erection v). Chimney vi). Cooling Tower vii). Others (Civil)	i). Electrical ii). CI iii). Others (Elec & CI)	i). Boiler & Aux (All types including CW Piping if applicable) ii). Power Cycle Piping/Critical Piping iii). LP Piping iv). ESP v). Steam Turbine Generator set & Aux vi). Gas Turbine Generator set & Aux vii). Hydro Turbine Generator set & Aux viii). Turbo Blower (including Steam Turbine) ix). Material Handling x). Material Management xi). Material Handling & Material Management xii). Others (Mechanical)

c) Bidders who have not been evaluated for at least six package months in the last 36 months in the online BHEL system for contractor performance evaluation in BHEL PS Regions, wef July'2010 shall be considered "NEW VENDOR".

A 'NEW VENDOR' shall be considered qualified subject to satisfying all other tender conditions

A 'NEW VENDOR' if awarded a job (of package/packages identified under this clause) shall be tagged as "FIRST TIMER" on the date of first LOI from BHEL.

The "FIRST TIMER" tag shall remain till execution of work for a period of not less than 09 months, from the commencement of work of first package

A Bidder shall not be eligible for the next job as long as the Bidder is tagged as "FIRST TIMER" excepting for the Tenders which have been opened on or before the date of the bidder being tagged as 'FIRST TIMER'.

After removal of 'FIRST TIMER' tag, the Bidder shall be considered 'QUALIFIED' for the future tenders subject to satisfying all other tender conditions including 'Capacity Evaluation of Bidders'.

d) In the unlikely event of all bidders shortlisted against Technical and Financial Qualification criteria not meeting the criteria on 'Assessment of Capacity of Bidders' detailed above, OR leads to a single tender response on applying the criteria of 'Assessment of Capacity of Bidders' or due to non-approval by Customer, then BHEL at its discretion reserves the right to consider the further processing of the Tender based on the **Overall Performance Rating** 'R_{BHEL}' only, starting from the upper band.

e) 'Under execution' shall mean works in progress as per the following:

i. up to Boiler Steam Blowing in case of Steam Generator and Auxiliaries

ii. upto Synchronisation in case of all other works excepting sl no (i) and (iii)

iii. Upto execution of at least 90% of anticipated contract value in case of Civil & Structures (unit wise), Enabling works and upto 90% of material unloading (in tonnage) as per the original contract in case of MM Package.

Note : BHEL at its discretion can extend (or reduce in exceptional cases in line with Contract conditions) the period defined against (i), (ii) and (iii) above, depending upon the balance scope of work to be completed.

f) Performance evaluation in CL 9 above is applicable to Prime bidder and consortium partner (or Technical tie up partner) for their respective scope of work

10.0 Since the job shall be executed at site**,** bidders must visit site/ work area and study the job content, facilities available, availability of materials, prevailing site conditions including law & order situation, applicable wage structure, wage rules, etc before quoting for this tender. They may also consult this office before submitting their offers, for any clarifications regarding scope of work, facilities available at sites or on terms and conditions.

11.0 For any clarification on the tender document, the bidder may seek the same in writing or through e-mail, as per specified format, within the scheduled date for seeking clarification, from the office of the undersigned. BHEL shall not be responsible for receipt of queries after due date of seeking clarification due to postal delay or any other delays. Any clarification / query received after last date for seeking clarification may not be normally entertained by BHEL and no time extension will be given.

12.0 BHEL may decide holding of pre-bid discussion [PBD] with all intending bidders as per date indicated in the NIT. The bidder shall ensure participation for the same at the appointed time, date and place as may be decided by BHEL. Bidders shall plan their visit accordingly. The outcome of pre-bid discussion (PBD) shall also form part of tender.

13.0 In the event of any conflict between requirement of any clause of this specification/ documents/drawings/data sheets etc or requirements of different codes/standards specified, the same to be brought to the knowledge of BHEL in writing for clarification before due date of seeking clarification (whichever is applicable), otherwise, interpretation by BHEL shall prevail. Any typing error/missing pages/ other clerical errors in the tender

documents, noticed must be pointed out before pre-bid meeting/submission of offer, else BHEL's interpretation shall prevail.

14.0 Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.

15.0 Bidders shall submit Integrity Pact Agreement (Duly signed by authorized signatory who signs in the offer), **if applicable**, along with techno-commercial bid. This pact shall be considered as a preliminary qualification for further participation. **The names and other details of Independent External Monitor (IEM) for the subject tender is as given at point (1) above.**

16.0 The Bidder has to satisfy the Pre Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of satisfying the Pre Qualification Criteria specified in this NIT as per Annexure-I (as applicable), past performance etc. and date of opening of price bids shall be intimated to only such bidders. BHEL reserves the right not to consider offers of parties under HOLD.

17.0 In case BHEL decides on a `Public Opening', the date & time of opening of the sealed PRICE BID shall be intimated to the qualified bidders and in such a case, bidder may depute one authorised representative to witness the price bid opening. BHEL reserves the right to open 'in-camera' the 'PRICE BID' of any or all Unsuccessful/Disqualified bidders under intimation to the respective bidders.

18.0 Validity of the offer shall be for **six months** from the latest due date of offer submission (including extension, if any) unless specified otherwise.

19.0 BHEL reserves the right to decide the successful bidder on the basis of Reverse Auction process. In such case all qualified bidders will be intimated regarding procedure/ modality for Reverse Auction process prior to Reverse Auction and price will be decided as per the rules for Reverse Auction. .

However, if reverse auction process is unsuccessful as defined in the RA rules/procedures, or for whatsoever reason, then the sealed 'PRICE BIDs' will be opened for deciding the successful bidder. BHEL's decision in this regard will be final and binding on bidder.

20.0 On submission of offer, further consideration will be subject to compliance to tender & qualifying requirement and customer's acceptance, as applicable.

21.0 In case the bidder is an "Indian Agent of Foreign Principals", 'Agency agreement has to be submitted along with Bid, detailing the role of the agent along with the terms of payment for agency commission in INR, along with supporting documents.

22.0 The bidders shall not enter into any undisclosed M.O.U. or any understanding amongst themselves with respect to tender.

23.0 Consortium Bidding (or Technical Tie up) shall be allowed only if specified in Pre Qualifying Requirement (PQR) criteria, and in such a case the following shall be complied with:

23.1 Prime Bidder and Consortium Partner or partners are required to enter into a consortium agreement with a validity period of six months initially. In case the consortium is awarded the contract, then the Consortium Agreement between the Prime Bidder and Consortium Partner or partners shall be extended till contractual completion period including extension periods if any applicable.

23.2 'Stand alone' bidder cannot become a '**Prime Bidder' or a 'Consortium bidder' or 'Technical Tie up bidder' in a consortium (or Technical Tie up) bidding**. Prime bidder shall neither be a consortium partner to other prime bidder nor take any other consortium partners. However, consortium partner may

enter into consortium agreement with other prime bidders. In case of non compliance, consortium bids of such Prime bidders will be rejected.

23.3 Number of partners for a consortium Bidding (or Technical Tie up) shall be as specified in the PQR

23.4 Prime Bidder shall be as specified in the Pre Qualification Requirement, else the bidder who has the major share of work

23.5 In order to be qualified for the tender, Prime Bidder and Consortium partner or partners shall satisfy (i) the Technical 'Pre Qualifying Requirements' specified for the respective package, (ii) "Assessment of Capacity of Bidder' as specified in clause 9.0

23.6 Prime Bidder shall comply with additional 'Technical' criteria of PQR as defined in 'Explanatory Notes for the PQR'

23.7 Prime Bidder shall comply with all other Pre Qualifying criteria for the Tender unless otherwise specified

23.8 In case customer approval is required, then Prime Bidder and Consortium Partner or partners shall have to be individually approved by Customer for being considered for the tender.

23.9 Prime Bidder shall be responsible for the overall execution of the contract

23.10 In case of award of job, Performance shall be evaluated for Prime Bidder and Consortium Partner or partners for their respective scope of work(s) as per prescribed formats

23.11 In case the Consortium partner or partners back out, their SDs shall be encashed by BHEL. In such a case, other consortium partner or partners meeting the PQR have to be engaged by the Prime Bidder, and if not, the respective work will be withdrawn and executed on risk and cost basis of the Prime Bidder. The new consortium partner or partners shall submit fresh SDs as applicable.

23.12 In case the prime Bidder withdraws, the whole contract shall be considered cancelled and short closed.

23.13 After execution of work, the work experience shall be assigned to the Prime Bidder and the consortium partner or partners for their respective scope of work. After successful execution of two similar works with the same consortium partner or partners under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a 'stand alone' bidder for similar works, subject to certification from BHEL about the active involvement of the Prime Bidder for satisfactory execution of the works.

23.14 The consortium partner shall submit SD equivalent to 2% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value. In case there are two consortium partners, then each partner shall submit SD equivalent to 1% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value.

23.15 In case of a Technical Tie up, all the clauses applicable for the Consortium partner shall be applicable for the Technical Tie up partner also

24.0 The bidder shall submit documents in support of possession of 'Qualifying Requirements' duly self certified and stamped by the authorized signatory, indexed and properly linked in the format for PQR. In case BHEL requires any other documents/proofs, these shall be submitted immediately.

25.0 The bidder may have to produce original document for verification if so decided by BHEL.

26.0 Order of Precedence

In the event of any ambiguity or conflict between the Tender Documents, the order of precedence shall be in the order below:

a. Amendments/Clarifications/Corrigenda/Errata etc issued in respect of the tender documents by BHEL
b. Notice Inviting Tender (NIT)
c. Price Bid
d. Technical Conditions of Contract (TCC)—Volume-1A
e. Special Conditions of Contract (SCC) —Volume-1B
f. General Conditions of Contract (GCC) —Volume-1C
g. Forms and Procedures —Volume-1D

It may please be noted that guidelines/rules in respect of suspension of business dealings', 'Vendor evaluation format', 'Quality, Safety & HSE guidelines', etc may undergo change from time to time and the latest one shall be followed

for BHARAT HEAVY ELECTRICALS LTD

AGM Pur

Enclosure

01. Annexure-1: Pre Qualifying criteria.
02. Annexure-2: Check List .
03. Annexure-3: Important Information .
03 Other Tender documents as per this NIT.

ANNEXURE - 1

PRE QUALIFYING CRITERIA

JOB	COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD, TRANSPORTATION OF MATERIALS TO SITE, **ERECTION, TESTING, COMMISSIONING**, APPLICATION OF THERMAL INSULATION, FINAL PAINTING INCLUDING SUPPLY OF PAINTS & PRIMERS, PERFORMANCE TESTING, TRIAL OPERATION AND HANDING OVER OF TG PLANT PACKAGE COMPRISING OF **TURBINES, GENERATOR, MSRs, CONDENSERS**WITH INBUILT FEED WATER HEATER, TG AUXILARIES, INTEGRAL PIPING INCLUDING HP-MSR-LP STEAM PIPING, TANKS, VESSELS, LP HEATERS ETC. WITH HANGERS & SUPPORTS AND ASSOCIATED VALVES, FITTING ETC. **FOR UNIT-3 OF 2X700 MWe NPCIL KAKRAPARATOMIC POWER PROJECT**AS PER TENDER SPECIFICATIONS AT NPCIL (NUCLEAR POWER CORPORATION OF INDIA) KAKRAPAR ATOMIC POWER PROJECT KAKRAPAR, DIST. SURAT, STATE- GUJARAT
TENDER NO	**BHE/PW/PUR/KKRN/1206**

SL NO	PRE QUALIFICATION CRITERIA	Bidders claim in respect of fulfilling the PQR Criteria	
		Name and Description of qualifying criteria	Page no of supporting document. **Bidder must fill up this column as per applicability**
A	Submission of Integrity Pact duly signed (if applicable) (Note: To be submitted by Prime Bidder & Consortium/Technical Tie up partner jointly in case Consortium bidding is permitted, otherwise by the sole bidder)	**NOT APPLICABLE**	
B	**Technical** Bidder must have, Executed Erection, Testing and Commissioning (Up to Synchronization of the Unit or beyond) of One set of Steam Turbine Generator (STG) of 400 MW or higher rating in last seven years as on the latest date of offer Submission..	**APPLICABLE**	
C-1	**Financial** **TURNOVER** Bidders must have achieved an average annual financial turnover (Audited) of **Rs 240 Lakhs** or more over last three Financial Years (FY) i.e. 2010-2011, 2011-12 & 2012-13	**APPLICABLE**	
C-2	**NETWORTH** (only in case of Companies) Net worth of the Bidder based on the latest Audited Accounts as furnished for 'C-1' above should be positive	**APPLICABLE**	
C-3	**PROFIT** Bidder must have earned cash profit in any one of the three Financial Years as applicable in the last three	**APPLICABLE**	

	Financial Years defined in 'C-1 above based on latest Audited Accounts.		
D	Assessment of Capacity of Bidder to execute the work as per sl no 9 of NIT (if applicable)	**APPLICABLE**	By BHEL
E	Approval of Customer (if applicable) **Note:** Names of bidders (including consortium/Technical Tie up partners in case consortium bidding is permitted) who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval.	**NOT APPLICABLE**	BY BHEL
F	Price Bid Opening **Note:** Price Bids of only those bidders shall be opened who stand qualified after compliance of criteria A to E		BY BHEL
F	Technical Tie up criteria (if applicable)	**NOT APPLICABLE**	

Explanatory Notes for the PQR (unless otherwise specified in the PQR):

1. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as indicated against C-1 above along with all annexures
2. In case audited Financial statements have not been submitted for all the three years as indicated against C-1 above, then the applicable audited statements submitted by the bidders against the requisite three years, will be averaged for three years i.e total divided by three.
3. C-2:-NETWORTH : Shall be calculated based on the latest Audited Accounts as furnished for C-1 above. Net worth = Paid up share capital + Reserves. (Net worth is required to be evaluated in case of companies)
4. C-3:- PROFIT : shall be NET profit (PAT + Non cash expenditure viz depreciation) earned during any one of the three financial years as in C-1 above
5. ~~'Additional' Criteria in respect of 'Technical' criteria of PQR (as in 'B' above) for Civil, Electrical, CI, unless otherwise specified :~~
   1. ~~Bidder should have executed similar work of any one of the following:~~
      - ~~a. One (1) work of value not less than Rs XXX~~
      - ~~OR~~
      - ~~b. Two (2) works of not less than Rs YYY~~
      - ~~OR~~
      - ~~c. Three (3) works of not less than Rs ZZZ~~
      - ~~(Value XXX, YYY, ZZZ shall be as indicated by BHEL~~
   2. ~~'Similar' work for criteria 5 above means~~
      - ~~a. Civil or Structures or Civil & Structures or Chimney respectively as applicable to the tendered scope in respect of 'CIVIL' Works~~
      - ~~b. Electrical works in respect of 'ELECTRICAL'~~
      - ~~c. CI works in respect of 'CI' Works~~
      - ~~d. Material Handling and/or Management works in respect of 'MM' works~~
6. Time period for achievement of the 'Technical' criteria of PQR (as in 'B' above) will be the last 7 years ending on the 'latest date' of Bid submission
7. 'EXECUTED' means the Vendor should have achieved the criteria specified in the Technical criteria of PQR (as in 'B' above) even if the Contract has not been completed or closed
8. Unless otherwise specified, for the purpose of 'Technical' criteria of PQR (as in 'B' above), the word 'EXECUTED' means:
   1. ~~"BOILER LIGHT UP" in respect of Boiler & Aux and ESP~~
   2. "SYNCHRONISATION" in respect of STG/GTG and 'SPINNING' in case of HTG
   3. ~~"STEAM BLOWING COMPLETION" in respect of at least Main Steam Line of Power Cycle Piping~~
   4. ~~"HYDRAULIC TEST" of the system in respect of Structures, Pressure parts/IBR Piping~~
   5. ~~"CHARGING" in respect of power Transformers, Bus ducts, HT/LT switchgears~~
   6. ~~"Completion of RCC Shell and liner (steel or brick as per tendered scope) up to the HEIGHT specified using slip form" in case of RCC Chimney.~~
   7. ~~Achievement of physical Quantities as per respective PQRs in respect of Civil & Structures and Piling Works~~
   8. ~~'Readiness for coal Filling" in respect of Bunker Structure Work.~~

	~~9. Boiler means HRSG or WHRB or any other types of Steam Generator~~ ~~10. Critical/Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass, LP Bypass lines~~ 11. ~~For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5TPH where ever rating of HRSG/BOILER is mentioned in MW. Similarly, where ever rating of Gas Turbine is mentioned in terms of Frame size, ISO rating in terms of MW shall be considered for evaluation~~. 12. ~~In case the experience/PO/WO certificate enclosed by bidders do not have separate break up prices for the E&C portion of Electrical and CI Works, (i.e. the certificates enclosed are for composite order for supply and erection of Electrical & CI and other works if any), then value of Erection and Commissioning for the Electrical & CI portion shall be considered as 15% of the supply & erection of Electrical & CI, unless otherwise specifically indicated in the PQR~~. 13. ~~Scope for capital overhaul of STG shall cover Bearing Inspection work and overhauling of all cylinders of the Turbine unless otherwise specifically indicated in the PQR.~~ 14. ~~In case the tendered scope is not a Pulverised Fuel Boiler, experience of Oil/Gas Fired Boilers also can be considered unless otherwise specifically indicated in the PQR~~ 15. The value of work (Experience submitted against PQR B) shall be updated as per the PVC indices for "All India Avg. Consumer Price Index for Industrial Workers" with base month as date of execution (completion of contract/work) and indexed upto two months prior to bid opening month.

BIDDER SHALL SUBMIT ABOVE PRE-QUALIFICATION CRITERIA FORMAT, DULY FILLED-IN, SPECIFYING RESPECTIVE ANNEXURE NUMBER AGAINST EACH CRITERIA AND FURNISH RELEVANT DOCUMENT IN THE RESPECTIVE ANNEXURES IN THEIR OFFER.

ANNEXURE - 2

CHECK LIST

NOTE:- Tenderers are required to fill in the following details and no column should be left blank

1	Name and Address of the Tenderer		
2	Details about type of the Firm/Company		
3.a	Details of Contact person for this Tender	Name : Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
3.b	Details of alternate Contact person for this Tender	Name : Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
4	EMD DETAILS	DD No: Date : Bank : Amount: Please tick (√) whichever applicable:- ONE TIME EMD / ONLY FOR THIS TENDER	
5	Validity of Offer	TO BE VALID FOR SIX MONTHS FROM DUE DATE	
		APPLICABILITY(BY BHEL)	ENCLOSED BY BIDDER
6	Whether the format for compliance with **PRE QUALIFICATION CRITERIA** (ANNEXURE-I) is understood and filled with proper supporting documents referenced in the specified format	Applicable	YES / NO
7	Audited profit and Loss Account for the last three years	Applicable/~~Not Applicable~~	YES/NO
8	Copy of PAN Card	Applicable/~~Not Applicable~~	YES/NO
9	Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed	Applicable/~~Not Applicable~~	YES/NO
10	Integrity Pact	~~Applicable~~/Not Applicable	NO
11	Declaration by Authorised Signatory	Applicable/~~Not Applicable~~	YES/NO
12	No Deviation Certificate	Applicable/~~Not Applicable~~	YES/NO

13	Declaration confirming knowledge about Site Conditions	Applicable/~~Not Applicable~~	YES/NO
14	Declaration for relation in BHEL	Applicable/~~Not Applicable~~	YES/NO
15	Non Disclosure Certificate	Applicable/~~Not Applicable~~	YES/NO
16	Bank Account Details for E-Payment	Applicable/~~Not Applicable~~	YES/NO
17	Capacity Evaluation of Bidder for current Tender	Applicable/~~Not Applicable~~	YES/NO
18	Tie Ups/Consortium Agreement are submitted as per format	~~Applicable~~/Not Applicable	YES/NO
19	Power of Attorney for Submission of Tender/Signing Contract Agreement	Applicable/~~Not Applicable~~	YES/NO
20	Analysis of Unit rates	Applicable/~~Not Applicable~~	YES/NO

NOTE : STRIKE OFF 'YES' OR 'NO', AS APPLICABLE. TENDER NOT ACCOMPANIED BY THE PRESCRIBED **ABOVE APPLICABLE DOCUMENTS** ARE LIABLE TO BE SUMMARILY REJECTED.

DATE :

AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

Annexure-3

IMPORTANT INFORMATION

1. **The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site (www.bhel.com ---> Tender Notification -→ List of Banned Firms)**

2. **All Statutory Requirements as applicable for this project shall be complied with.**

3. **Please take note of following Revised Tender Clauses:**

   i. Notice Inviting Tender: Sl No 9

   ii. General conditions of Contract: Clause No 1.15.13 (New), Clause No 2.8.3, 2.8.4 and 2.8.5

4. Following Notes are added to Form F- 15 of Volume I D 'Forms & procedures'

   i. It is only indicative and shall be as per the online format issued by BHEL time to time.
   ii. No request will be entertained after specified date of the current month w.r.t the changes requested in the scores of immediate previous month.

5. **PRICE VARIATION CLAUSE**

Revision in Price Variation Compensation Clause no. 2.17 of Vol I C GCC:

Clause No. 2.17.9 of Vol IC GCC is revised as below:-

PVC shall be applicable only during the extended period of contract (if any) after the schedule completion date for the portion of work delayed / backlog for the reasons not attributable to Contractor. However total quantum of Price Variation amount payable/recoverable shall be regulated as follows:

i. For the portion of backlog attributable to the contractor and for the portion of backlog due to force majeure condition during contract period, PVC shall not be paid.
ii. For the period of force Majeure during extended contract period, PVC will be as per the indices applicable at the beginning of the force majeure period.
iii. void
iv. The total amount of PVC shall not exceed 20% of the cumulatively executed contract value during the extended contract period. Executed contract value

for this purpose is exclusive of PVC, ORC, Supplementary/Additional Items and Extra works.

Clause No. 2.17.5 of is modified as below:-

Base date shall be the calendar month of the (schedule completion date of the contract + Period extended for the reasons attributable to Contractor & Force Majeure Condition). Schedule Completion date shall be the actual start date plus contract period as defined in Chapter VI 'Vol IA TCC'

6. OVER RUN COMPENSATION

Modification in Price Variation Compensation Clause no. 2.12 of Vol I C GCC:

Clause No. 2.12 of Vol IC GCC is Revised as below:-

IF THE CONTRACT IS EXTENDED BEYOND THE CONTRACT PERIOD FOR ANY REASON OTHER THAN THOSE ATTRIBUTABLE TO THE CONTRACTOR OR FORCE MAJEURE CONDITIONS, THE CONTRACTOR WILL BE COMPENSATED BY PAYMENT OF OVERRUN CHARGES AT THE RATE OF **RS.100000/- (One Lakh Only)** PER MONTH. OVERRUN COMPENSATION WILL BE PAID FOR THE EXTENSION ATTRIBUTABLE TO BHEL ONLY. NO OVERRUN COMPENSATION WILL BE PAYABLE FOR THE EXTENSION ON ACCOUNT OF REASONS ATTRIBUTABLE TO CONTRACTOR AND/OR FORCE MAJEURE CONDITIONS. OVERRUN COMPENSATION FOR ELIGIBLE PERIOD SHALL BE IN PROPORTION TO THE PROGRESS ACHIEVED AGAINST THE PLAN FOR RESPECTIVE PERIOD.

7. Broad Terms & Conditions of Reverse Auction

In continuation to Clause 19.0 of NIT (Notice Inviting Tender) following are the broad terms and conditions of Reverse Auction:

7.1. BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids. In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit „online sealed bid" in the Reverse Auction. Non-submission of „online sealed bid" by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

7.2. The philosophy followed for reverse auction shall be English Reverse (No ties). English Reverse (No ties) is a type of auction where the starting price and bid decrement are announced before start of online reverse auction. The interested bidders can thereupon start bidding in an iterative process wherein the lowest bidder at any given moment can be displaced by an even lower bid of a competing bidder, within a given time frame. The bidding is with reference to the current lowest bid in the reverse auction. All bidders will see only the current lowest quoted price. The term „No ties" is used since more than one bidder cannot give an identical price, at a given instant, during the reverse auction. In other words, there shall never be a tie in the bids.

7.3. Technically and commercially acceptable bidders only shall be eligible to participate.

7.4. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet. Business rules for Reverse Auction and other information like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.

7.5. After receipt of "online sealed bids" by the participating bidders, start price & bid decrement will be decided by BHEL, before the online Reverse Auction. Only those bidders who have submitted the "on-line sealed bid" within the scheduled time shall be eligible to participate further in RA process. **However, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA.** Once participating bidders have given 'Online Sealed Bid' and 'start price' & 'bid decrement' is decided by BHEL, Bidding for RA will start as per RA schedule specified in business rules. Bidders may then submit their bids (current L-1 price(s) lowered by multiple decrements). If the 'start price' decided by BHEL is same as the 'Online Sealed Bid' price of any bidder, then that bidder shall be reckoned as current L1 automatically at the start of Reverse Auction and no acceptance of that price is required i.e (RA shall deemed to have started at this stage for further bidding)

7.6. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.

7.7. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.

1206

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

TECHNICAL CONDITIONS OF CONTRACT (TCC)
CONTENTS

1.0 PROJECT INFORMATION

1.1 INTRODUCTION

Nuclear Power Corporation of India (NPCIL) intends to set up two (2) nos. of 700 MWe PHWR type Nuclear Power Plants (KAPP-3 and KAPP-4) at Kakrapar near Surat, Gujarat, India. The Kakrapar site is situated on the left bank of the river Tapi, in Mandvi Taluka of Surat District of Gujarat state. The site is accessible by road from Surat from Mumbai-Ahmedabad National Highway (NH-8) and is about 86 km from NH-8. Nearest seaport is Kandla (about 665 km away) but loading and unloading barge facility is available at Hazira which is about 90 km from site. Nearest railway station, Vyara, is about 20 km from Site, on Surat Bhusawal broad gauge section. The nearest airports are at Vadodara and Mumbai which are about 190 km and 300 km away from the respective sites, by road.

1.2 SITE INFORMATION

a)	Location	Kakrapar, Dist. Surat, Gujarat-394651
b)	Nearest Railway Station	Vyara and Madhi (Western Railway)
c)	Nearest Air port	Surat
d)	Elevation (RL)	Varies from +47m to +50m

1.3 CLIMATIC CONDITION

1)	**Seismic data**	
	Seismic Intensity	Acc to BIS- 1893-2002, Part-1
	Zone	III
2)	**Ambient Air Temperature**	
	Maximum dry bulb temperature with corresponding relative humidity	43.8 deg C – 2%
	Minimum dry bulb temperature with corresponding relative humidity	4.5 deg C – 98%
	Design temperature for electrical equipment/devices	50 deg C
3)	**Relative Humidity**	
	Maximum during monsoon	98%
	Minimum during Dec-Jan	2%
4)	**Wind Pressures**	
	Height above mean Retarding Surface, m	**Design Wind Speed m/sec**

	@ 10m	69.26
	@ 30m	76.26
5)	**Rain fall**	
	Annual Average	1941 mm
	Maximum intensity for 1 hour	90 mm
	Maximum intensity sustained for 24 hours	482 mm (max rainfall in a day of 24 hours)
	Period	Year 1994 year 2002
6)	**Wind data**	
	Wind code	IS-875-1964
	Base wind pressure	150 kg/m^2
	Wind load Upto 30 M	150 kg/m^2

1.4

The bidder is advised to visit and examine the site of WORKS and its surroundings and obtain for himself on his own responsibility all information that may be necessary for preparing the bid and entering into the CONTRACT. All costs for and associated with site visits shall be borne by the bidder.

2.0 SCOPE OF WORK

The work to be carried out under the scope of these specifications is broadly as under:

1. Identification and development of erection and construction procedures for all equipment, structures and systems of turbine island as specified therein.

2. Receipt/collection/loading/ unloading/ transportation of materials from BHEL/client's stores /storage yards, transportation to site of work /erection at site including the heavy consignment like Steam Turbine HP and LP modules, condensers with inbuilit feed water heaters, Steam Turbine Generator, Moisture Separator Reheater and all other related erection materials etc. by making his own transport and handling arrangements.

3. Pre-assembly, Assembly and pre-assembly checks as applicable.

4. Lifting, placement, erection, fit-up, alignment etc. of equipments of Steam Turbines, Steam Turbine Generators, condensers with in-built feed water heater, Moisture Separator Reheater with respective auxiliaries, systems, piping including integral piping of STG & auxiliaries etc.

5. Erection, Alignment, Fit-up and welding/bolting/fastening, Pre-heat treatment/Post Heat treatment etc. of Equipments with Aux., systems, Field piping & Integral Piping with supports etc. including primer painting of site weld joints with Chlorinated based Zinc Phosphate primer, thermal insulation of piping etc.

6. The piping involved includes HP turbine to MSR to LP turbine piping, turbine by pass valves piping, MSR drain and condensate recovery piping, LP Heater piping, drain and condensate recovery piping, Condenser air evacuation piping, lube oil piping, lube oil treatment piping, turbine supervisory system piping, turbine protection system piping, Jacking System piping, Control Oil system piping, Gland Steam Sealing piping, Generator integral piping etc.

6. Non Destructive Examination, Radiography etc.

7. Supply of all grouting materials including ready mix special grouting materials, Grouting of foundation bolts, base plates, preparation of foundation including breaking the lean mortar cover, chipping, as required before placing base plate and final grouting of foundation bolts. (Refer chapter-19)

8. Concrete/cement mortar cubes/briquittes etc. shall be tested for their strength by BHEL/NPCIL only after which the contractor shall undertake grouting work. Grouting

permits will be cleared by BHEL/NPCIL only, after which the contractor shall undertake grouting work.

9. Secondary grouting of Equipments & Structures with related Aux., Rotating machines etc. including the associated form works like shuttering and related facilities & process for grout mixing.

10. The works such as disassembly cleaning and reassembly of equipment here required are in the scope of contractor.

11. The contractor shall carry out necessary repairs/modifications on erected plant/equipment which are due to the contractor's own defects/faults.

12. Testing, Pre-commissioning, Commissioning, Hydraulic Testing, Chemical cleaning/ Air Blowing/ Flushing, Alkali Boil out, Steam Blowing, Safety Valve etc.

13. Insulation of piping under the scope of works.

14. Erection, Laying, Welding, NDE/Radiography of temporary Piping, Valves, Tanks, Supports etc. for Air Blowing, Steam Blowing, Chemical Cleaning/ Flushing etc. and their subsequent dismantling after completion of work, levelling, cold pulling, adjusting, heat treatment, hydraulic test, chemical pickling, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of auxiliaries, Insulation (excluding spray insulation) final painting of all equipments & piping covered under these specifications and all other activities till handing over.

15. Handling and filling of Chemicals, Lubricants/gas/ preservatives during, erection, preservation, Chemical cleaning / flushing / blowing, pre-commissioning, Commissioning and subsequent topping up till Trial operation completion.

16. Supply of Paints/Primer and application of paints for final painting including surface preparation, cleaning, marking of identification marks, colour bands, direction of rotation / flow marks, legends etc. as per NPCIL/ BHEL site requirement.

17. Pre-commissioning checks, Trial runs, testing and commissioning.

18. Surface preparation and Final painting of equipments, related Aux., Systems, Structures, Piping with valves, fittings, supports etc.

16. Safety Valve Floating, Trial operation.

17. Completion of facility points (as applicable).

2.2.2 Tentative Scope of Equipments/Systems Covered Under This Scope of Work

1. Steam Turbines (1 HP and 3 LP turbines) along with associated auxiliaries.
2. Generator set, exciter, with associated auxiliaries
3. Condensers with associated auxiliaries.
4. Moisture separator reheaters with associated auxiliaries
5. Integral/Field/External/power cycle piping schemes including HP-MSR-LP piping related with STG system, with valves, fittings, hangers and supports etc.
6. LP Heaters.
7. Various pumps, vapour extractors, vacuum pumps etc., motors and auxiliaries.
8. Insulation and cladding of equipments/TG/piping/tanks etc. (wherever applicable).
9. Control oil system, lube oil system, jacking oil system, gland steam sealing system, Cross around piping, HP-MSR-LP steam piping, equipments drains and vents piping, generator seal oil system, gas system piping, vapour extractor and other related integral pipings, governing cubicles and other auxiliaries.
10. Tanks/vessels including flash tanks, such as main oil tank etc.
11. Brought out items
12. Operating platform around the GSC, Flash tanks , Lube oil / Control oil tanks , HP/LP By pass valves , ESVS / IVS, MSR, Turbine, Local platforms for various inaccessible valves and equipments etc..

NOTE: BHEL SHALL PROVIDE SUITABLE CAPACITY CRANE AS PER TERMS AND CONDITIONS INDICATED IN TCC CHAPTER-5, AT STORAGE YARD, FOR LOADING OF HEAVY CONSIGNMENTS ON CONTRACTOR'S TRAILER.

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.1	***ESTABLISHMENT***			
3.1.1	***FOR CONSTRUCTION PURPOSE:***			
a	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with owner
b	Open space for storage (as per availability)	Yes		Location will be finalized after joint survey with owner
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipments, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
f	Fire fighting equipments like buckets, extinguishers etc		Yes	
g	Fencing of storage area, office, canteen etc of the bidder		Yes	
3.1.2	***FOR LIVING PURPOSES OF THE BIDDER***			
a	Open space for labor colony (as per availability)	Yes		There may be space constraint, contractor shall manage/adjust his requirements within the space area as provided by NPCIL.
b	Labor Colony with internal roads, sanitation, complying with statutory requirements		Yes	**Hygenic labour colony with proper sanitation, access road, electricity, water arrangement as per BHEL/NPCIL reqirements.**
3.2.0	***ELECTRICITY***			

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.2.1	***Electricity for construction purposes 3 Phase*** *415/440 V* ***(To be specified whether chargeable or free)***	**Yes**		Free
a	Single point source	Yes		BHEL/NPCIL will provide 3 phase, 4 wire, 415/440 V cable supply point at one single point at a distance of approx 500m.
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	To be taken care by bidder
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.2	***Electricity for the office, stores, canteen etc of the bidder***.			Chargeable
a	Single point source	Yes		Chargeable
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.2.3	***Electricity for living accommodation of the bidder's staff, engineers, supervisors etc***		Yes	Chargeable
a	Single point source	Yes		Chargeable
b	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c	Duties and deposits including statutory clearances if applicable		Yes	
3.3.0	***WATER SUPPLY***			

Sl.No	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.3.1	***For construction purposes: (to be specified whether chargeable or free)***			chargeable
a	Making the water available at single point	Yes		. **Construction water will be on chargeable basis on charges as charged by NPCIL. At present , the charges are Rs. 12.10 per 1000 litres and this rate is subject to revision from time to time. The charges as charged by NPCIL shall be charged to contractor.**
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.2	***Water supply for bidder's office, stores, canteen etc***			**Chargeable**
a	Making the water available at single point	Yes		**Chargeable**
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.3.3	***Water supply for Living Purpose***			
a	Making the water available at single point		Yes	
b	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	***LIGHTING***			

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	Contractor has to make his own arrangement.
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area 3 At the construction site /area		Yes	Contractor has to make his own arrangement.
c	Providing the necessary consumables like bulbs, switches, etc during the course of project work		Yes	Contractor has to make his own arrangement.
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	***COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER***			
a	Telephone, fax, internet, intranet, e-mail etc		Yes	
3.6.0	***COMPRESSED AIR wherever required for the work***		Yes	
3.7.0	***Demobilization of all the above facilities***		**YES**	
3.8.0	***TRANSPORTATION***			
a	For site personnel of the bidder		Yes	
b	For bidder's equipments and consumables (T&P, Consumables etc)		Yes	

Sl.No	Description PART II ***3.9.0 ERECTION FACILITIES***	Scope / to be taken care by		Remarks
		BHEL	Bidder	

Sl.No	Description PART II ***3.9.0 ERECTION FACILITIES***	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.9.1	Engineering works for construction:			
a	Providing the erection/constructions drawings for all the equipments covered under this scope	Yes		
b	Drawings for construction methods	Yes	Yes	In consultation with BHEL
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	Changes are to be marked in drawing & handover to BHEL on completion of work.
d	Shipping lists etc for reference and planning the activities	Yes		
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
g	Weekly erection schedules based on Sl No. e		Yes	In consultation with BHEL
h	Daily erection / work plan based on Sl No. g		Yes	In consultation with BHEL

Sl.No	Description PART II ***3.9.0 ERECTION FACILITIES***	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
i	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
j	Preparation of preassembly bay		Yes	
k	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/bidder himself		Yes	
L	Arranging the materials required for preassembly		Yes	

3.10

The contractor shall use the construction power in the most efficient and judicious manner so as to avoid any wastage. It is to be clearly understood that the construction power shall not be misused by the contractor for any activity other than construction purpose. If at any time it is found that the construction power is being misused, BHEL reserves the right to suspend the supply of construction power. In such cases as they may arise, contractor has to make his own arrangement of diesel generators to meet the requirement of power without causing any delay to project activities. No compensation in time or money shall be applicable to contractor in any such cases.

3.11

It is to be clearly understood that the disruption in power supply or non availability of electricity shall not entitle the contractor for any claim for compensation either in time or money. **The contractor should make his own arrangement of diesel generators to meet his requirement of electrical power during interruptions in power supply and keep electrically operated equipment to the minimum in view of uncertainty of 24 hours power supply.** Temporary power as arranged by the contractor on his own shall be provided for bonafide construction purposes limited to the extent required for the job.

3.12

BHEL/NPCIL shall meter the supply of power to the contractor at the points at which the supply is given. For this purpose, the **energy meter will be installed by the Contractor on their distribution pane**l. Contractor shall also install the actual **Maximum Demand Meter** on the incoming panel. In case of any dispute on the accuracy of meter, the meter in dispute shall be checked in the standard laboratory of the State Government and the meter will be replaced if required. The fees levied by the Standard laboratory for testing the meter shall be charged to the contractor. The Engineer may at his discretion replace any meter installed at the cost of contractor, if found defective/faulty. It would be the contractor's responsibility to ensure the safety of the meter and to ensure protection so that the meter is not tampered with. In case, it is found that the meter has been tampered with, the supply will be disconnected and re-connection charges at State Electricity Board rates per BHP will be charged. In case the meter is found faulty, the charges will be recovered on the basis of average consumption for the preceding 6 months.

3.13

The contractor shall make his own arrangements for the distribution of power to all his works from the point (s) of supply. The contractor shall supply and install control panel, distribution board, switch control, cables, energy meters, protection devices with ELCB etc. of adequate rating/capacity as per safety and quality approval by NPCIL/BHEL.

3.14

It shall be the responsibility of the contractor to provide and maintain complete installation on the load side of the supply with due regard to safety requirements at site. All cabling and installation shall be subject to the approval of the Engineer/Safety Engineer and shall comply in all respects to the appropriate statutory requirements given in the following:

- Indian Electricity Act, 1910 (as amended)
- Electricity Supply Act, 1910 (as amended)
- Indian Electricity Rules, 1956 (as amended)
- Latest State Electricity Board regulations

3.15

The contractor shall maintain a power factor of not less than 0.9 by installing if necessary at his own cost suitable correction devices/ capacitor banks of suitable capacity. The contractor's failure in this regard within a period as stipulated by the Engineer-in-charge shall lead to disconnection of Power Supply. The individual, single-phase loads shall be suitably connected so that the total load at the supply point balances as much as possible.

3.16

BHEL will not be liable for any loss or damage to the contractor's equipment as a result of variations in voltage or frequency or interruptions planned or unplanned in power supply. The Purchaser will also not be liable for any loss to the contractor arising from any interruption, failure or stoppage of works and any attendant delays consequent on such failure, interruption

or stoppage of power supply or variation voltage or frequency. The contractor shall install all safety devices for such purpose as deemed fit by him.

3.17

After completion of the works, the contractor shall at his own cost promptly dismantle the distribution and other facilities he may have erected.

A: TOOLS AND PLANTS TO BE DEPLOYED BY CONTRACTOR

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	DEPLOYMENT PERIOD	REMARKS
1	MOBILE HYDRA CRANE	14/15 MT	01 nos. and further additional as per requirement	From start of project till commissioning	FOR E&C
2	TRAILER WITH TROLLEY	AS PER REQUIREMENT	AS PER REQUIREMENT	AS PER REQUIREMENT	AS PER REQUIREMENT
3	AIR COMPRESSOR (ELECTRIC/DIESEL OPERATED)	140 CFM, 7 KG/CM2	1	AS PER REQUIREMET	AS PER REQUIREMET
4	TIG WELDING SET	AS REQUIRED	3 NOS. AND FURTHER AS PER REQUIREMENT	AS PER REQUIREMET	AS PER REQUIREMET
5	ORBITAL WELDING MACHINE	As per requirement	06	As per requirement	As per requirement
6	PLASMA CUTTING M/C	FOR CUTTING STAINLESS STEEL	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
7	CONDENSOR TUBE EXPANDER SET	AS REQUIRED	AS PER REQUIREMENT	AS PER REQUIREMENT	AS PER REQUIREMENT
8	3-PHASE DISTRIBUTION BOARD WITH COMPLETE SET UP FOR DRAWL OF CONSTRUCTION POWER & FITTED WITH ENERGY METER	600 AMP	AS PER REQUIREMET	AS PER REQUIREMET	AS PER REQUIREMET
9	POWER CABLE FOR DRAWL OF CONSTRUCTION POWER	AS REQUIRED	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
10	PRE HEATING / STRESS RELIEVING SET (HEATING CONTROL PANEL, CABLES, HEATING ELEMENTS, THERMOMETERS ETC.)	AS REQUIRED	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
11	RADIOGRAPHY ARRANGEMENT WITH RADIOACTIVE ISOTOPE SOURCE	IRIDIUM-192	AS PER REQUIREMENT	AS PER REQUIREMET	AS PER REQUIREMET

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	DEPLOYMENT PERIOD	REMARKS
12	THEODOLITE OF REQUIRED ACCURACY	TO ENSURE VERICALITY OF STRUCTURAL COLUMNS	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
13	SELF DRILLING CUM TAPPING MACHINE FOR FIXING OF SHEETING WORK SCREWS	AS REQUIRED	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
14	CHEMICAL CIRCULATION PUMPS TO HANDLE ACID SOLUTION FOR CHEMICAL CLEANING, WITH DRIVE MOTORS, STARTER PANEL, CABLE, SWITCH FUSE UNIT ETC.	CONTRACTOR SHALL DEPLOY THE RQUIRED CAPACITY PUMP WITH ACCESSORIES AFTER OBTAINING WRITTEN APPROVAL OF BHEL.	AS REQUIRED (02 Set)	AS PER REQUIREMET	AS PER REQUIREMET
15	WELDING GENERATOR/ AUTOMATIC WELDING MACHINE (ELECTRICAL)	300 AMPERE RATING	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
16	WELDING GENERATOR (DIESEL OPERATED)	300 AMPERE RATING	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
17	RADIOGRAPHY FILM VIEWER	AS REQUIRED	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
18	ELECTRIC WINCH WITH WIRE ROPE	03 TON	AS REQUIRED (MINIMUM 2 NOS.)	FROM START OF ERECTION TO TILL THE COMMISSIONING OF PROJECT	AS PER REQUIREMET
19	PIPE BENDING MACHINE-HAND OPERATED	UP TO 2”/4” PIPES	AS REQUIRED	AS PER REQUIREMENT	AS PER REQUIREMET
20	HAND WINCH WITH WIRE ROPE	01 TON	AS REQUIRED (MINIMUM 3 NOS.)	FROM START OF ERECTION TO TILL THE COMMISSIONING OF	AS PER REQUIREMET

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	DEPLOYMENT PERIOD	REMARKS
				PROJECT	
21	BAKING OVEN AND HOLDING OVEN WITH THERMOSTAT AND TEMPERATURE GAUGE FOR WELDING ELECTRODES	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
22	PORTABLE OVEN FOR COATED WELDING ELECTRODES	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
23	HYDRAULIC TEST PUMP OF SUITABLE CAPACITY	250 KG/CM2	1 Set	AS PER REQUIREMET	1. Including arrangement for hydro test of valves, 2. Further as required
24	SCAFFOLDING MATERIALS (SCAFFOLDING PIPES WITH CLAMPS ETC.)	ADEQUATE TO SUIT THE REQUIREMENT	800 SETS AND FURTHER AS PER REQUIREMENT	AS PER REQUIREMET	AS PER REQUIREMET
25	ALU. SHEET CLAD PROFILE MAKING MACHINE	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
26	HAND TOOLS, CUTTING TOOLS GRINDING MACHINES ETC	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
27	NIBBLING MACHINE	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
28	SHEARING MACHINE	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
29	PORTABLE GRINDING M/C	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
30	PORTABLE DRILLING M/C	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET

SN	DESCRIPTION	CAPACITY (MINIMUM)	MINIMUM QUANTITY	DEPLOYMENT PERIOD	REMARKS
31	CHAIN PULLEY BLOCKS	ASSORTED CAPACITIES	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
32	GANG OPERATED AND HAND OPERATED HYDRAULIC JACKS WITH SUFFICIENT LONG HOSES OF VARIOUS CAPACITIES FOR TURBINE and STG	AS PER REQUIREMENT (50 MT & 100 MT)	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
33	SLINGS OF VAROIUS CAPACITY AND QUANTITIES FOR HANDLING OF EQUIPMENTS	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
34	VACUUM CLEANER (INDUSTRIAL)	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
35	FIRE EXTINGUISHER	AS PER REQUIREMENT	AS REQUIRED	AS PER REQUIREMET	AS PER REQUIREMET
36	ENERGY METER	-	1	From Start of work	-
37	MAXIMUM DEMAND METER	-	1	From start of work	-
38	DE-WATERING PUMP	AS PER REQUIREMENT	AS PER REQUIREMENT	AS PER REQUIREMENT	AS PER REQUIREMENT
39	TORQUE WRENCH	AS PER REQUIREMENT	AS PER REQUIREMENT	AS PER REQUIREMENT	AS PER REQUIREMENT

B: MEASURING AND MONITORING DEVISES (MMD) TO BE DEPLOYED BY CONTRACTOR
AS PER REQUIREMENT TO BE FINALIZED AT SITE.

NOTE:

1) THIS LIST ABOVE IS ONLY INDICATIVE AND NEITHER EXHAUSTING NOR LIMITING. ALL THE TOOLS AND PLANTS REQUIRED FOR THIS SCOPE OF WORK, EXCEPT THE TOOLS & PLANTS PROVIDED BY BHEL ARE TO BE ARRANGED BY CONTRACTOR WITHIN THE QUOTED RATES. THE LIST IS SUGGESTIVE IN NATURE. ANY ADDITIONAL T&P REQUIRED TO BE ARRANGED BY THE CONTRACTOR WITHIN THE QUOTED RATES.

2) **IF ABOVE MENTIONED T & P ARE NOT DEPLOYED WHENEVER AND WHEREVER REQUIRED, BHEL WILL CHARGE TO CONTRACTOR CURRENT MARKET RATE + 30 % OVERHEADS FOR NON AVAILABILITY T&P OR LEVY A DAY WISE PENALTY FOR NON DEPLOYMENT OR DELAYED DEPLOYMENT**.

3) IF THE WORKS GET DELAYED DUE TO NON-AVAILABILITY OF T&P, BHEL RESERVES THE RIGHT TO GET THE WORK DONE AT THE RISK AND COST OF CONTRACTOR WITHIN PREJUDICE TO RIGHTS OF BHEL AS IN GCC.

4) THE MANUFACTURING YEAR OF ALL MAJOR T&PS DEPLOYED BY THE CONTRACTOR (15/14 MT Hydra Crane) SHOULD NOT BE MORE THAN 10 YEARS AS ON THE DATE OF DEPLOYMENT. IF AT ANY MOMENT OF TIME DURING THE EXECUTION OF WORK, ANY CRANE IS FOUND TO BE NOT IN A GOOD WORKING CONDITION AND NON-PERFORMING AT DESIRED MINIMUM CAPACITY, AS CERTIFIED BY BHEL ENGINEER, THE CONTRACTOR SHALL DEPLOY ANOTHER CRANE IN GOOD WORKING CONDITION WITH MINIMUM DESIRED CAPACITY. IF CONTRACTOR FAILS TO DEPLOY THE SAME WITH IN 10 DAYS, BHEL WILL RECOVER NON-REFUNDABLE PENALTY PER DAY OF DELAY IN THE FOLLOWING MANNER -

1. IN RESPECT OF 15/14 MT CRANES: @ RS. 1,000 / per crane

9) **THE VARIOUS LIFTING / HANDLING EQUIPMENT AND RIGGING TOOLS PROPOSED TO BE USED BY THE CONTRACTOR SHALL BE TESTED AS PER STATUTORY AND SAFETY REGULATIONS AND THE LATEST TEST CERTIFICATES SHALL BE FURNISHED TO THE SATISFACTION OF BHEL/NPCIL. IF BHEL/NPCIL FEELS THAT THE TOOLS AND TACKLES ARE INADEQUATE OR UNSUITABLE, THE CONTRACTOR SHALL ARRANGE TO PROVIDE SUCH TOOLS AND TACKLES CONSIDERED SUITABLE BY BHEL/NPCIL IN SUFFICIENT QUANTITIES ACCEPTABLE TO BHEL/NPCIL.**

C: LIST OF T&P TO BE PROVIDED BY BHEL ON SHARING BASIS:

S.No.	DESCRIPTION AND CAPACITY OF T&P	QUANTITY	REMARKS
1	75 MT Crane	01	At storage yard for loading of consignments on contractor's trailer
2	200/250 MT Crane	01	At storage yard for loading of consignments on contractor's trailer
3	EOT CRANE (125/25 MT) IN TG HALL	01	FOR HANDLING AND ERECTION WITHIN TG HALL ON SHARING BASIS AS AVAILABLE AND SUBJECT TO THEIR ACCESSIBILITY AND APPROACHABILITY
4	Suitable capacity crane for erection of Generator stator and MSR in TG Hall	01	For Generator stator and MSR erection only. **(on chargeable basis)**

NOTE:

1. **EOT crane of capacity 125/25 MT will be provided inside the TG hall for erection purposes subject to its availability, approachability and safe working load limit. EOT crane will be used on sharing basis by other agencies working within the TG hall under the instruction of BHEL.**
2. Consignments within the capacity of contractor's crane shall be handled by contractor's crane only.
3. Cranes deployed by BHEL shall be owned or hired by BHEL.
4. Operator and O&M for BHEL owned cranes shall be arranged by BHEL free of charges.
5. Operator and O&M for BHEL hired crane will be provided by hiring agency free of charges.
6. **Fuel for BHEL cranes (owned/hired) shall be provided by contractor for his scope of operations within the quoted rates.**
7. **Contractor has to provide EOT crane operator for his operations within quoted rates.**
8. EOT crane will be used on sharing basis by other agencies working within the TG hall under the instruction of BHEL. The contractor shall extend the services of his operator to such other agencies as well on mutually agreed mode of cost sharing.
9. Above T&Ps will be provided on sharing basis only. Contractor has to plan his activities well in advance and inform BHEL engineer in charge/ construction manager the date of actual use.
10. **BHEL/NPCIL will provide suitable capacity crane/strand jack arrangement for generator stator lifting. Contractor shall provide manpower and assistance for supporting work of handling, unloading, lifting and placement of generator stator to its designated foundation.**

6. TIME SCHEDULE & MOBILIZATION

6.1 Initial Mobilization

After receipt of fax **Letter of Intent (LOI),** Contractor shall discuss with Project Manager / Construction Manager regarding initial mobilization. Contractor shall mobilize necessary resources **within two weeks** of issue of fax letter of intent and shall further augment his manpower and T&P resources as per the directive of Project Manager / Construction Manager. Such resources shall be progressively augmented to match the schedule of milestones and commissioning.

6.2 Mobilization for Erection, Testing, Commissioning etc.

The activities for Erection, Testing etc. shall be started within two weeks / as per directions of BHEL Engineer at site. Contractor shall mobilize further resources (in addition to those required for activities under clause no. 6.2) as per requirement to commence the work of erection, testing etc. of STG and their related auxiliaries and augment the manpower and T&P resources to achieve the below mentioned milestone activities and overall commissioning schedule of the project.

SL No.	Milestones	Tentative completion Schedule (From Start of contract Period ref. Clause No.-6.3 of TCC)
1	Condenser Erection Start	End Dec'13
2	Turbine Erection Start	End Jan'14
3	Oil Flushing completion	March'15
4	Turbine on barring gear	April'15
5	Rolling and synchronization with Nuclear Steam	June'15
6	Full Load	Aug'15
7	Trial Operation	Aug'15
8	Completion of facilities	Sep'15

In order to meet above schedule in general, and any other intermediate targets set to meet customer/ project schedule requirements, contractor shall make note of above and mobilize his manpower and resources from time to time on instructions of BHEL to achieve the desired progress of work and project commissioning schedule.

6.3 Commencement of Contract Period

Erection / placement of first major permanent equipment / component covered in the scope of these specifications shall be recognized as start of Contract Period for erection, testing and commissioning portion as defined in the scope of works in the tender specifications. Similar items like packers, plates, shims, anchors, inserts etc. will not be considered as start of contract period.

6.4 Contract Period

The contract period for erection, testing and commissioning completion shall be **22 (Twenty Two) Months** from start of contract period as defined under 6.3.2.

6.5

In order to meet above schedule and other intermediate targets/activities as set **by BHEL Engineer in charge** at site & to meet customer requirements/project schedule, contractor shall arrange all necessary resources and work force in consultation with BHEL Engineer at site to undertake works concurrently in all possible fronts as made available to contractor.

Contractor shall note that individual milestones as above shall be achieved as per schedule furnished above.

7.2 The progressive payment for **"Erection, Testing and Commissioning of STG-3 package"** on accepted price of contract value will be released as per the break up given hereinafter:

		CONDENSER			TURBINES				GENERATOR	MSR AND HEATERS			PUMPS AND AUX	MISCELLANEOUS ITEMS	PIPING
		21%			22%				15%	18%			5%	4%	15%
	Overall weightage for each area out of lumpsum value quoted for STG	Condenser 1 (7%)	Condenser 2 (7%)	Condenser 3 (7%)	HP Turbine Module 1 (4%)	LP Turbine Module 1 (6%)	LP Turbine Module 2 (6%)	LP Turbine Module 3 (6%)	GENERATOR 1 (15%)	MSR 1 (7%)	MSR 2 (7%)	HEATERS ETC. (4%)			
S.NO.	Activity/Work Description														
A	PRO RATA PAYMENTS (85%)														
A.1	CONDENSER (WEIGHTAGE 21%)														
A.1.1	PREPARATION OF FOUNDATION	2%	2%	2%	-	-	-	-	-	-	-	-	-	-	-
A.1.2	PLACEMENT, ALIGNMENT, ASSEMBLY AND WELDING OF BOTTOM PLATE SEGMENTS, HOT WELL, NDT AND SPRING ELEMENTS PLACEMENT AND GROUTING	10%	10%	10%	-	-	-	-	-	-	-	-	-	-	-
A.1.3	ASSEMBLY AND POSITIONING OF WATER CHAMBER, SIDE PLATES, BOTTOM PLATES, WELDING AND NDT INCLUDING HINGE ASSEMBLY	11%	11%	11%	-	-	-	-	-	-	-	-	-	-	-
A.1.4	ASSEMBLY, ALIGNMENT AND WELDING & NDT OF TUBE SUPPORT PLATES	12%	12%	12%	-	-	-	-	-	-	-	-	-	-	-

	AND INTERNALS LIKE BAFFLE PLATES, AIR EVACUATION PIPES ETC.														
A.1.5	ASSEMBLY, WELDING & NDT OF DOME WALLS AND DOME STIFFENERS, EXTRACTION PIPING WITHIN CONDENSER AND STEAM THROW DEVICE, LPH-1 SUPPORT ETC.	10%	10%	10%	-	-	-	-	-	-	-	-	-	-	-
A.1.6	INSERTION EXPANSION, CUTTING ETC. OF CONDENSER TUBES	15%	15%	15%	-	-	-	-	-	-	-	-	-	-	-
A.1.7	HYDRO TEST OF STEAM AND WATER SIDE	10%	10%	10%	-	-	-	-	-	-	-	-	-	-	-
A.1.8	WELDING OF CONDENSER NECK JOINT AND NDT & COMPLETION OF BALANCE WORKS	10%	10%	10%	-	-	-	-	-	-	-	-	-	-	-
A.1.9	ERECTION, COMMISSIONING, LOAD TESTING OF CONDENSER WATER BOX HANDLING SYSTEM	3%	3%	3%	-	-	-	-	-	-	-	-	-	-	-
A.1.10	SATISFACTORY SUBMISSION OF ALL NECESSARY DOCUMENTATION	2%	2%	2%	-	-	-	-	-	-	-	-	-	-	-
	SUBTOTAL FOR CONDENSER	**85%**	**85%**	**85%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
A.2	**TURBINES (WEIGHTAGE 22%)**														
A.2.1	PREPARATION OF FOUNDATION, PLACEMENT, ALIGNMENT AND GROUTING OF BASE PLATES OF LPC AND BEARING PEDESTALS	-	-	-	-	7%	7%	7%	-	-	-	-	-	-	-
A.2.2	PLACEMENT AND ALIGNMENT OF LP OUTER CASING BOTTOM PORTION AND CENTER GUIDE KEYS	-	-	-	-	6%	6%	6%	-	-	-	-	-	-	-

A.2.3	PLACEMENT OF LP ROTOR AND ALIGNMENT WITH INNER CASING AND CHECKING OF BLADE CLEARANCE	-	-	-	-	12%	12%	12%	-	-	-	-	-	-	-
A.2.4	ASSEMBLY, ALIGNMENT & WELDING OF LP OUTER CASING OUTER HALF	-	-	-	-	12%	12%	12%	-	-	-	-	-	-	-
A.2.5	PREPARATION OF FOUNDATION, PLACEMENT, ALIGNMENT AND GROUTING OF BEARING PEDESTALS OF HP TURBINE OUTER CASING AND INNER CASING (LOWER HALVES)	-	-	-	15%	-	-	-	-	-	-	-	-	-	-
A.2.6	PLACEMENT AND ALIGNMENT OF HP ROTOR WITH LOWER CASING AND BOXING UP OF INNER AND OUTER CASING (UPPER HALVES) , CHECKING OF CLEARANCES, COUPLING, HP TURBINE SWING CHECKS ETC.	-	-	-	26%	-	-	-	-	-	-	-	-	-	-
A.2.7	FINAL BOX UP OF HP TURBINE	-	-	-	10%	-	-	-	-	-	-	-	-	-	-
A.2.8	BOXING UP OF LP INNER & OUTER AND ROLL CHECK	-	-	-	-	7%	7%	7%	-	-	-	-	-	-	-
A.2.9	ALIGNMENT OF ALL ROTORS INCLUDING REAMING, HONING AND FIXING OF COUPLING BOLTS	-	-	-	9%	9%	9%	9%	-	-	-	-	-	-	-
A.2.10	ASSEMBLY OF GOVERNING SYSTEM/EQUIPMENT	-	-	-	4%	4%	4%	4%	-	-	-	-	-	-	-
A.2.11	INSTALLATION OF ALL HP AND LP VALVES	-	-	-	8%	8%	8%	8%	-	-	-	-	-	-	-
A.2.12	ERECTION, WELDING AND ALIGNMENT OF CROSS AROUND PIPING	-	-	-	5%	5%	5%	5%	-	-	-	-	-	-	-
A.2.13	FINAL BOX UP OF LP TURBINE	-	-	-	-	7%	7%	7%	-	-	-	-	-	-	-
A.2.14	ASSEMBLY AND PREPARATION OF HYDRO TEST, STEAM BLOWING	-	-	-	1%	1%	1%	1%	-	-	-	-	-	-	-

	DEVICES AND NORMALISATION ETC.													
A.2.15	FINAL BOXING UP OF PEDESTALS AFTER OIL FLUSHING COMPLETION	-	-	-	5%	5%	5%	5%	-	-	-	-	-	-	-
A.2.16	SATISFACTORY SUBMISSION OF ALL NECESSARY DOCUMENTATION				2%	2%	2%	2%	-	-	-	-	-	-	-
	SUB TOTAL FOR STEAM TURBINE	**0%**	**0%**	**0%**	**85%**	**85%**	**85%**	**85%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
A.3	**TURBO GENERATOR (WEIGHTAGE 15%)**														
A.3.1	PREPARATION OF FOUNDATION, LEVELLING, MATCHING AND GROUTING OF FOUNDATION PLATES	-	-	-	-	-	-	-	5%	-	-	-	-	-	-
A.3.2	LIFTING, LEVELLING AND ALIGNMENT OF STATOR	-	-	-	-	-	-	-	23%	-	-	-	-	-	-
A.3.3	FIXING OF END SHIELDS ON TO FOUNDATION BEAMS	-	-	-	-	-	-	-	6%	-	-	-	-	-	-
A.3.4	ROTOR INSERTION	-	-	-	-	-	-	-	6%	-	-	-	-	-	-
A.3.5	BOXING UP OF GENERATOR AND ASSEMBLY OF HYDROGEN SEALS	-	-	-	-	-	-	-	11%	-	-	-	-	-	-
A.3.6	ALIGNMENT OF GENERATOR ROTOR WITH LP TURBINE ROTOR, RUN-OUT CHECKS AND REAMING, ONING OF COUPLING HOLES AND FIXING OF COUPLING BOLTS	-	-	-	-	-	-	-	8%	-	-	-	-	-	-
A.3.7	ERECTION OF EXCITATION EQUIPMENTS AND ALIGNMENT OF GEN-EXCITER ROTORS INCLUDING SWING CHECK AND COMPLETION OF BALANCE WORKS	-	-	-	-	-	-	-	9%	-	-	-	-	-	-

A.3.8	INSTALLATION OF ENCLOSURES OF GENERATOR/EXCITER WITH ALL AUXILLIARIES	-	-	-	-	-	-	-	5%	-	-	-	-	-	-
A.3.9	GROUTING OF GEN BEARING PEDESTALS AND EXCITER	-	-	-	-	-	-	-	5%	-	-	-	-	-	-
A.3.10	ASSEMBLY OF TERMINAL BUSHING, COMPLETION OF LEAK TEST / HYDRO TEST OF STATOR WINDING SYSTEM, FINAL GAS TIGHTNEESS TEST OF STATOR WITH COMPLETE SYSTEM.	-	-	-	-	-	-	-	5%	-	-	-	-	-	-
A.3.11	SATISFACTORY SUBMISSION OF ALL NECESSARY DOCUMENTATION	-	-	-	-	-	-	-	2%	-	-	-	-	-	-
	SUB TOTAL FOR TURBO-GENERATOR	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**85%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
A.4	**MOISTURE SEPARATOR REHEATER AND HEATERS (WEIGHTAGE 18%)**														
A.4.1	ASSEMBLY AND ERECTION OF FOUNDATION PLATES/LOAD BEARINGS	-	-	-	-	-	-	-	-	10%	10%	-	-	-	-
A.4.2	PLACEMENT, LEVELLING, ALIGNMENT OF LOWER HALF INCLUDING WELDING OF SUPPORT FRAME, SEPARATOR	-	-	-	-	-	-	-	-	10%	10%	-	-	-	-
A.4.3	PLACEMENT, ALIGNMENT OF MSR UPPER HALF AND ASSEMBLY/WELDING OF CONDENSATE PIPES, STIFFNERS, BACKING STRIPS AND OTHER LOOSE ITEMS	-	-	-	-	-	-	-	-	28%	28%	-	-	-	-
A.4.4	WELDING OF MSR	-	-	-	-	-	-	-	-	15%	15%	-	-	-	-
A.4.5	HYDRO TEST OF MSR									2%	2%				-

A.4.6	ERECTION OF MS DRAIN TANKS, REHEATER CONDESATE TANK STAGE-1, AND REHEATER CONDENSATE TANK STAGE-2, DRAINS, VENTS AND THERMAL INSULATION	-	-	-	-	-	-	-	-	16%	16%	-	-	-	-
A.4.7	ERECTION, TESTING, COMMISSIONING OF LP HEATERS	-	-	-	-	-	-	-	-	-	-	56%	-	-	-
A.4.8	ERECTION, TESTING AND COMMISSIONING OF GLAND STEAM CONDENSER, DRAIN COOLERS	-	-	-	-	-	-	-	-	-	-	23%	-	-	-
A.4.9	INSULATION AND CLADDING OF MSR AND APPLICABLE EQUIPMENTS									4%	4%	4%			
A.4.10	SATISFACTORY SUBMISSION OF ALL NECESSARY DOCUMENTATION				-	-	-	-	-	-	-	2%	-	-	-
	SUB TOTAL FOR MSR AND HEATERS	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**85%**	**85%**	**85%**	**0%**	**0%**	**0%**
A.5	**PUMPS AND AUXILIARIES (WEIGHTAGE 5%)**														
A.5.1	ERECTION/TESTING AND COMMISSIONING OF MAIN OIL PUMP, JOP, EOP, AOP, AOP, CENTRALISED LUBE OIL PURIFICATION SYSTEM, OIL VAPOUR EXHAUSTER, OIL MIST FILTER, STRAINER, DUPLEX FILTER LUB OIL, LUB OIL SKID UNIT, PW PUMP AND FILTER UNIT ALONG WITH MOTORS AND ALL AUXILIARIES	-	-	-	-	-	-	-	-	-	-	-	38%	-	-

A.5.2	ERECTION, TESTING AND COMMISSSIONING OF GLAND STEAM CONTROL VALVE, MSR LINE CHECK VALVE, HP HEATER CHECK VALVES, DEAERATOR CHECK VALVE, LP HEATER CHECK VALVE, THERMOSTATIC VALVE, OTHER MISCELLANEOUS VALVES, INSTRUMENT RACKS,	-	-	-	-	-	-	-	-	-	-	-	27%	-	-
A.5.3	ERECTION, TESTING AND COMMISSIONING OF VACUUM PUMPS	-	-	-	-	-	-	-	-	-	-	-	18%	-	-
A.5.4	SATISFACTORY SUBMISSION OF ALL NECESSARY DOCUMENTATION	-	-	-	-	-	-	-	-	-	-	-	2%	-	-
	SUB TOTAL FOR PUMPS AND AUXILIARIES	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**85%**	**0%**	**0%**
A.6	**MISCELLANEOUS ITEMS (WEIGHTAGE 4%)**														
A.6.1	ERECTION, TESTING AND COMMISSIONING OF CO_2 VAPORISER, H_2 DISTRIBUTER, CO_2 DISTRIBUTER, DRAIN OIL COLLECTOR, RESINS, SEAL RINGS	-	-	-	-	-	-	-	-	-	-	-	-	16%	-
A.6.2	ERECTION, TESTING AND COMMISSIONING OF MAIN OIL TANK, SEAL OIL STORAGE TANK, PRIMARY WATER TANK SINGLE FLOW S.O.U-PART1&2, LIQUID DETECTOR RACK, GAS UNIT, DRY AIR BLOWER	-	-	-	-	-	-	-	-	-	-	-	-	28%	-
A.6.3	ERECTION, TESTING AND COMMISSIONING OF HYDROGEN COOLERS, EXCITER COOLERS, COOLER HOUSING FRAMES AND OTHER LOOSE ITEMS OF	-	-	-	-	-	-	-	-	-	-	-	-	15%	-

	HYDROGEN AND EXCITER COOLERS														
A.6.4	ERECTION, TESTING AND COMMISSIONING OF ANY OTHER TURBINE a OR GENERATOR ACCESSORIES	-	-	-	-	-	-	-	-	-	-	-	-	5%	-
A.6.5	ERECTION, TESTING AND COMMISSSIONING OF MISC. HOISTS AND CHAIN PULLEY BLOCKS	-	-	-	-	-	-	-	-	-	-	-	-	4%	-
A.6.6	ERECTION OF SUPPORT PLATFORMS, WALKWAYS, LADDERS ETC.													15%	
A.6.7	SATISFACTORY SUBMISSION OF ALL NECESSARY DOCUMENTATION	-	-	-	-	-	-	-	-	-	-	-	-	2%	-
	SUB TOTAL FOR MISCELLANEOUS ITEMS	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**85%**	**0%**
A.7	**PIPING**														
	(HP-MSR-LP PIPING, TURBINE INTEGRAL PIPING AND GENRATOR INTEGRAL PIPING CONSISTING OF LUBE OIL, JACKING OIL, OIL VAPOUR EXTRACTION, SEAL OIL, CONTROL OIL, CONTROL OIL, SEAL STEAM, CONDENSATE SPRAY/EXHAUST HOOD SPRAY, TURBINE WATER DRAINAGE GAS PIPING, PRIMARY STATOR WATER PIPING ETC. INCLUDING ALL ACCESSORIES LIKE THERMOWELLS, PROBES, ORRIFICES ETC. AND HANGERS AND SUPPORTS (ERECTION, TESTING AND COMMISSIONING ON PRO-RATA BASIS)-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

A.7.1	PRE-ASSEMBLY	-	-	-	-	-	-	-	-	-	-	-	-	-	10%
A.7.2	PLACEMENT IN POSITION	-	-	-	-	-	-	-	-	-	-	-	-	-	14%
A.7.3	ALIGNMENT	-	-	-	-	-	-	-	-	-	-	-	-	-	10%
A.7.4	WELDING/BOLTING/FIXING	-	-	-	-	-	-	-	-	-	-	-	-	-	20%
A.7.5	COMPLETION OF NON DESTRUCTIVE EXAMINATION AND STRESS RELIEVING/HEAT TREATMENT , INSULATION WHEREVER APPLICABLE	-	-	-	-	-	-	-	-	-	-	-	-	-	7%
A.7.6	HANGERS AND SUPPORTS ETC. WHEREVER NECESSARY AS PER DRAWING	-	-	-	-	-	-	-	-	-	-	-	-	-	5%
A.7.7	HYDRAULIC TEST/PNEUMATIC TEST WHEREVER APPLICABLE	-	-	-	-	-	-	-	-	-	-	-	-	-	10%
A.7.8	INSULATION AND CLADDING OF RELATED PIPING AND EQUIPMENTS														7%
A.7.9	SATISFACTORY SUBMISSION OF ALL NECESSARY DOCUMENTATION				-	-	-	-	-	-	-	-	-	-	2%
	SUB TOTAL FOR INTEGRAL AND HP-MSR-LP PIPING	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**85%**
	TOTAL FOR PRO-RATA (85%)	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**
B	**FINAL PAINTING (4%)**														
B.1	PROGREESIVE PAYMENT FOR SUPPLY AND APPLICATION OF PAINTS FOR FINAL PAINTING OF EQUIPMENTS UNDER SCOPE	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	TOTAL FOR FINAL PAINTING (4%)	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**

c	**STAGE/MILESTONE PAYMENTS (11%)**														
C.1	TG BOX UP	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
C.2	OIL FLUSHING COMPLETION	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
C.3	BARRING GEAR	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
C.4	SYNCHRONIZATION WITH NUCLEAR STEAM	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
C.5	FULL LOAD	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
C.6	TRIAL OPERATION OF UNIT	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
C.7	COMPLETION OF FACILITIES AND HANDING OVER	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	TOTAL FOR STAGE/MILESTONE PAYMENTS (11%)	**11%**	**11%**	**11%**	**11%**	**11%**	**11%**	**11%**	**11%**	**11%**	**11%**	**11%**	**11%**	**11%**	**11%**
	TOTAL OF A, B & C	**100%**	**100%**	**100%**	**100%**	**100 %**	**100%**	**100 %**	**100%**	**100 %**	**100 %**	**100%**	**100%**	**100%**	**100%**

*** Considering very essential safety requirements, 2% of RA bill will be released only after certification from BHEL engineer that all safety related rules and requirements have been followed by the contractor.**

**** Wherever application of INSULATION is applicable, same shall be covered under the respective item/equipment for 'Terms of Payment'.**

Note: The terms of payment is only for enabling release of payments through RA bills and is not indicative of the actual quantum or value of work.

8.0 TAXES, DUTIES, LEVIES (Consolidated Rev 03 dated 09/04/2013)

8.1. For All types of works excepting works covered under sl no 8.2

8.1.1

The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

However, provisions regarding Service Tax and Value Added Tax (VAT) on output services and goods shall be as per following clauses.

8.1.2 Service Tax & Cess on Service Tax

Contractor's price/rates shall be exclusive of Service Tax and Cess on Services. In case, it becomes mandatory for the contractor under provisions of relevant act/law to collect the Service Tax & Cess from BHEL and pay the same to the concerned tax authorities, such applicable amount will be paid by BHEL at the prevailing Service Tax Rate (presently 12.36 %) on the admitted bill value.

Contractor shall submit to BHEL documentary evidence of Service Tax registration certificate specifying name of services covered under this contract. Contractor shall submit serially numbered Service Tax and Cess Invoice, signed by him or a person authorized by him in respect of taxable service provided, and shall contain the following, namely,

1. **The name, address and the registration number of the contractor,**
2. **The name and address of the party receiving taxable service,**
3. **Description, classification and value of taxable service provided and,**
4. **The service tax payable thereon.**

All the Four conditions shall be fulfilled in the invoice before release of service tax payment.

Wherever, more than one route/option are available for discharge of service tax liability under a particular service, (e.g. "works contract Service"), contractor shall obtain prior written consent from BHEL site before billing the amount towards Service Tax.

8.1.3 VAT (Sales Tax /WCT)

As regards Value Added Tax (VAT)/CST on transfer of property in goods involved in Works Contract (previously known as Works Contract Tax) applicable as per local laws, the price quoted by the contractor shall be inclusive of the same and in no case input or output VAT/CST will be reimbursed extra.

In any case the Contractor shall register himself with the respective Sales Tax authorities of the state and submit proof of such registration to BHEL along with the first RA bill. Contractor will submit all the details of VAT/CST paid for the contract in the prescribed format of the respective state VAT laws. Also, the

contractor will issue the tax Invoices to BHEL as per the Tax laws of respective state on monthly basis. Contractor shall also be required to furnish to BHEL necessary proof of VAT remittance on monthly basis.

Deduction of tax at source shall be made as per the provisions of law and is to be construed as an advance tax paid by the contractor and no reimbursement thereof will be made.

Further, if BHEL, at the instance of customer or otherwise adopts the specific route for discharging output VAT liability itself, benefit of the reduction in liability of the contractor will be passed on to BHEL.

In case, BHEL is forced to pay any VAT liability on behalf of contractor, the same will be recovered from contractor's bill or otherwise as deemed fit

~~8.2 'Enabling Works'~~

~~The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.~~ **~~(i.e. rates quoted by bidder shall be inclusive of Service Tax, VAT/WCT and all other taxes and duties)~~**

~~However, Since the proposed work is in the nature of 'Works Contract service' as per Service tax law, Hence, For non-corporate contractors being Individual, HUF, Proprietary Firm, Partnership Firm or Association of Persons (AOP), BHEL shall recover the applicable Service Tax under reverse charge mechanism from the contractor and remit the same with the Government as per the provisions of Law. Necessary advice/confirmation of remittance shall be issued to the contractor. The contractor shall not be eligible for any refund/reimbursement of such service tax from BHEL. It shall be the responsibility of the contractor to submit proper invoice giving all the requisite details as per Service Tax Law for the determination of the service tax liability of BHEL under reverse charge mechanism. BHEL reserves the right to determine such liability based on the invoice submitted by the contractor or otherwise independently and remittance of the same with the Government.~~

8.3 New Taxes/Levies

In case the Government imposes any new levy/tax on the output service/ goods/work after award of the contract, the same shall be reimbursed by BHEL at actual.

In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same **before opening of Price Bid**. Claim for any such impact after opening the Price Bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.

No reimbursement/recovery on account of increase/reduction in the rate of taxes, levies, duties etc. on input goods/services/work shall be made. Such impact shall be taken care of by the Price Variation/Adjustment Clause (PVC) if any. In case PVC is not applicable for the contract, Bidder has to make his own assessment of the impact of future variation if any, in rates of taxes/duties/ levies etc. in his price bid.

9. INCLUSIONS

9.1
All terminal connections for equipment & piping covered in this specification.

9.2
Impulse/ pneumatic piping between customer's battery limit and equipments.

9.3
Servicing and assembly of control valves/regulating valves, fixing of filter elements/strainers etc. is the part of scope of work.

9.4
It may be specifically noted that it should not be construed or claimed by the contractor that with the technical specification and "exclusions and/or inclusions" detailed in this tender specification, BHEL has covered the entire scope of work and/or the details thereof to be executed by the contractor .

9.5
Supply of grouting material as per specifications under Chapter 19.

9.6
Chipping of foundation, placement, erection, alignment, commissioning, grouting, mounting of equipment mount instruments, panels and other fittings as supplied from BHEL / their vendors are in scope of the work. Erection and commissioning of these equipments/pumps & BOP packages will be required to complete and meet the commissioning schedule/ milestone activities of other areas and other agencies working in the same premise and required for commissioning of equipments. Contractor shall plan and complete erection & commissioning of these equipments on priority as per decision of BHEL engineer/customer requirement. Details of such systems are furnished in relevant appendix.

9.7
Most of the Misc. Pumps with drive motors, base frame, fittings etc will be supplied in loose parts/ dismantled condition as skid mount. These pumps along with drive and fittings shall be assembled at site. The Delivery of these will be taken from BHEL stores/storage yard and will be assembled/ installed at different locations as per drawing and instruction of BHEL Engineer at site. The work involved is preservation, assembly, installation, erection, alignment, Pockets / base frames / foundations grouting including providing non-shrink free flow grout mix material, fixing of loose items, filling of lubricants, greasing, commissioning, no load/ load trial run of motors & pumps. All the works shall be carried our as part of scope of work.

These Misc. pumps / equipments which will be required for erection and commissioning of other systems, pipings, equipments which will be under scope of erection of other agencies. Contractor shall carry out the installation, erection and alignment works etc. as per priority decided by BHEL Engineer at site to enable the other agencies to proceed with their work. Contractor shall carry out the welding of terminal point/interface/matching & connected flanges joints, pipe joints etc. of other system & other agencies as scope of work. The decision of BHEL Engineer shall be final and binding on contractor.

9.8

Complete control fluid system of both HP and LP bypass system is included in this specification. Associated assistance for commissioning like lube oil flushing, filling and topping up of lube oil etc. shall be part of the work.

9.9

Assembly and installation of strainer elements of MS / HP/MSR/HRH / CRH steam system, Oil and Water systems are within the scope of work. Cleaning of these strainer elements during trial operation of machine is also covered under this scope as per instruction of BHEL Engineer at site.

9.10 PRIMER AND PAINTS

Supply and application of all primer and paints as per specifications for preservation and final painting are included in the scope of contractor within the quoted prices.

9.11 CONSUMABLES

The contractor shall provide all consumables required for carrying out the work covered under these specifications excepting those which are specifically indicated as BHEL scope.
TG special consumables like hylomar / golden hermetite / stag-b / molykote/ anabond compounds / rubber fixing compounds etc. will have to be arranged by the contractor.

9.12

All consumables to be used for the work shall have prior approval of BHEL engineer with regard to brand and quality specifications. Test reports / certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL engineer.

9.13 WELDING ELECTRODES, FILLER WIRES FOR TIG WELDING AND GASES

All welding consumables including welding electrodes, gases, filler wires etc. are in the contractor's scope.

9.14

All the required welding electrodes as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement, regarding manufacturer, type of electrodes etc. on receipt of the electrodes at

site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry etc. Batch test certificates shall be made available for verification & record before the actual use of the welding consumables.

BHEL reserves the right to reject the use of any electrodes, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf life expiry, unapproved type / brand etc.

9.15

The contractor shall provide all consumables required for carrying out the work covered under this scope of work including TIG wires for welding of piping joints.

9.16

All the required gases like argon, oxygen, and acetylene etc. including required high purity nitrogen gas (for purging of generator stator water system) shall be arranged by the contractor at his cost.

9.17

It must be expressly noted that the T&P requirement as indicated in the relevant chapter is only indicative and any other T&P required for smooth material handling and erection shall be arranged by the contractor within the quoted rate..

10. EXCLUSIONS

The following works are specific exclusions from the scope of work under erection, testing & commissioning of tender specification.

10.1
Civil works except to the extent specifically indicated elsewhere in this tender.

10.2
Sub-delivery items and electrical components such as push-buttons, junction boxes etc. However Turbo Generator and all Motors related to the equipments covered under these specifications are specifically included in the scope of contractor under these tender specifications.

10.3
E&C work of cable trays, cables and earthing, control panels, EPMS, MCC etc.

10.4
All electrical and control & instrumentation related to items except those specified elsewhere in these specifications.

10.5
Testing and commissioning of heating elements, thermostats, HV rectifier transformers.

10.6
Pneumatic copper tubing and fittings thereof. Electrical and C&I items of Variable Frequency Drives as provided elsewhere in these specifications.

10.7
All cable connections, except those specified as scope of work.

10.8
Measuring instruments, monitoring, relaying, protection and signaling equipments other than those supplied with the equipments by / on behalf of BHEL and which have been indicated as scope of work.

10.9
Electrical testing of motors, turbo-generator. However erection of these items will be under the scope of this tender specification.

10.10

Impulse piping and fittings beyond the root wall and nut & tail is excluded from the scope of contractor under these specifications. It is to mention that impulse piping and fitting from tapping point upto nut & tail (including nut & tail) is specifically included under the scope of work of contractor under these tender specifications.

10.11
Supply of materials for temporary piping (pipe, valve, structural steel etc.) required for chemical cleaning, flushing or steam/air blowing of the pipelines.

10.12
Supply of chemicals and lube oil as required for chemical cleaning and oil flushing operations during pre-commissioning, commissioning and trial operations activities.

10.13
Some sub-delivery items and electrical components such as push-buttons, junction boxes etc.

ESTIMATED WEIGHT OF VARIOUS SYSTEM IN SCOPE OF WORK FOR ERECTION, TESTING AND COMMISSIONING OF UNIT #3 STG AND AUXILIARIES PACKAGE

NOTE: The weight details shown are only for the purpose of erection, testing and commissioning of unit #3 STG and auxiliaries package.

A) BHEL-BHOPAL/ALSTOM Supply

A.1 Condenser

There are 3 Condensers in Unit #3.

S. No.	Name of package	Box Qty (Nos.)	Size of packages (tentatively)			Weight (kg)
			L (mm)	B (mm)	H (mm)	
1	CONDENSER (HOTWELL)	1	13000	2000	1200	6500
2	BOTTOM PLATE (FRONT)	1	7200	4000	1000	7100
3	BOTTOM PLATE-REAR	1	7200	4000	1000	7100
4	BOTTOM PLATE (MIDDLE)	1	7200	4000	1000	8500
5	BOTTOM PLATE: LOOSE ITEMS. (BACKING STRIPS AND STIFF.)	1	2000	500	500	400
6	CONDENSER SPRING SUPPORT ASSY.(8 SET)	1	1800	1700	1000	4200
7	CONDENSER SPRING SUPPORT ASSY.(8 SETS)	1	1800	1700	1000	4200
8	CONDENSER SPRING SUPPORT ASSY.(6 SET)	1	1800	1400	1000	3200
9	CONDENSER SPRING SUPPORT ASSY.(6 SETS)	1	1800	1400	1000	3200
10	CONENSER SPRING SUPPORT (LOOSE-ITEMS)BASE-PLATES-PACK	1	1000	500	500	5000
11	FRONT WATER CHAMBER : (LHS) GENERATOR SIDE	1	7500	7200	400	6500
12	FRONT WATER BOX (LHS) GENERATOR SIDE	1	7200	7200	2000	14500
13	FRONT WATER CHAMBER(RHS)TURBINE SIDE	1	7500	7200	400	6500
14	FRONT WATER BOX (RHS) : TURBINE SIDE	1	7200	7200	2000	14500
15	REAR WATER CHAMBER(RHS) GENERATOR SIDE	1	7500	7200	400	6500
16	REAR WATER BOX (RHS) : GENERATOR SIDE	1	7200	7200	2000	14500
17	REAR WATER CHAMBER(LHS) TURBINE SIDE	1	7500	7200	400	6500
18	REAR WATER BOX (LHS) :TURBINE SIDE	1	7200	7200	2000	14500
19	SIDE WALL (TRURBINE SIDE) : FRONT	1	7600	1700	16	1800
20	SIDE WALL (TURB. SIDE) : MIDDLE	1	7600	2800	16	2400
21	SIDE WALL (TURB. SIDE) : MIDDLE	1	7600	2800	16	2400

22	SIDE WALL (TURB. SIDE) MIDDLE	1	7600	2800	16	2400
23	SIDE WALL (TURB. SIDE) REAR	1	7600	1700	16	1800
24	SIDE WALL (TUR SIDE) LOOSE ITEMS (STIFFENERS)	1	500	250	500	250
25	SIDE WALL (TURB SIDE) LOOSE ITEMS (STIFFENERS)	1	6000	500	500	600
26	SIDE WALL GEN.SIDE FRONT BOX	1	7600	1700	16	1800
27	SIDE WALL GEN. SIDE MIDDLE BOX	1	7600	2800	16	2400
28	SIDE WALL GEN.SIDE MIDDLE BOX	1	7600	2800	16	2400
29	SIDE WALL GEN. SIDE MIDDLE BOX	1	7600	2800	16	2400
30	SIDE WALL GEN. SIDE REAR BOX	1	7600	1700	16	1800
31	SIDE WALL (GEN SIDE) LOOSE ITEMS (STIFFENERS)	1	500	250	500	250
32	SIDE WALL (GEN SIDE) LOOSE ITEMS	1	6000	500	500	600
33	SHELL INTERNALS: STIFFENING BARS DIA.100 mm	1	4000	500	500	5000
34	SHELL INTERNALS :STIFFENING BAR-DIA.100 MM)	1	4000	500	500	5000
35	SHELL INTERNAL DETAILS (STIFFENING BAR 100 DIA.)	1	4000	500	500	5000
36	SHELL INTERNALS STIFFENING BAR -100 DIA.	1	4000	500	500	5000
37	SHELL INTERNALS: PLATES AND LANDING BARS	1	1000	500	500	700
38	SHELL INTERNALS: STIFFENING BARS DIA. 250MM	1	4000	500	500	4300
39	AIR EXTRACTION PIPING	1	4200	500	500	1200
40	SHELL INTERNAL:(TUBE SUPPORT PLATES):5 NOS	1	7000	3350	100	6200
41	SHELL INTERNAL:(TUBE SUPPORT PLATES):5 NOS	1	7000	3350	100	6200
42	SHELL INTERNAL:(TUBE SUPPORT PLATES):5 NOS	1	7000	3350	100	6200
43	SHELL INTERNAL:(TUBE SUPPORT PLATES):5 NOS	1	7000	3350	100	6200
44	SHELL INTERNAL:(TUBE SUPPORT PLATES):4 NOS	1	7000	3350	100	6200
45	SHELL INTERNAL:(TUBE SUPPORT PLATES):4 NOS	1	7000	3350	100	6200
46	SHELL INTERNALS: BAFFLE PLATE-LANDING BARS-FLATS	1	4000	1000	500	7500

47	SHELL INTERNALS: BAFFLE PLAT ES-JOINING PLATES	1	5000	500	500	4000
48	SHELL INTERNALS:MAKEUP BARS :DIA.25 & 100 mm	1	4000	500	500	1000
49	LOWER DOME WALL (TURB. SIDE) :LOWER PORTION	1	12500	5000	550	9000
50	LOWER DOME WALL (TURB. SIDE): LOOSE ITEMS	1	5000	2500	500	1000
51	LOWER DOME WALL (TURB. SIDE): LOOSE ITEMS	1	9350	200	500	350
52	LOWER DOME WALL GENERATOR SIDE) LOWER PORTION	1	12500	5000	550	9000
53	LOWER DOME WALL (GEN.SIDE):LOOSE ITEMS	1	5000	2500	500	1000
54	LOWER DOME WALL (GEN.SIDE):LOOSE ITEMS	1	9350	200	500	350
55	LOWER DOME WALL(FWB SIDE) :LOWER PORTION	1	7200	5000	550	6500
56	LOWER DOME WALL(FWB SIDE) :UPPER PORTION	1	3300	2500	500	1500
57	LOWER DOME WALL(FWB SIDE)LOOSE ITEMS	1	6400	200	500	600
58	LOWER DOME WALL(RWB SIDE) : LOWER PORTION	1	7200	5000	550	6500
59	LOWER DOME WALL (RWB SIDE); UPPER PORTION	1	3300	2500	500	1500
60	LOWER DOME WALL(RWB SIDE): LOOSE-ITEMS(STIFF/CATCHMENT/DISPER.	1	6400	200	500	200
61	DOME INTERNAL STIFEENING	1	2000	500	500	900
62	DOME INTERNAL STIFEENING	1	2000	500	500	900
63	DOME INTERNAL STIFEENING	1	2000	500	500	900
64	DOME INTERNAL STIFEENING	1	2000	500	500	900
65	DOME INTERNAL STIFEENING	1	2000	500	500	500
66	DOME INTERNAL STIFEENING	1	2000	500	500	500
67	DOME INTERNAL STIFEENING	1	2000	500	500	4000
68	DOME INTERNAL STIFEENING	1	2500	500	500	4500
69	UPPER DOME WALL (TURB. SIDE)	1	8000	1800	500	2500
70	UPPER DOME WALL (GENERATOR SIDE)	1	8000	1800	500	2500
71	UPPER DOME WALL (FWB SIDE)	1	6500	1800	500	2200
72	UPPER DOME WALL (RWB SIDE)	1	6500	1800	500	2200
73	UPPER DOME WALL:(LOOSE ITEMES)	1	1500	600	600	700
74	WATER BOX REMOVAL DEVICE:SWIVEL PIPE	1	2500	1000	500	800

	ASSEMBLY					
75	WATER BOX REMOVAL DEVICELOOSE ITEMS-SHORT/LONG BRKT /SUPP. BLOCKS)	1	2000	500	500	4000
76	WATER BOX REMOVAL DEVICE: FRAME ASSEMBLY	1	2000	500	500	800
77	WATER BOX REMOVAL DEVICE: FRAME ASSEMBLY	1	2000	500	500	800
78	STEAM THROW DEVICE -U1	1	1800	610	610	1000
79	STEAM THROW DEVICE -U2	1	1800	280	280	300
80	CONDENSER LOOSE ITEMS : FASTENERS	1	500	500	500	1500
81	CONDENSER LOOSE ITEMS: ASME BASKET, NAME PLATE ETC.	1	500	500	500	200
82	CONDENSER LOOSE ITEMS :LPH-3 EXT. PIPE	1	3000	1000	500	700
83	CONDENSER LOOSE ITEMS : TOOLS & TACKLES	1	1000	500	500	25
84	STAND PIPE - LOOSE ITEMS	1	4000	1000	500	200
	TOTAL (for 1 no. condenser)					**303625**
	TOTAL (for 3 no. condensers)					**910875**

A.2 Condenser Tubes

S. No.	Name of package	Qty per condenser	Weight (kg)
1	Condenser Tubes (SS Welded to SA 249 TP 316L)	22864	
	TOTAL (for 1 no. condenser)		**136000**
	TOTAL (for 3 no. condenser)		**408000**

Tube Material: SS welded to SA 249 TP 316L,
Tube OD x Thickness x Qty: For top two rows : approx 28.575 mm x 1.244mm x 464 nos./condenser
Remaining Bundle (including air cooling zone): approx 28.575 mm x 1.244mm x 22400 nos./condenser

TOTAL QTY: approx. 22864 nos./condenser
Seal Welding and roller expansion forms part of specifications. Contractor to refer the NPCIL welding specs. and it is clarified that orbital welding is included.

A.3 MS Drain Tank

There is 1 No.MS Drain tank for Unit#3

S. No.	Name of package	Box Qty (Nos.)	Size of packages (tentatively)			Weight (kg)
			L (mm)	B (mm)	H (mm)	
1	MSR Drain Tank Assy.	1	4000	2500	2600	4000

2	Stand Pipe Assemblies (3 Nos.)	1	3200	700	700	300
3	Bottom Base Plate with fasteners (2 Sets)	1	1600	500	500	125
4	Magnetic Level Indicator	1	2200	400	400	50
5	Set of Root Valves (50NB, 25NB, 15 NB SW) & Safety Relief Valve	1	1000	1000	1000	300
6	Rating Plate	1	500	500	100	2
7	Set of Level Transmitters (5 Nos.)	1	1000	1000	1000	50
	TOTAL (1 No. MS Drain Tank)					**4827**

A.4 MSR

There are 2 No. MSRs for Unit#3

S. No.	Name of package	Box Qty (Nos.)	Size of packages (tentatively)			Weight (kg)
1	MSR (lower half)	1	5300 Dia	10800 Height	--	59300
2	Base Plate - Lower	1	1300 Dia	450 Height	--	1350
3	Base Plate - Upper	1	1200 Dia	100 Height	--	900
4	Bearing Housing Forging - 1	1	950 Dia	350 Height	--	700
5	Bearing Housing Forging - 2	1	650 Dia	100 Height	--	170
6	Neopot Bearing	1	600 Dia	150 Height	--	250
7	Set of Fasteners + NPT Plugs (Lower Half)	1	500 Long	500 Wide	500 Height	50
8	Set of Plate Shims, Fillers & Lugs for Foundation	1	900 Dia	125 Height	--	300
9	MSR (Upper Half)	1	5300 Dia	12500 Height	--	125000
10	Rating Plate	1	500 Long	500 Wide	100 Height	10
11	Set of Snubbers (Tie Rods) with Brackets with Fasteners	1	1000 Long	1000 Wide	2000 Height	750
12	Manhole Gaskets (Grooved Metal)	1	700 Long	700 Wide	200 Height	10
13	Set of Fasteners (Upper Half)	1	300 Long	300 Wide	350 Height	30
14	Table Top Structure for Snubber Support	1	6000 Long	2000 Wide	3000 Height	1000
15	**MSR Lifting Beam Assy.(common)**	**1**	**5500 Long**	**3200 Wide**	**1000 Height**	**6500**
	TOTAL (1 No. MSR)					**196320**
	TOTAL (2 No. MSRs)					**392640**

A.5 Vacuum Pump

There are 4 No. vacuum pumps for Unit#3

S. No.	Name of package	Box Qty (Nos.)	Size of packages (tentatively)			Weight (kg)
			L (mm)	B (mm)	H (mm)	
1	Vaccum Pump	1	6000	2000	3300	7500
	TOTAL (1 No. vacuum pump)					**7500**
	TOTAL (4 nos. vacuum pump)					**30000**

A.6 Reheater Condenser Tank (Stage-1)

There are 2 No. Reheater Condenser Tanks (Stage-1) for Unit #3

S. No.	Name of package	Box Qty (Nos.)	Size of packages (tentatively)			Weight (kg)
1	Reh. Cond. Tank Assy. (Stage-I)	1	4500 Height	1400 Dia	---	3200
2	Stand Pipe Assemblies (2 Nos.)	1	3000 Long	1000 Height	1000 Wide	200
3	Magnetic Level Indicator	1	2200 Long	400 Height	400 Height	50
4	Set of Root Valves (50NB, 25NB, 15 NB SW)	1	1000 Long	500 Height	500 Height	250
5	Rating Plate	1	500 Long	100 Height	500 Wide	2
6	Set of Level Transmitters (2 Nos.)	1	600 Long	600 Height	600 Wide	20
7	Set of Fasteners (FDN Bolts & Nuts)	1	500 Long	500 Height	300 Wide	20
	TOTAL (1 No. Reheater Condenser Tank (Stage-1))					**3742**
	TOTAL (2 No. Reheater Condenser Tanks (Stage-1))					**7484**

A.7 Reheater Condenser Tank (Stage-2)

There are 2 No. Reheater Condenser Tanks (Stage-2) for Unit#3

S. No.	Name of package	Box Qty (Nos.)	Size of packages (tentatively)			Weight (kg)
1	Reh. Cond. Tank Assy. (Stage-I)	1	4500 Height	1400 Dia	---	3300
2	Stand Pipe Assemblies (2 Nos.)	1	3000 Long	1000 Height	1000 Wide	200
3	Magnetic Level Indicator	1	2200 Long	400 Height	400 Height	50
4	Set of Root Valves (50NB, 25NB, 15 NB	1	1000 Long	500 Height	500 Height	250
5	Rating Plate	1	500 Long	100 Height	500 Wide	2
6	Set of Level Transmitters (2 Nos.)	1	600 Long	600 Height	600 Wide	20

7	Set of Fasteners (FDN Bolts & Nuts)	1	500 Long	500 Height	300 Wide	20
	TOTAL (1 No. Reheater Condenser Tank (Stage-2))					**3842**
	TOTAL (2 No. Reheater Condenser Tank (Stage-2))					**7684**

A.8 LP Heaters

There are 3 No. LP Heaters for Unit#3

S. No.	Name of package	Box Qty (Nos.)	Size of packages (tentatively)			Weight (kg)
			L (mm)	W (mm)	H (mm)	
1	ASSY. OF LP HEATER NO.1	1	10400	1750	1800	17000
2	LOOSE ITEMS (SHOP FABRICATED)	1	1000	500	500	100
3	LOOSE ITEMS (BOUGHT OUT)	1	500	500	250	20
4	LOOSE ITEMS (FRAGILE)	1	500	250	250	10
5	FOUNDATION ITEMS	1	500	500	500	200
6	RELIEF VALVES	1	500	500	250	100
7	*BUNDLE REMOVAL TROLLEY	1	1500	1000	350	500
	TOTAL (1 No. LP Heater)					**17930**
	TOTAL (3 No. LP Heaters)					**53790**

A.9 Turbine Modules

There are 3 LP Turbines, 1 HP Turbines for Unit #3

S.No.	Description	Unit Weight (MT)	Dimensions		
			L (mm)	W (mm)	H (mm)
1	HP Main steam valves (1 complete set)	23.8	4943	3074	2155
2	HP Bladed Rotor	22	7416	1735	1735
3	Upper HP Casing	29.7	5770	4240	1635
4	Lower HP Casing	34.6	5195	4240	2110
7	HP1 and HP2 diaphragms (1)	2.7	1694	1694	310
8	HP3 and HP4 diaphragms (1)	3.5	1934	1934	383
9	HP5 and HP6 diaphragms + diffuser (1)	4.4	2100	2100	654
10	HP Gland carrier (1 set)	1.1	1275	1275	685
11	HP Front Pedestal (inc. journal bearing but w/o main oil pump and turning gear)	10.1	2530	3800	1525
12	HP Rear pedestal (inc. journal bearing and thrust bearing)	15.2	1295	4590	1540
	TOTAL (1 No. HP Turbine Module)	**147.1**			

S.No.	Description	Unit Weight (MT)	Dimensions		
			L (mm)	W (mm)	H (mm)
1	LP Bladed Rotor	61.2	8528	3720	3720
4	Complete upper Exhaust Hood (inc. Inlet steam box and closings)	33	7010	8140	3190
6	Complete lower Exhaust Hood (inc. Bolting and pedestal cover)	56	7760	8660	3770
7	Upper inner Casing (inc. Thermal screen)	12.3	2870	4500	2260
8	Lower Inner Casing (inc. Thermal screen)	12.2	3000	4260	2350
11	LP1 and LP2 Diaphragms	2.8	2470	2470	333
12	LP3 Diaphragms	2	2470	2470	233
13	LP4 Diaphragms	3.4	3076	3076	349
14	LP5 Diaphragms + diffuser	8.3	4580	4580	936
15	LP Gland carrier (1 set)	1.1	1490	1700	1030
16	LP Journal bearing	0.9	1000	1000	420
	TOTAL (1 No. LP Turbine Module)	**193.2**			
	TOTAL (3 No. LP Turbines Modules)	**579.6**			

S.No.	Description	Unit Weight (MT)	Dimensions		
			L (mm)	W (mm)	H (mm)
1	LP Valves	15	1650	1500	3000
	TOTAL FOR 1 UNIT (6 NOS.)	**90**			

A.10 Turbine auxiliaries and piping

S.No.	SYSTEM	QTY	VOL (m^3)	TOTAL WT. FOR 1 UNIT(kg)
1	CRH Piping	1 set	230	63250
2	HRH Piping	1 set	180	64330
3	HP Loop Pipe	1 set	10	9500
4	Extraction Pipe Inside Condenser (To Heater 1)	1 set	9.4	4000
5	Extraction Pipe Inside Condenser (To Heater 2)	1 set	2.75	1500
6	Extraction Pipe Inside Condenser (To Heater 3)	1 set	1.7	1000
7	Lub Oil and Jacking Oil System	1 set	20	7330
8	Control Oil Piping	1 set	1.15	1470
9	Gland Steam	1 set	30	20410
TOTAL FOR UNIT #3				**172790**

Note:
CRH piping consists of Stainless Steel material and HRH piping consists of Carbon Steel material. The outer diameter for these piping varies from 1.1m to 1.8m and thickness varying from 12.5 to 16mm.

A.11 Auxiliaries Equipment

S.No.	EQUIPMENT	QTY	VOL (m^3)	TOTAL WT. FOR 1 UNIT (kg)
1	Main Oil Tank	1 no	75	27500
2	Auxiliary Oil Pump and motor	1 no	4.6	2875
3	Emerency Oil Pump and motor	2 nos	6	2760
4	Jacking Oil Pump and motor	2 nos	3	3080
5	Oil Vapour Exhauster, oil mist filter , strainer	2 nos	1.7	1278
6	Misc Equipement (Valve,accessories,Instrument rack)	1 SET		2500
7	Duplex filter Lub Oil	1 nos	13.8	3440
8	Duplex filter Jacking Oil	1 nos	0.2	400
9	Oil purifier	1 nos	35.04	6000
10	Gland steam control Valve	1 nos		2200
11	MSR line check valve	1 nos	0.63	1050
12	HP heater 5 Check Valve	1 nos	0.86	1750
13	Deaerator check Valve	1 nos	13.2	7110
14	LP heater 3 Check Valve	1 nos	14.3	7110
15	Gland Steam control Valve	1 No	0.7	2000
16	Other gland steam line valves	1 set		150
17	Thermostatic Valve	1 Set		2000
18	Control Oil Skid Unit	1 set		3600
19	Gland Steam Condenser	1 set		2000
TOTAL FOR UNIT #3				**78803**

A.12 Piping insulation, hangers, supports etc.

S. No.	Name of package	Box Qty (Nos.)	Weight (kg)
A	**PIPING INSULATION**		
1	HP-MSR-LP Piping	1	11500
2	HP Inlet	1	600
3	Gland Steam	1	1400

B	**HANGER AND SUPPORT WEIGHT**		
1	Bearing Housing Forging - 2	1	45500
2	Neopot Bearing	1	5000
3	Set of Fasteners + NPT Plugs (Lower Half)	1	2100
4	Set of Plate Shims, Fillers & Lugs for Foundation	1	350
5	MSR (Upper Half)	1	200
	TOTAL FOR 1 UNIT		**66650**

A.13 Stairs, platforms, walkways, etc.

Approx. quantity = 33MT

A.14 Turbine governing system

Approx. quantity =26.4MT

B. BHEL-Haridwar supply

B.1 Generator.

S. No.	Name of package	Size of packages (tentatively)	Weight (kg)
1	FOUNDATION PLATES	6400X1680X950	11915
2	FOUNDATION BOLTS	2540X655X600	960
3	FOUNDATION ITEMS	5800X1120X520	2170
4	GENERATOR STATOR	9860X4440X4260	312000
5	GENERATOR ROTOR WITHSKID PLATE	14125X1790X1740	84300
6	END SHIELD LOWER HALF (TE)	3800X1500X2240	9883
7	END SHIELD UPPER HALF (TE)	3800X1500X2240	8883
8	END SHIELD LOWER HALF (EE)	3800X1500X2240	9933
9	END SHIELD UPPER HALF (EE)END SHIELD UPPER HALF (EE)	3800X1500X2240	8933
10	GENERATOR BEARING (EE & TE)	1180X1050X1170	1906
11	BAFFLE RING CARRIER &AIR GAP SEAL ASSY.	2035X1885X1200	1315
12	TERMINAL BUSHINGS	2200X1830X610	1523
13	TERMINAL BUSHING BOX	3500X2600X1740	7337
14	SHAFT SEALS (EE & TE) &OIL CATCHER (INNER & OUTER)	2140X1140X965	1435

15	BAFFLE RING ASSY	2070X1870X1080	1218
16	GENERATOR ACCESSORIES	2140X2140X1240	700
17	FLEXIBLE TERMINAL CONNECTIONS	1350X950X400	592
18	GENERATOR ACCESSORIES	950X950X450	550
19	GENERATOR ACCESSORIES	1000X1000X750	810
20	GENERATOR ACCESSORIES	1700X1200X250	140
21	PRIMARY WATER TANK	10500X2400X1200	2040
22	PW TANK PIPE LINES	4500X1800X500	830
23	PW TANK PIPE LINES	3000X600X500	680
24	PLATFORM FOR PW TANK	5000X1200X600	1190
25	COOLER HOUSING FRAME	4290X4450X1428	21500
26	SEAL RINGS	750X750X200	90
27	CONNECTION PIECE ASSEMBLY	1650X1100X450	858
28	DRY AIR BLOWER	1100X1000X700	80
29	ROTOR INSERTION DEVICES	2460X1170X1240	2410
30	WIRE ROPES FOR ROTOR	1800X1800X400	330
31	GENERATOR ERECTION DEVICES	3300X1555X1140	1455
32	SPECIAL TOOLS AND TACKLES	800X700X300	145
33	BRUSHLESS EXCITER SET	5750X2350X3400	32928
34	EXCITER BED PLATE ACCESSORIES	3900X1250X1150	1741
35	EXCITER ACCESSORIES	2200X1200X1100	1111
36	EXCITER BED PLATE ACCESSORIESNON TEST BED ITEMS)	1000X800X800	775
37	RR WHEEL AIR GUIDE COVER	2800X1500X2000	1572
38	SEAL OIL STORAGE TANK	5000X1800X1700	2500
39	PW PUMP AND FILTER UNIT	4000X4000X3000	7065
40	SINGLE FLOW S.O.U. - PART I	4000X2500X3000	5300
41	SINGLE FLOW S.O.U. -PART II	2500X2500X3400	4525
42	LIQUID DETECTOR RACK	2000X600X2000	660
43	GAS UNIT	1980X1640X2420	1205
44	CO2 VAPORISER	1520X840X840	250
45	H2 DISTRIBUTOR	3480X1540X440	333
46	CO2 DISTRIBUTOR	4860X1240X440	353
47	N2 DISTRIBUTOR	1400X1240X440	143
48	DRAIN OIL COLLECTOR	2000X550X550	139
49	RESINS	1200X600X600	100
50	TG SYSTEM INTEGRAL PIPING(VALVES)	2750X1400X1400	2486
51	TG SYSTEM INTEGRAL PIPING(INSTRUMENTS)	1000X940X900	222

52	CONSUMABLES	800X400X200	55
	TOTAL for UNIT #3		**561574**

B.2 Coolers

S. No.	Name of package	Weight (kg)
1	HYDROGEN COOLER	2750
2	HYDROGEN COOLER	2750
3	LOOSE ITEMS (HYDROGEN COOLERS)LOOSE ITEMS (HYDROGEN COOLERS)	750
4	EXCITER AIR COOLER	1980
5	EXCITER AIR COOLER	1980
	TOTAL for Unit #3	**10210**

TOTAL WEIGHT FOR UNIT #3 ERECTION, TESTING, COMMISSIONING ETC. AS PER TENDER SPECIFICATIONS = 3581427 kg

NOTES:

- The list is for **ONE UNIT** and tentative and has been given to enable the contractor to study the nature of work to be done in this contract. There may be variation in size, weight etc. and no claim on this account will be applicable.
- Some of the packages may be sent in parts to suit the site conditions/transportation. The same is to be assembled at site without any extra cost. Likewise the package may be assembled together and sent as a single assembly. Contractor may have to dismantle and erect, erect as a single assembly as per the instructions of BHEL engineers without any extra cost.
- Payment for TG/Generator Integral Piping including Piping Covered under Sl No A.10 of Annexure I of Volume I A 'TCC' shall be on Pro Rata basis on a per MT Rate. The Per MT rate shall be the allocated (The % applicable as per 'terms of Payment') value for 'Piping' Divided by the tendered quantity of Piping in MT (Sl No A 10 of Annexure I and Tonnage of TG/Generator Integral Piping indicated in Annexure I of Vol I A) On completion of Piping Works, compensation due to variation of quantities of Piping shall be as per the Quantity Variation Clause 2.14 of GCC.

PAINTING SCHEME:

PAINTING SCHEME AS PER BHEL/NPCIL SPECIFICATION FOR FINAL / TOUCH UP PAINTING.

(KAPP Painting Scheme shall be issued during execution)

GENERAL REQUIREMENTS

17.1
The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the Contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

17.2
The terminal points decided by BHEL shall be final and binding on the Contractor for deciding the scope of work and effecting payment for the work done.

17.3
The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Contractor and his personnel shall cooperate with personnel of BHEL, BHEL'S Customer, Customer's consultants and other Contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.

17.4
The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The Contractor should ensure proper planning and successful & timely completion of the work to meet the overall project schedule. The Contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.

17.5
The work to be carried out under the scope of these specifications covers the complete work of collection from stores/storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment, bolting, fastening, welding, radiography, leveling, cold pulling, adjusting, Non-destructive testing, Post weld heat treatment, hydraulic test, chemical cleaning, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of auxiliaries covered under these specifications, commissioning and all other activities till handing over of the unit. The work shall conform to dimensions and tolerances specified in the various drawings, documents etc. that will be provided during the course of installation. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost failing which the work will be got done by BHEL at the cost and risk of the contractor. Contractor may please note that the collection, loading of materials at storage yard/Stores in contractor's Trailer / Carriers while collecting materials and transportation to site of work shall be considered as a part of scope of work under Erection, Commissioning scope of contractor.

17.6
During the course of execution of this work, certain rework/ modification/ rectification/ repairs/ fabrication etc. will be necessary on account of feedback from various thermal power stations on units already commissioned and/or units under erection and commissioning and also on account of design

discrepancies and manufacturing defects and site operation/maintenance requirements. Contractor shall carryout such rework/ modification/ rectification/ fabrication/ repairs etc promptly and expeditiously. Daily log sheets indicating the details of work carried out, man hours; consumables used etc, shall be maintained by the Contractor and got signed by BHEL engineer every day. Claims of contractor, if any, for such works will be dealt as per relevant clauses of General Conditions of Contract.

17.7
The contractor shall make adequate security arrangements including employment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of materials/equipments issued to him for the work. Special care will have to be taken to guard against pilferage / theft of copper tubing, brass fittings, brass valves and other costly materials.

17.8
All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipments without the specific permission of the engineer.

17.9
The Contractor shall prepare and submit procedure for each activity and overall programme within the reasonable period to BHEL/NPCIL for their prior approval before commencement of activity in such form as may be required by BHEL/NPCIL, the order of procedure in which he proposes to carry out the works as to erection, testing and commissioning activities. The submission to and approval by BHEL/NPCIL of such programme shall not relieve the Contractor of any of his duties or responsibilities under the contract. Detailed procedure for carrying out erection, testing and commissioning, shall be submitted by Contractor for BHEL/NPCIL's approval prior to start of these activities, in a format and contents to be approved by BHEL/NPCIL.

17.10
After submission to and approval by BHEL/NPCIL of such programme the Contractor shall adhere to the order of procedure and method stated therein unless he obtains the written permission of BHEL/NPCIL to vary such method or order.

17.11
If at any time it should appear to BHEL/NPCIL that the actual progress of the works does not confirm to the programme, the Contractor shall produce, at the written request of BHEL/NPCIL, a revised programme showing modifications to the approved programme necessary to ensure completion of the works within the time for completion.

17.12
The contractor should submit well in advance his scheme for movement/lifting/handling of heavy equipment/ components also indicating the tools, tackles and equipment with due calibration, testing certificates, which he proposes to employ for the same, for approval by BHEL/NPCIL prior to actual undertaking of such work.

17.13
Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and

fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the Contractor. No claims for extra payment from the Contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.

17.14
All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory/ local authorities are to be arranged by the Contractor at his cost in time to ensure smooth progress of work.

17.15
The work shall conform to dimensions and tolerances specified in the various drawings / documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations due to Contractor's fault, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by BHEL and recoveries will be effected from the Contractor's bills towards expenditure incurred including cost of materials and departmental overheads of BHEL.

17.16
The Contractor shall perform any services, tests etc, which may not be specified but nevertheless, required for the completion of work within quoted rates.

17.17
The Contractor shall execute the work in the most substantial and workman like manner. The stores shall be handled with care and diligence.

17.18
Contractor shall ensure proper housekeeping and remove all scrap materials periodically from various work area covered in the scope and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to remove scrap at contractor's cost and risk.

17.19
BHEL reserves right to recover from the Contractor any loss which arises out of undue delay / discrepancy / shortage / damage or any other causes due to Contractor's lapse during any stage of work. Any loss to BHEL due to Contractor's lapse shall have to be made good by the Contractor.

17.20
All cranes, transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors/engineers, consumables etc, except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by Contractor unless otherwise specified in the relevant clauses. The Contractor's quoted rates should be inclusive of all such contingencies.

17.21
During the course of erection, testing and commissioning certain rework / modification / rectification / repair / fabrication etc may become necessary on account of feedback / revision of drawing etc. This will

also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repair etc promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours etc shall be maintained by the Contractor for such reworks. Claim of Contractor if any, for such works will be governed by relevant clauses of 'General Conditions of Contract'.

17.22
All works such as cleaning, leveling, aligning, trial assembly, dismantling of certain equipments / components for checking and cleaning, surface preparation, fabrication of structures, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, gouging, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting up etc as may be applicable in such erection works and which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the Contractor as part of the work within the quoted rates.

17.23
The Contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. Contractor shall arrange necessary steel for such usage.

17.24
The Contractor shall take delivery of the components, equipments, chemicals, and lubricants etc from the BHEL stores/ storage area after getting the approval of BHEL Engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipments after usage shall be submitted to the BHEL and reconciled periodically.

17.25
Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the Contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, same shall be done by Contractor most expeditiously as incidental to work.

17.26
Plant materials should not be used for any temporary supports / scaffolding/ preparing pre-assembly bed etc.

17.27
The details of equipments to be erected under this contract are generally as per the schedule given in relevant appendices. These details are approximate and meant only to give a general idea to the bidder about the magnitude of the work involved. Actual quantum and type of equipments will be based on the relevant erection documents which will be furnished to the Contractor in due course of erection and the weight and quantity as per the relevant engineering documents will only be admissible for the billing purpose.

17.28
Hangers & suspensions, supports etc for tubes, piping, & ducts etc will be supplied in running / random lengths / sizes which shall be cut to suitable sizes and adjusted as required.

17.29
Spring suspension / constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests/locks, cutting of excess thread length of hanger tie-rod etc have to be carried out as and when required. Load setting of spring hangers, as per BHEL's documents/instructions, during various stages of erection & testing and after floating of piping/ducting during cold and hot condition will have to be done as part of work. This exercise may have to be repeated till satisfactory results are achieved.

17.30
Contractor shall lay/install the field-routed/small-bore pipelines to suit site condition/ requirement. Before laying/installing such pipelines, the contractor shall prepare necessary sketch for routing these pipe lines and get the same approved by BHEL. Contractor must take care of the location/layout of other systems and equipment before preparing such sketch to avoid interference. There is a possibility of minor change in routing such pipelines even after completion of erection; contractor shall carry out the same without any extra cost to BHEL.

17.31
Welding of necessary instrumentation tapping points, thermowell, thermocouple pad, metal temp pad and clamps, root valve upto nut & tail including reducer (to suit Control & Instrumentation Impulse Piping requirements), condensing vessel, flow metering & measurement devices, and control valves to be provided on main equipments & its auxiliaries and piping are covered within the scope of this specification. The installation of all the above items will be Contractor's responsibility even if:

a) Items are not specifically indicated under the respective product groups as given in the technical specifications.
b) Items are supplied by an agency other than BHEL.

Pre-heating, NDE, and Post weld heat treatment for above shall be done as per the specifications as part of work.

17.32
Certain instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, junction boxes, power cylinders, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal/speed switches of motors, accumulators etc are received in assembled condition as integral part of equipments. Contractor shall dismount such instruments for calibration and hand over the same to BHEL. C & I erection agency will do storage / re-erection calibration etc.

17.33
Fixing and seal welding of thermowells & plugs before Hydro test/ steam blowing of equipment or other piping system is within the scope of work. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld thermowells after hydro test/steam blowing of lines as part of work.

17.34
Actuators/drives of valves, dampers, gates, powered vanes etc may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.

17.35
All electrical motors have to be tested for IR & PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor shall make all arrangements in this regard and complete the work as instructed. BHEL will provide the motorized insulation testers.

17.36
In installation of various equipments it may become necessary to install these on temporary supports/ hanger due to various reasons including non-availability of suspension materials. Contractor shall install such temporary suspensions/hangers and later on shift the relevant equipments to their respective permanent hangers/ suspensions/ supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free -returnable basis which shall be returned to BHEL after the use.

17.37
The work shall be carried out strictly in accordance to the "Field Quality Plan" approved by BHEL/client. Contractor, jointly with BHEL, shall prepare all necessary records of measurements/readings/ protocols etc.

17.38
All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments / components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per the general engineering practice and as per BHEL engineers instructions at site, cutting, weld disposing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scraping, lapping, fitting up etc as may be applicable in such erection works and which are treated incidental to the erection work and necessary to complete the work satisfactorily shall be carried out by the Contractor as part of the work.

17.39
Interconnection/ hookup, if any, with the existing system shall form part of work. Such interconnections, hookups may require shut down of running plant and the relevant work have to be completed within such planned shutdowns. This may call for working with enhanced resources and on extended hours. Contractor's offer shall cover all such contingencies.

17.40
Contractor shall regulate flow of material to and from site in such a manner and sequence that material accumulation at site does not lead to congestion at site. In case it is necessary to shift and restack the materials kept at work areas / site to enable other agencies to carry out their work or further any other reason, it shall be done by the Contractor most expeditiously. No claim for extra payment for such work will be applicable.

17.41

It may so happen that certain components like manhole doors, hanger etc may be supplied in loose items. They need to be assembled as per relevant drawings or as per advice of BHEL engineer prior to erection. This forms the part of the scope of work.

17.42

The Contractor shall have total responsibility for all equipment and materials in his custody at Contractor's stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL engineer's instructions. The machine surfaces/finished surfaces should be greased and covered.

17.43 COLLECTION AND RETURN OF EQUIPMENTS, MATERIALS & CONSUMABLES

17.43.1

Contractor shall take delivery of the components, equipments, lubricants, chemicals, special consumables, steel etc. from the storage yard/stores/sheds of BHEL/ client. The Contractor should note that the transport of equipments to erection site, assembly yards etc should be done by the prescribed route, without disturbing the other works and contractors and in the most professional manner. Special equipments such as laboratory equipments, measuring and controls equipments, special electrodes, valves, shims, packing materials for joints and seals, lubricants, actuators etc, shall be stored, when taken over by the Contractor, in appropriate manner as per BHEL's instructions.

17.43.2

The contractor shall return all parts, materials, consumables etc. remaining extra over the normal requirement with proper identification tags to BHEL stores. In case of any misuse or use over actual requirement, BHEL reserves the right to recover the cost of parts/materials used in excess or misused, with departmental charges.

17.43.3

Transportation of lube oil, Chemicals, Gas cylinders etc from stores, is included in the scope of this contract. The contractor shall have to return all the empty and excess drums to the customer/BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities/ processes mentioned in clauses herein from BHEL/customer's stores and charging of chemicals into the system for carrying out various pre-commissioning activities and processes mentioned herein and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of contractor. After completion of oil flushing operation, the used oil shall be filled in empty drums and which in turn shall be returned to BHEL/customer's stores.

17.44 TEST TAPPING POINTS

Installation and welding of Tapping Points for taking performance test measurements shall be carried out by the contractor as part of this work for the equipments covered under this tender specification under the guidance of BHEL engineer. The scope will be limited to all the tapping points for which materials are available and their locations identified within the regular contract period and extensions thereof.

17.44.1
All packing and forwarding material shall be returned as soon as the material is unpacked. The location for storage of such materials shall be as indicated by BHEL Engineer.

17.44.2
All Measuring and Monitoring Devices (MMD) used for the work in scope of these tender specifications shall be calibrated by the accredited agencies that are approved by BHEL or calibration tractability is established upto National Physical Laboratory.

17.44.3
Contractor shall furnish the consumption details of chemicals, lubricants, TIG welding filler wire, welding electrodes and other consumables on monthly basis.

17.45
During the course of erection, platforms and floor grills are to be cut at certain places to route steam, oil, water and air piping, cable trays, etc or for accommodating erection, rigging etc, the cutting of platforms and grills should be minimum and as approved by BHEL engineer. After completion of work, the platform/grills cut shall be made good neatly as instructed by BHEL engineer.

17.46
Erection and welding of stainless steel fittings including supply of necessary stainless steel welding electrodes is within the scope of the work/specification.

17.47
No temporary supports should be welded on to the piping.

17.48
Contractor shall carry out preservation painting on all items taken from stores. The preservation painting has to be carried out on material taken from stores and also on material erected wherever the shop painting has given away. Periodical inspection shall be made as per the instructions of BHEL engineer and the portion of items or the complete items needing painting shall be carried out to the satisfaction of BHEL engineer. This facility shall be provided by the contractor till the commissioning and handing over of the equipment to the customer. Preservative and touch up painting on equipments covered under this specification stored at stores/storage yard shall also be carried out by the contractor.

17.49
Adjustment of spring hangers for piping shall be done by the contractor during initial erection. After initial commissioning trials, it is possible that the spring hangers have to be adjusted repeatedly till the correct spring compression is achieved. Contractor shall do the same to the satisfaction of BHEL engineer. The marking of cold and hot positions on the hangers shall be done by the contractor.

17.50
The contractor shall return to BHEL the excess materials left over after completion of work, materials issued for temporary pipelines for HT, chemical cleaning, flushing, blowing etc. and materials issued on returnable basis in neatly dressed condition. Necessary grinding, edge cutting (square facing), edge

preparation (vee), painting etc. to the condition similar to the one at the time of issue shall be in scope of work.

17.51
Wherever the equipments are erected by the contractor and connected piping is done by other agency, contractor shall weld / tighten the incoming pipes to either the equipment or the counter flange provided on the equipment.

17.54
The lubricants and chemicals required for chemical cleaning, oil flushing, and the lubricants for trial runs of the equipments and trial operation of the unit will be supplied by BHEL free of charges.

17.55
The Contractor shall make his own arrangements of Gate Pass with photo for his employees as prescribed and instructed by the Security deptt. at his own cost, each gate pass has to be endorsed by the Security Officer of the plant before the pass be used by any employee. In case of termination of the service of any of his employee during the contractual period, the contractor shall have to surrender the Gate Pass issued to the employees to the Security Deptt. At the end of the project all the gate passes endorsed by the Security Deptt. for use of the contractor's employees shall have to be returned.

17.56
The Contractor shall make his own arrangements of Gate Pass for his Vehicle, T&P etc. as prescribed and instructed by the Security dept. at his own cost, each gate pass has to be endorsed by the Security Officer of the plant before the pass be used. In case of termination of the service of any of T&P or Vehicle during the contractual period, the contractor shall have to surrender the Gate Pass to the Security Department. At the end of the project all the gate passes endorsed by the Security Department for use of the contractor's Vehicle, T&P shall have to be returned.

17.57
Where permitted, by Customer/ BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permit for working beyond normal working hours.

17.58
Contractor to note that in addition to BHEL requirements of safety, occupational health and environmental management, contractor shall strictly follow & abide the safety laws/rules & regulation requirements of NPCIL at site and in the event of any deviation/ dispute, the requirements of NPCIL in this regard shall be final and binding on contractor.

For non-compliances/violation of safety rules and fine/penalty imposed by NPCIL as their rules & regulations shall be to the account of contractor & same shall be paid by contractor. In event of any recovery from BHEL bills by customer on account of contractor against such fine/penalty, BHEL shall recover such amount/payment in addition to departmental overheads from any available bills/payments of contractor which is due for payment from BHEL.

17.59

Second unit TG and auxiliaries work will be carried out by separate agency. Contractor under these tender specifications shall complete on priority/as per instructions of BHEL engineers at site the interface works between Units 3&4 to meet the progress and commissioning schedule of second unit and related equipments. Contractor shall carry out the hook up work as per instruction of BHEL engineers.

17.60

Periodical reports need to be submitted by the contractor as per format prescribed by BHEL engineer. These reports shall be including but not limited to the following areas of operation:

- Weekly, fortnightly, monthly planning charts
- Consumption of welding electrode and gases
- Detailed Manpower reports
- Daily, weekly and monthly progress reports
- Field calibration reports
- Welders performance and qualification records

Contractor to note that any additional report relating to work progress as desired by BHEL/NPCIL shall be furnished by the contractor in the required format.

DETAILS OF SCOPE OF WORK FOR STG AND AUXILIARIES INCLUDING PIPING
The scope of work is further detailed in the specifications herein after.

18.1 PIPING (INCLUDING EXTERNAL / POWER CYCLE / FIELD PIPING, INTEGRAL PIPING, REGENERATIVE PIPING INCLUDING INSTRUMENT AIR & SERVICE AIR PIPING ETC.)

18.1.1
piping weight indicated in relevant Appendix- with valves/fittings, supports and all other piping schemes like CRH , HRH, Main Steam piping i.e. HP Turbine to MSR to LP Turbine piping, Lube Oil Treatment piping, Turbine Protection System Piping, Turbine Supervisory Piping, Turbine Jacking Oil Piping, Control Oil System piping, Gland Steam Sealing piping, Lube Oil System piping, Turbine by pass valve piping, MSR drain and recovery piping, Condenser Extraction Piping, Drain and condensate recovery piping, condenser air evacuation piping etc. is indicative only. Contractor shall carry out the erection and complete the piping works of respective system as per sequence, schedule and programme decided by BHEL engineer/customer at site in order to achieve the commissioning schedule of respective equipments/ systems and over all commissioning schedule of project as whole.

18.1.2
The work on various piping systems (Except Steam piping HP-MSR-LP piping) will include cutting to required length, edge preparation, laying, fixing & welding of the pipes / elbows / fittings/ valves etc. in the pipeline, fixing & adjustment of supports / anchors / shock absorbers and carrying out all other activities / work to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineers instructions and / or as per approved drawings / documents.

The HP-MSR-LP piping which are steam piping will be supplied in cut to size form at site with duly edge prepared. However some sections of piping adjoining the main equipments / assemblies may be supplied in excess length to facilitate the erection requirement at site. The cutting of such excess length & subsequent edge preparation during erection, pre-commissioning / commissioning & normalization of system shall be part of scope of work of contractor.

18.1.3
Laying of pipelines as per the specifications, between equipments constituting terminal point, whether the terminal equipments fall within the scope of the work / specification or not, is within the scope of the work / specification. The contractor shall complete terminal joints at both ends for all the piping schemes covered in the specification.

18.1.4
Aligning, matching and welding of piping to the terminal points (such as stubs, on terminal equipments, stubs on headers, battery limits etc), even if these terminal equipment/point do not form part of this scope of work / specification, and stress relieving and NDE of joints so made is also within the scope of work / specification. Also, where the piping connection to the terminal points involves flanged joints, mounting and welding of flanges on piping as well as terminal equipment matching of flanges as specified elsewhere herein, fixing of gaskets, bolting and tightening as per BHEL engineer's instruction is also in this scope of work / specifications. Required fasteners and gaskets will be supplied by BHEL free of cost.

18.1.5

Following items of work shall also form part of piping erection:

1) Installation & removal, as applicable, of isolating devices/ NRVS and removal & re-fixing of internals required for hydraulic testing, pre-commissioning and commissioning activities. Required gaskets will be supplied by BHEL free of cost.

2) Matching of flanges for achieving parallelism and alignment resorting to heat correction or other suitable methods as per instructions of BHEL Engineers.

3) To locate the cause of vibrations in pumps or other auxiliaries and to carry out necessary corrections in piping and its supports. This may involve cutting, fresh edge preparation, welding, radiography, stress relieving, etc., of suction, discharge, re-circulating and other connected piping and its supports at number of places.

4) Increase or decrease in length of piping including change in layout to suit site conditions.

5) Erection, welding, NDE and stress relieving of certain equipments, e.g. flow nozzles, control valves etc, after completion of certain activities e.g. chemical cleaning, steam blowing etc is part of work. This may involve removal of portions from the already erected pipelines in order to introduce these equipments and resultant edge preparation etc shall be incidental to work. No separate/ additional payment is envisaged for cutting, welding and edge preparation in this regard. The removed pieces of pipes shall be returned to BHEL stores with proper cleaning, dressing and identification marking.

6) Matching of all fittings like tees, bends, flanges, reducers, valves, socket fittings, etc with pipes for welding. This may involve weld build up, edge preparation, etc.

7) Cleaning of all pipes as prescribed, flushing by compressed air etc.

8) Welding of root valves including reducer (to suit Control & Instrumentation Impulse Piping requirements) with small length of piping to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping.

9) Welding of weld blanks with due NDE & PWHT, if required, on a temporary basis.

10) Opening of valve actuators, dismantling of actuators from the valves, refitting and rendering assistance connected with the electrical and mechanical problems.

11) Fixing and welding including due NDE & PWHT etc of carrier plates on to the pipes.

18.1.6
On all steam piping, water piping, oil piping, air piping, etc, where butt welding is involved, root TIG welding and subsequent arc welding shall be adopted as instructed by BHEL engineer. The decision of BHEL engineer regarding welding procedure for welding of above lines will be binding on the contractor.

18.1.7
Pipes / tubes / structural materials, which are issued in running meters, may not be sent in standard lengths. These have to be cut to suit site conditions.

18.1.8
Certain pipe lines of oil, air, steam and water will be field routed as per schemes approved at site or as per the instructions of BHEL engineer, and will be supplied in random lengths / running lengths. The contractor shall lay the piping according to instructions at sites, after carrying out the necessary fabrication, edge preparation, routing, supporting etc, in best professional manner and as per instructions. The supports for field-routed piping shall be fabricated and erected as per the requirement of the work. The steel required for the supports will be provided by BHEL free of cost at their stores.

18.1.9
All weld joints on piping shall be ground or filed on completion of welding and before radiography as per instructions BHEL engineer so as to achieve smooth surface free of notches, ripples, undulations, etc. and to limit the reinforcement as per the codes.

18.1.10
Contractor shall erect the piping by doing pre-assemble on ground if possible at the first instance. The pipe laying shall be carried out from the available terminal point / points or any other area between the terminal points. The erection can be carried out on temporary supports to obtain proper alignment and welding. After fixing the permanent supports, all the temporary supports shall be removed. The alignment, distances and loading of the supports shall be checked and the required spring compression achieved in the case of spring hangers.

18.1.11
Contractor shall carryout edge preparations for welds joints in accordance with BHEL drawings / BHEL standards / BHEL engineer's instruction.

18.1.12
The location of drain headers, valves, stations, steam traps of piping as indicated in the BHEL drawings are suggestive only. The final location and routings shall be decided to suit the site conditions. While routing such lines and fixing the stations, it has to be erected so as to provide easy accessibility and free path for the purpose of easy operation and maintenance. These locations shall be acceptable to the client. Sometimes, the locations of stations and routing of lines may have to be changed as per the site conditions. All such works shall be carried out expeditiously as per the instructions of BHEL engineer. The decision of BHEL engineer is final and binding on the contractor.

18.1.13
The rate quoted in rate schedule is also inclusive of pre-heating, welding, radiography, post heating, post weld heat treatment/ stress relieving and NDE.

18.1.14
Hanger rods shown in the piping arrangement drawing may have to cut and welded to suit site condition. The contractor shall do cutting and welding of these hanger rods. The NDE & stress relieving required on welded hanger rods shall be carried out. The hanger for piping will be tested for even distribution of load with the help of torque wrench.

18.1.15
The piping may be provided with hand holes. The hand holes will be opened up for inspection and seal welded prior to operation.

18.1.16
Structural materials required for the supporting / operating platforms required for the valves/equipments at various levels for the safe operation will be issued in random sizes to the contractor free of cost. However, the contractor's quoted rate shall include fabrication and erection of all such of platforms at site and no extra payments shall be allowed for this.

18.1.17
Erection of piping systems shall be coordinated by the contractor as required, with the erection of Steam Turbine, Steam Turbine Generators, and other major equipments, approval must be obtained from the concerned BHEL engineer and other agencies concerned prior to making piping interface connections to the aforementioned equipments. Sequence of work shall be carefully planned to minimize interference with other groups working in the same area. Actual sequence to be followed shall be subject to the approval of engineer and engineers may, at time, direct the contractor to reschedule his work as per status of the site work.

18.1.18
While erecting the field run pipes, the contractor shall check the accessibility of valves, instruments tapping points and maintain minimum head room requirement and other necessary clearance from the adjoining work areas to avoid interferences.

18.1.19
All pipelines shall be given proper slope towards the drain points during erection.

18.1.20
All pipe lines must be provided with suitable vent and the drain points with valve (s) on the highest and lower points of the pipe run although may not be specifically mentioned in the drawing as per the instructions of BHEL engineer.

18.1.21
For instrument connections, pipe stubs including the instrument tubing up to the root valves including reducer (to suit Control & Instrumentation Impulse Piping requirements) shall be installed by the contractor. Root valves including reducer (to suit Control & Instrumentation Impulse Piping requirements) shall be located in the convenient location / place as required by the customer to facilitate easy operation as per the decision / instruction of BHEL engineer.

18.1.22
The contractor shall be responsible for correct orientation of all valves so that flow direction, seats, stem and hand wheel are in desired locations. Information regarding orientation of valves, not fully located on drawings, may be obtained from the BHEL engineers.

18.1.23
All piping works and related requirements shall be done as per requirements of BHEL/NPCIL.

18.1.24
All piping shall be grouped wherever practicable and shall be routed to present a neat appearance.

18.1.25
For field run piping, contractor shall erect all hangers and supports as required with due regard to general arrangement layout of other pipes, hangers, cable trays, ducting, structural members, etc.

18.1.26
For maintaining the slopes as given in the drawings for larger thickness and larger diameter pipelines, edge preparation for welding may have to be altered suitably to achieve the slope.

18.1.27
It may become necessary to make & install temporary spool pieces for certain process requirements. Contractor's scope shall include preparation, erection, fit-up, welding, NDE etc and dismantling of such spool pieces at appropriate stage without any additional payment.

18.1.28
In pipelines like re-heater lines, CRH lines, extraction lines, HP/IP & LP bypass lines etc., the NRVS and valves will also be erected by contractor under this tender specifications. though these NRVS & valves may be supplied from different units / different sources, the erection, alignment, welding, NDE test, heat treatment, radiography, supporting etc. along with their control/ governing oil system piping with tanks, pumps, power cylinders etc. including the oil flushing & commissioning of these valves shall be carried out by contractor as per instruction of BHEL engineer and drawings / documents requirement. Similarly erection / fixing, welding etc. of strainers, dummy devices in various lines, valves and their subsequent removal & re-fixing during pre-commissioning / commissioning stages of steam blowing, flushing etc. shall be carried out by contractor under these tender specifications.

18.1.29
All temporary lines required for chemical cleaning, hydraulic testing, steam blowing, etc., shall be supplied in 'as is where is' condition. The contractor shall arrange to carry out the required fabrication, dressing, grinding, cleaning, cutting, edge preparation etc., while carrying out erection. No extra claim on this account will be entertained. For human protection, temporary insulation over piping to be applied at no extra cost.

18.1.30
Before laying the piping on supports, the coordinates and elevations of all supports shall be checked by the contractor for correctness. Discrepancies from the execution drawings, if any, shall be promptly brought to the notice of BHEL engineer in writing and correction shall be carried out as per his instructions.

18.1.31
Normally, hangers setting in cold condition are done by simulation adding additional temporary weight, which will be roughly equal to the weight of the insulation. Attachment of temporary weights and floating of the joints in the simulation test to be treated as part of job. Hanger settings have to be repeated for achieving free-floating joints. Hanger adjustments to be repeated for steam blowing by resetting hot and cold values if required. This may have to be repeated several times after steam blowing and synchronization. The weights will be supplied by BHEL. Contractor has to transport from BHEL stores and return the same after completion of work. No extra claim on this account will be entertained.

18.1.32
All the instrumentation tap-off points like thermo-wells, root valves including reducer (to suit Control & Instrumentation Impulse Piping requirements), impulse lines, nipples etc., shall also be erected and welded by the contractor irrespective of whether such materials are supplied by BHEL or any other agency.

18.1.33
The weld grooves of MS line, HRH line, CRH line, BFD lines and other pipes will be as per BHEL standard specifications. Further, the edge preparation shall be done as per instruction of BHEL site engineer and same shall be binding on the contractor.

18.1.34
All equipments / works shall be preserved and protected properly during and after erection. Instructions / directions given by BHEL in this connection will have to be observed by the contractor.

18.1.35
The location of tanks, vessels, valves, stations etc in the pipelines indicated in the BHEL drawings may be indicative only. The final location and routings shall be decided to suit the site conditions. While routing such lines and fixing the stations, they have to be erected so as to provide easy accessibility and free path for the purpose of easy operation and maintenance. These locations shall be acceptable to the client. Sometimes, the locations of stations and routing of lines may have to be modified as per the site conditions. All such work shall be carried out expeditiously as per the instructions of BHEL engineer. The decision of BHEL engineer is final and binding on the contractor.

18.1.36
All G.I. pipelines shall be joined by threaded (screwed) joints. Pipes and fittings will be supplied by BHEL as commercially available. Contractor shall arrange to check and clean and ream the existing threads if necessary, by running thread cleaning die/tap or by machining. Fresh threading shall be done in case existing thread is found damaged beyond repair after cutting off the damaged portion within the quoted rates. Fresh threading shall also be done in G.I. pipe ends cut to suit site layout.

18.1.37
Both male and female threads shall be cleaned of oil, grease etc, with appropriate solvent etc. prior to jointing. Joints shall be sealed by applying teflon tape on male thread. All joints shall be tightened adequately so as to achieve leak-proof joint. Exposed portion of the external threads shall be coated with zinc silicate paint. Contractor shall arrange all consumables for cleaning, sealing and painting.

18.1.38
Pressure testing with compressed air and external application of soap solution or flame or any other BHEL-approved method shall be done on all joints. Such tests may have to be repeated several times to ensure a leak proof system. Leakages if any shall be repaired by the contractor promptly according to the BHEL-approved procedure/method. Any additional expenses for repair attributable to contractor shall be borne by the contractor.

18.2 ERECTION OF STEAM TURBINE WITH AUX, STEAM TURBINE GENERATOR AND AUXILIARIES

18.2.1
EOT crane of capacity 125 MT will be provided by BHEL/NPCIL will be provided for erection of TG equipments in TG hall. Contractor shall make use of this EOT crane for erection of TG Equipments in TG hall subject to its capacity, accessibility & approachability. Any other additional arrangements / attachments as required for erection & handling of heavy will be arranged by contractor as part of scope of work. NPCIL will provide their mobile heavy duty crane for erection of Generator Stator. Any help / assistance as required for movement / handling of this crane shall be rendered by contractor as a part of scope of work. Contractor shall take specific note of this aspect and shall arrange other all necessary T&P and lifting/handling/transportation arrangements for placement on required foundation/elevation, erection of equipment including the heavier consignments/equipment like Steam Turbines, Steam turbine generators, Moisture Separator Reheaters, Condensers, LP Heaters, Turbine auxiliaries like Main Oil tanks, etc

BHEL shall only provide their crane at storage yard for placement of heavier equipments on contractor's trailer. No crane shall be provided for transportation arrangement for this work. Contractor shall make all arrangements including cranes, trailers and other suitable arrangements as indicated in relevant Appendix- and required for completion of work in contractor's scope including the handling of heavy equipments like Steam Turbines, Steam Turbine Generators, Moisture Separator Reheaters, Condensers, LP Heaters, Main Oil Tanks etc.

18.3.2
For the skid mounted equipment, the checking and realignment required at site is in the scope of work.

18.3.3
Overhauling, cleaning, revisioning, servicing of pumps, governing system, equipments, valves etc. During erection and commissioning stages, are in the scope of work. Gaskets/packing for replacement will be provided by BHEL free of cost. All equipments shall be preserved and protected periodically before and after erection as per the advice of BHEL engineer at no extra cost. All motors should be, if necessary, serviced and reassembled before erection as per the advice of BHEL engineer.

18.3.4
Certain instrumentation like pressure switches, air sets, filter regulators, pressure gauges, and junction boxes, power Cylinders, dial thermometers, flow meters, valve actuators, flow indicators etc. are received in assembled condition as integral part of equipments. Contractor shall dismount such instruments for calibration. Mounting of such instruments will be done by the contractor.

18.3.5
Contractor shall provide the following for STG set and other related equipments with auxiliaries' erection:

1) Temporary bolts of required size for honing of generator coupling
2) Spanner & torque wrench/bolt stretching device for stretching / tightening of load and accessories coupling bolts.

18.3.5
Rain hood protection shall be provided for the equipments as per drawing requirement/instruction of BHEL engineer.

19 PREPARATION OF FOUNDATIONS, AND GROUTING OF EQUIPMENT OF STG & AUXILIARIES

19.1
Building foundations and other necessary civil works for supporting structures, equipments etc will be provided by BHEL / Customer. The checking of dimensional accuracy, axes, elevation, levels etc, with reference to bench marks of foundations and anchor bolt pits have to be checked and logged by the Contractor. The permanent benchmark / reference marks will have to be transferred to new locations with sufficient care to maintain the accuracy and protected / preserved with adequate care (to enable rechecking at later dates) as per BHEL instruction.

Minor adjustment of foundation level, dressing and chipping of foundation surfaces and blue-matching (wherever required) for of all equipments as per BHEL Engineers instructions, should be done by the Contractor as part of the work. Contractor/BHEL shall prepare protocols before taking over the foundations. Dressing and chipping of foundations upto 35mm for achieving proper levels will be within the scope of work/specification.

19.2
All temporary foundations and anchor points required for installing erection equipments and winches, foundations for pumps, tanks etc are in the scope of contractor. All building materials like cement, steel including re-inforcement bars, grits cements etc for such temporary foundations shall have to be arranged by the contractor within the quoted rates. All such foundations shall be demolished and normal ground conditions restored after the usage.

19.3
The quick-setting-non-shrink-free-flow special grout mix which is to be provided by contractor as a part of scope of work shall be purchased only from the following BHEL approved vendors:

1. M/S FOSROC CHEMICALS (INDIA) PVT LTD;
2. M/S SIKA INDIA PVT LTD;
3. M/S PAGEL CONCRETE TECHNOLOGIES PVT LTD;
4. M/S PIDILITE INDUSTRIES LTD.

In order to ensure the quality, the major grouting of equipments using any of above grout mixes shall essential be done as per the recommendations of supplier with regard to grout preparation and use of machinery etc under the supervision of the respective supplier. BHEL has arrangement with above suppliers for supervision services and the supervision charges for the same will be borne by BHEL. However, the contractor shall ensure readiness of equipment for grouting in all respect before such a service is requisitioned and the duration is not prolonged unduly. Any overstay required due to contractor shall be charged to the contractor with BHEL's departmental charges. Contract shall consult BHEL engineer before deciding upon the vendor for the above.

19.4
Contractor shall carry out scrapping and blue matching of embedded plates/ packers of rotating equipments. Chipping and the leveling of concrete surfaces, fine dressing up to the extent required to obtain contact between packer and concrete, is also covered in the scope of this work. Scrapping, chipping and matching shall be done so as to achieve prescribed percentage of contact between the two surfaces.

19.5
BHEL will provide free of cost only the shims and packer plates (either machined or plain) which go as permanent part of the equipment. Certain packer plates and shims over and above the quantity received as a part of supplies from manufacturing units of BHEL, will have to be cut out from steel plates / steel sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting / chiseling / grinding and de-burr the same. However, machining of the packers wherever necessary shall be arranged by contractor.

19.6
Complete grouting of structures equipments, including anchor/ foundation bolts, beneath base, base hollows etc, as may be applicable, is included in the scope of Contractor. Arranging all labour, building materials including cement, fresh portland cement confirming to IS:269 as well as quick setting – free flow - non-shrink grout mix (e.g. conbextra gp1/gp2), form work, shuttering, and any other requirements is in the Contractor's scope. All the rotating equipments shall have to necessarily grouted with quick setting-free flow non-shrink grout mix. Contractor shall obtain approval of BHEL for cement (fresh portland as-well-as quick setting – free flow- non-shrink grout mix) prior to use. Cleaning of foundation surfaces, pocket holes and anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods are within the scope of this specification/ work.

19.7
When the base is to be flow grouted, forms shall be built and securely anchored outside the base plate so as to completely confine and withstand the pressure of liquid grout under working and rodding conditions without leaking and high enough to ensure the grout is in contact with the underside of the base plate, provide a head of minimum 100mm above the underside of the base plate. Provisions of grout holes in base plate, rodding arrangements shall be checked prior to commencement of grouting.

19.8
Grouting once started shall be done quickly and continuously to prevent segregation, bleeding and break down of initial set. Grout shall be worked from one end to the other to prevent entrapment of air. To distribute the grout and to ensure complete contact between the base plate and foundation an to help release entrapped air, link chains, or doubled over flexible steel strapplings can be used to work the grout in place.

19.9
Forms and shims shall not be removed and the anchor bolts shall not be tightened for at least twenty four hours after placing the grout. After the removal of forms and shims, area occupied by shims shall be filled and the area between the base and the edge of the foundation shall be finished smooth to allow drainage away from the base. Interconnecting pipings and machinery shall not be attached to the machinery before anchor bolts are tightened. It is desirable to make these connections at least three days after grouting. During the period, cure the grout with wet rags.

19.10
Sand used shall be such as to produce a grout with good workability and without any tendency to segregate.

19.11
Sand for general grouting (grout thickness 25mm and over but less than 50mm) shall be graded within the following limits:

- Passing IS 2.36mm sieve – 95 to 100%
- Passing IS 1.18mm sieve – 65 to 95%
- Passing IS 300 micron sieve – 10 to 30%
- Passing IS 150 micron sieve – 3 to 10%

19.12
Sand for fluid grouts (grout thickness under 25mm) shall have the fine materials passing the 300 and 150 micron sieves at the upper limits specified in Clause 19.11 above.

19.13
Sand for stiff grouts (grout thickness 50mm and above) shall meet the usual grading specifications for concrete.

19.14
After all ingredients are added, the batch shall be mixed for 2 minutes. Batches of grout shall be small enough so that the batch may be fully used up in less than 45 minutes.

19.15
The proportions of grout shall be such as to produce a flowable mixture consistent with minimum water content and shrinkage. The rout proportions shall be limited as follows:

USE	GROUT THICKNESS	MIX PROPORTIONS	W/C RATIO (MAX)
Fluid mix	Under 25mm	One part of Portland cement to one part of sand	0.44
General	25mm and over but less than 50mm	One part of Portland cement to 2 parts of sand	0.53
Stiff mix	50mm and over	One part of Portland cement to 3 parts of sand	0.55

19.6
After the grouting has finally set and cured, alignment of equipments involved shall be checked again to verify for any disturbance or any other reason. If required, de-coupling of equipments has to be done for conducting the verification. In case any disturbance is noticed the cause, if any, shall be removed and re-alignment done as part of work.

20 WELDING, RADIOGRAPHY AND OTHER NON-DESTRUCTIVE TESTING, POST WELD HEAT TREATMENT

20.1 WELDING

Contractor shall carry out field welding of piping as per relevant sections under these specifications in conjunction with NPCIL specifications for Field Welding of Piping as attached in Annexure-4. In case of any conflict between these two, NPCIL specifications for Field Welding of Piping shall be binding on the contractor.

20.1.1

Installation of equipment involves good quality welding, NDE checks, post weld heat treatment etc. Contractor's personnel engaged should have adequate qualification on the above works.

20.1.2

The method of welding (viz) arc, TIG or other method will be indicated in the detailed drawing/documents. BHEL Engineer will have the option of changing the method of welding as per site requirement.

20.1.3

Welding of high pressure joints shall be done by IBR certified high pressure welders who have been permitted by CIB of state concerned for deployment at the site of work.

20.1.4

Welding of all attachments to pressure parts, piping shall be done only by the qualified and approved welders.

20.1.5

Before any welder is engaged on work, he shall be tested and qualified by BHEL/ customer, though they may possess the IBR/other certificate. BHEL reserves the right to reject any welder without assigning any reason. All the expenditure in testing/qualification of the Contractor's welder shall be borne by Contractor.

20.1.6

Unsatisfactory and continuous poor performance may result in discontinuation of concerned welder.

20.1.7

The welded surface shall be cleaned of slag and painted with primer paint to prevent rusting, corrosion. For this consumables like paint /primer etc will be in the Contractor's scope.

20.1.8

HP joint fit-up, should be protected, where required, by use of tapes/protective paint as may be prescribed by BHEL. The Contractor shall arrange consumables like protective paints/tapes etc.

20.1.9

The Contractor shall maintain welding records in the form as prescribed by BHEL containing all necessary details, and submit the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability of the welds shall be final.

20.1.10

In the case of P-91 pipe welding, Contractor shall deploy welders having experience in welding of P-91 material. The welders engaged by Contractor if not qualified for P-91 welding will be trained by BHEL at BHEL welding research institute (WRI) Trichy and allowed to work only after passing the required test arranged by BHEL. All the expenditure towards such qualification including cost of training, traveling expenses, stay etc., shall be borne by the Contractor.

20.1.11
Joint fit up will be a stage of inspection. Where required, joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

20.1.12
SS tubes of OD 6 mm and above shall be joined by single pass automatic gas tungsten arc welding process without using filler material for all positions by means of rotating electrode in an automatic orbital welding machine.

20.1.12 SOCKET WELDING:

In execution of this work, considerable number of socket weld joints is involved. The exact quantity of such socket welds or probable variation in the quantum cannot be furnished. The bidder shall take notice of this while quoting as no extra claim on this account will be entertained. The socket welding on HP parts/ HP piping shall be done by the IBR qualified welders. Contractor has to adhere to the procedures/specification as indicated in the drawing for socket welding.

20.1.13
Welding electrodes have to be stored in enclosures having temperature and humidity control arrangements. This enclosure shall meet BHEL specifications.

20.1.14
Welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the welding electrodes have to be carried in portable ovens.

20.2 HEAT TREATMENT:

20.2.1
For the purpose of temperature recording of stress relieving process, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations shall be as per the standards of BHEL. Thermocouples have to be attached using capacitor discharge type portable thermocouple attachment unit. Contractor shall arrange sufficient number of thermocouple attachment units.

20.2.2
Contractor should provide temperature indicator / temperature recorder for measuring temperature during pre-heating for welding or for controlling temperature of metal for hot correction etc. The temperature recorders should be preferably of solid state type.

20.2.3

Heat treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. The Contractor shall make all necessary arrangements including labourer required for the same as per directions of BHEL.

20.2.4
In certain cases only the pre-heating of weld joints may be called for.

20.2.5
For weld joints of heavy structural sections, if heat treatment is required, the same shall be carried out as part of the work.

20.2.6
Checking effectiveness of stress relieving by hardness tests (by digital hardness tester or other approved test methods as per BHEL Engineer's instruction) including necessary testing equipments is within the scope of the work / specification.

20.2.7
Preheating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the Contractor in accordance with BHEL engineer's instructions. Where the electric resistance heating method is adopted Contractor shall make all arrangement including heating equipment with automatic recording devices, all heating elements, thermocouples and attachment units, graph sheets, thermal chalks, & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works.

Where ever technically required BHEL will provide the induction heating equipment set for SA 335 P-91 materials piping only. The set will comprise of following:

Main panel
Capacitor panel
Interconnection power & control cables between above panels
185 sq mm special connecting cable from capacitor panel output – 5m length.

Contractor shall provide the input electrical power connection including arrangements such as DB, cables etc, thermocouple pads, thermocouples and compensating cables, induction heating annealing cables (from the capacitor panel to joint and for wrapping around the weld joint) (spec: single core 240 sq mm, 1200a, 3khz), ceramic wool and other consumables etc as may be required. Quantum of annealing cable requirement will depend on many parameters e.g. weld joint size, heat input, type of connection i.e. series or parallel etc.

20.2.8
All the recorded graphs for heat treatment shall be handed over to BHEL/ IBR authorities and due clearances obtained.

20.2.9
During welding & post weld heat treatment of main steam piping (P-91 material), the induction heating process shall continue un-interrupted. Therefore, contactor shall arrange back-up DG set to take care of power interruptions during the process.

20.2.10
Results of these processes shall be verified/ validated as per requirements of BHEL/client.

20.3 NON DESTRUCTIVE EXAMINATION AND RADIOGRAPHY:
Contractor shall carry out field welding, radiography, NDT, PWHT under these specifications in conjunction with NPCIL specifications for field welding of piping as attached in Annexure-4. In case of any conflict between these two, NPCIL specifications shall be binding on the contractor.

20.3.1
Contractor shall provide all resources and make all arrangements for the radiographic examination of welds for this work. for reasons of safety, invariably the radiography work will be carried out after the normal working hours and close of other site activities only. In this regard, the Contractor has to adhere to the safety rules / regulations laid by BARC authorities from time to time.

20.3.2
Radiography inspection of welds shall be performed in accordance with requirements and recommendation of BHEL Engineer. The minimum quantum of radiographic inspection shall be as per provision of IBR/BHEL's erection documents. They may, however be increased depending upon the performance of the individual welder at the discretion of BHEL Engineer/Boiler inspecting authority. Bidder shall also arrange the UT equipment with recording facility at his own cost. Usage of UT equipment shall be as per direction of BHEL engineer. Records of UT shall be produced as per site requirement.

20.3.3
All X-Ray / Gamma Ray films of weld joints shall be preserved properly and be handed over to BHEL/ IBR authorities and requisite clearances shall be obtained by the Contractor.

20.3.4
The field welded joints shall be subject to Dye-penetrate/MPT/RT/ other non-destructive examination as specified in the respective engineering documents/ as instructed by BHEL. T

20.3.5
Wherever required, surface preparation, like smooth grinding of welded area, prior to Radiography shall be done. It may also become necessary to adopt inter-layer radiography/MPT/UT depending upon the site/ technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The Contractor shall take all this into account in his offer. The required NDT method/procedure will be decided by BHEL engineer at site.

20.3.6
Bidder shall note that 100% radiography shall be taken on all high pressure welding till such time the welders' performance is found by BHEL Engineers to be satisfactory. Subsequently, subject to consistency in welder's performance, the percentage of radiography will be based on BHEL's standard practice/code requirement. The defects shall be rectified immediately and to the satisfaction of BHEL engineer. The decision of BHEL engineer regarding acceptance / rejecting the joints will be final and binding on the Contractor.

20.3.7
100% radiograph of certain sizes in piping have to be taken as per BHEL standards/ drawings.

20.3.8
For carrying out ultrasonic testing of welding joints of large size tubes and pipes, it will be necessary to prepare surface by grinding and buffing a smooth finish and contour as necessary. The Contractor's scope of work includes such preparation as incidental to work.

20.3.9
After stress relieving 5% of UT for all critical lines and 2% of UT for other alloy steel lines to be taken to ensure soundness of joints particularly stress relieving cracks. No separate payment will be made.

20.3.10
Contractor will have to undertake radiography with Iridium isotope camera in certain cases. For this Contractor has to deploy level–II operator certified by BARC.

20.3.11
In the case of P-91 piping wherever radiography is not possible, alternatively ultrasonic test has to be carried out apart from other NDE checks.

20.3.12
For piping of thickness less than 25 mm no radiography plugs will be provided radiography shots to be taken by double wall technique or any other method to be adopted in consultation with BHEL engineer at site.

20.3.13
No separate payment for any NDE activities (including radiography) will be made.

21 LINING AND INSULATION

Application of insulation, finishing, cladding and outer casing etc of the following:

1. HP-MSR-LP piping and other piping covered in the scope of works, TG integral piping and tanks & vessels
2. Water storage tank
3. Other equipments including BOI's, though not listed above but required for completion
4. ST-TG auxiliaries including, but not limited, to heat exchangers, pumps, tanks and vessels and other equipments
5. TG integral piping including condensate and extraction system piping

21.1
The work shall conform to dimension and tolerances specified in the various drawing and documents that will be provided during the execution. if any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by engaging other agencies or departmentally and recoveries will be deducted from Contractor's bills towards expenditure incurred including BHEL departmental charges as per relevant clauses of GCC.

21.2
The terminal points as decided by BHEL shall be final and binding on the Contractor.

21.3
All insulation and refractory materials including iron components and outer sheet casing materials, cladding sheets etc required will be supplied by BHEL and the same have to be erected/ applied as per the drawings and specifications of BHEL by the Contractor.

21.4
The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during all stages of work. Scaffolding materials (poles, gratings etc) shall be of light weight construction. Contractor shall arrange steel pipes & clamps with accessories like base plate attachment, fixing pins, struts etc for scaffolding required for this work. However, BHEL's decision in this regard shall be final and binding. Contractor shall arrange the scaffolding materials in sufficient quantity.

The Contractor shall provide the required quantity of wire, nails, and planks for formwork and other materials for shuttering and curing works.

21.5
Contractor shall observe all precaution for laying, curing etc of pourable insulation. The Contractor at his own cost shall redo any defective works found.

21.6
Wool insulation is received at site as loose bonded mattresses in standard sizes. These are to be dressed/cut to suite the equipments. Multiple layers of wool have to be applied as directed and as per drawings and specifications for all equipments/ systems covered under the scope of work.

21.7
Cutting & dressing of insulation bricks to suit the site area of application is incidental to work.

21.8
Removable type of insulation has to be provided for valves fittings, expansion joints etc as per drawing or as directed by BHEL Engineer.

21.9
The cladding and outer casing are aluminum sheets. All relevant specifications and procedures with regards to beading, sealing etc for aluminum sheets have to be adhered to.

21.10
Cladding/outer casing shall be fixed expeditiously, so as to avoid damage to the insulation from the weather.

21.11
The overlapping surface of outer casing/cladding sheet shall be coated with sealing compound, which will be supplied by BHEL free of cost.

21.12
To take care of bimetal corrosion due to variety of metals in contact of each other viz retainer to support, support to outer casing/cladding, cladding-to-cladding etc, suitable paints specified by BHEL, to be applied and/or neoprene rubber packing/strips or any other insert may have to be fixed as required.

21.13
The Contractor shall leave certain gaps and openings while doing the work as per the instructions of BHEL Engineer to facilitate inspection by boiler inspector or during commissioning to fix gauges, fittings, instruments etc. these gaps will have to be finished as per drawings at later date by the Contractor at his cost.

Contractor shall cut open works in needed as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over without any extra payment.

21.14
A log book shall be maintained by the Contractor for the clearance of the area for application of refractory and insulation. Where the Contractor does the work on his own accord without prior permission, the work should be re-done, at his own cost, where necessitated.

21.15
Wastage allowances for the material issued are envisaged as follows:

➢	a	Pourable & castable insulation	-	2%
➢	b	Insulation bricks and motor	-	2%
➢	c	Wool mattresses	-	2%
➢	d	Cladding sheets	-	2%

The wastage allowance will be applicable on the net issued quantity i.e. total quantity issued reduced by the quantity returned to stores as unused/fresh item. Contractor shall reconcile the material issues periodically as prescribed by BHEL site

21.16
The following works are also included in the scope of this contract.

- Cutting of cladding sheets as per the profile of the equipment and painting on inner surface two coats of bituminous paint. Paint will be supplied by Contractor.

- Cutting of the wool mattresses to the required shape and application of finishing cement of required thickness wherever required.

21.17
Insulation work of temporary piping for alkali boil out, steam blowing and chemical cleaning has to be carried out at site. The same have to be removed and returned to the BHEL stores after the completion of activity. Rates quoted for application of wool for boiler and auxiliaries will be applicable for this work also. No separate payment will be made for removal of temporary insulation and return of the same to BHEL stores/yard.

21.18
In certain instances, co-ordinated/phased application of castable refractory/ insulation on pressure parts etc may be necessitated in consideration of sequence of activities of other erection agencies. Contractor shall do such phased work as may be directed by BHEL.

21.19
Prior to application of refractory bituminous painting on the pressure parts and other area is under Contractor scope. The bituminous paint will be supplied by Contractor. No separate payment will be made for application of paint.

21.20
application of wool insulation, sheet metal cladding, welding of hooks/supports to hold insulation covered under this contract, shall include, but are not limited to, the following :-

a) Where indicated, removable type of insulation to be provided for valves, expansion joints, etc. as per the drawings or as directed by BHEL engineer.

b) Wool insulations are received at site as bonded and unbounded mattresses in standard sizes. These are to be dressed / cut to suit work by the contractor.

c) Application of insulation and refractory works and sheet metal covering as given in various drawings/ specifications of BHEL, supplied to the contractor.

d) Outer sheet cladding by fabrication of aluminum sheets to the sizes and shapes specified in drawings, beading, swaging, beveling of sheets, crowning the sheets, if necessary, fixing the same

to supports, over wool insulation with screws/retainers as specified in BHEL drawings or as instructed by BHEL engineer.

e) Welding of hooks/supports on equipment including on pr. parts and piping to support wool insulation, as per the drawings or as instructed by BHEL engineers.

f) Painting the inner side of aluminum/GI/steel cladding, with anticorrosive paint as specified. The required paint and thinner is in the contractor's scope. Also, all other accessories consumables for painting, cleaning the surfaces etc shall also be arranged by the contractor.

21.22

Application of lining and insulation on all piping covered under this Specification is also the part of this work. Similarly, it is applicable for Lining and insulation of TG side auxiliaries etc.

22.1 EQUIPMENT INSTALLATION – COMMON REQUIREMENTS

22.1.1
Filling of lubricants for steam turbine, turbo-generator and other rotating auxiliaries for purpose of oil flushing, initial fill up and subsequent topping up during various stages of work is in the scope of the contractor.

22.1.2
All works such as cleaning, leveling, aligning, hot alignment, trial assembly, dismantling of certain equipments/components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, grinding, straightening, chamfering, filling, machining, chipping, drilling, reaming, scraping, lapping, shaping, fitting-up, drilling of holes, making dowel pins, minor rectification of foundation bolts etc. are incidental to the erection/commissioning and any other work/activity which is necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work.

22.1.3
Cleaning, servicing, lubrication of actuators, pumps, headers, governing system, ESV & IV, control valves, tanks, vessels etc. during erection and commissioning stages is in the scope of work. However, gaskets/pickings/lubricants for replacement will be provided by BHEL free of cost.

22.1.4
All equipment shall be preserved and protected periodically before and after erection as per advice of BHEL engineer. The journals of steam turbine rotors, generator rotor, HT motors and other rotating machines shall be thoroughly cleaned, greased/painted with preservative agents periodically as instructed by BHEL engineer.

22.1.5
Trial run of all motors including checking direction of rotation in uncoupled condition, check alignment and re-couple the motor to driven equipment.

22.1.6
After initial trial of rotating equipments, control and power cabling for motors and other equipments/instrumentation may have to be disconnected for checking alignment and resetting/realignment/hot alignment. Contractor will have to provide services for disconnection and reconnection of control and power cables.

22.1.7
All racks or assembled units like Governing Rack, Seal Oil Unit, Gas Unit, Seal Oil Valve Rack, Gas Cylinder Racks etc supplied from manufacturing units will be tested in BHEL/ Customer stores or at site. This may require transportation, filling of oil, water etc in these racks for carrying out testing of these racks. Defects noticed during testing of these racks will have to be rectified by the contractor free of charges. Further, any pipeline / flanges / fittings not found assembled properly, the same have to be rectified / corrected by the contractor free of charges.

22.2 CONDENSER INSTALLATION

22.2.1
The condenser will be dispatched in loose parts mainly comprising of bottom plates, dome valves, front and rear water chamber, front and rear water boxes, side walls, hot well, spring elements, support plates, air extraction pipes, baffles, stiffening rods and pipes etc. Condenser tubing and tube expansion (roller expansion) is to be done at site by the contractor, after taking due care to clean all the tube holes. After final alignment and leveling of turbine exhaust and condenser, the same has to be welded to the exhaust position of LP exhaust as per the sequential welding procedure. Condenser tube material is stainless steel.

22.2.2
Before insertion of tubes, the contractor shall clean the holes in the tube plates and tube support plates to remove paint, corrosion spots, oxide scales etc. Usage of suitable cleaning agent may also be required which has to be supplied by the contractor.

22.2.3
The tubes shall be expanded using an Automatic Electronic Torque Controlled Tube Expanding unit or Pneumatic Tube Expander. Tube expansion shall be checked with dial bore gauge. The total set up including tube expanders and tube cutting tools etc. for carrying out the complete condenser tube expansion works shall be provided by the contractor.

22.2.4
The welding of expanded joint of the tube end shall be done with the help of single pass automatic gas tungsten arc welding process without using filler material for all positions by means of rotating electrode in an automatic Orbital welding machine after completion of expansion. The necessary orbital welding machine and consumables/gases etc including qualified welder has to be arranged by contractor within the quoted rates.

22.2.5
The contractor shall carry out the condenser neck welding with LP cylinder exhaust hood only after final installation of LP casing. Neck welding shall be subjected to specified non-destructive testing.

22.2.6
The hydrostatic testing of steam space and hydraulic testing of water space up to the terminal point after assembly of water boxes are also included in the scope.

22.2.7
Work of painting of condenser surfaces in various areas and at various stages of work are specified elsewhere in these specifications.

22.3 MSR INSTALLATION

22.3.1
The approximate weight and dimensions of MSR components are indicated in Annexure-1. The contractor shall arrange suitable capacity trailer, well in advance, to transport MSR components from storage yard to

site. At site, BHEL/NPCIL shall provide suitable capacity crane on chargeable basis for placement/erection of MSR. Contractor to provide necessary support and manpower assistance.

22.3.2

MSR installation shall be carried out as per the instruction of BHEL engineer at site. The general procedure involved in installation of MSR shall be as follows:

A. Upper section

1. Check as built dimensions of concrete support including embedded plate and level.
2. Mount the bearing support in position.
3. Lift lower section of MSR in the loading bay to operating floor horizontally using lifting beam.
4. Tilt lower section to vertical position as per detail shown for upper section of MSR.
5. Ensure proper orientation of nozzles and lower the lower section in position and support at concrete base at elevation 2.02m position.
6. Install and fix the bearing support.
7. Install the support brackets at 11.0 m floor.

B. Lower Section

1. Lift upper section of MSR in loading bay horizontally up to operating floor using lifting beam.
2. Tilt upper section to vertical position.
3. Ensure nozzles orientation and lower the upper section in position.
4. Install temporary support brackets at 18.0 m level.
5. Align both sections of MSR circumferentially and weld approximately 1/3 of the circumference while holding upper section by crane.
6. Install tie rods and shock absorber at 16.45m and 17.3 m respectively in position as shown in G.A drawing.
7. Weld the remaining circumferential weld and hydro test shell side as per procedure.

23 HYDROSTATIC TESTING, PRESERVATION & OTHER TESTS

Contractor shall carry out hydrostatic testing, preservation and other tests under these specifications in conjunction with NPCIL specifications for field welding of piping, as attached in Annexure-4. In case of any conflict between these two, NPCIL specifications shall be binding on the contractor.

23.1

Contractor shall carry out the following tests required to complete the erection and commissioning of the TG Set:

- Hydraulic testing of individual equipments like condenser, coolers, heaters, other auxiliaries and equipments. Required capacity Hydraulic test pump/Fill pump and other necessary arrangement shall be provided by contractor to carry out hydraulic testing, chemical cleaning of the equipments and piping as part of scope of work under this tender specification.
- Ultrasonic test
- Dye Penetrate test
- Magnetic Particle Test.

All above facilities (men, materials, equipments, consumables etc) with operating engineer/experienced person and proper approach wherever required shall be provided by the contractor for satisfactory completion of the above tests.

23.2

Contractor shall lay all necessary temporary piping, welding, supports, install pumps, valves, pressure gauges, electric cables and switches etc, required for the Hydro test, Air leak test, Chemical cleaning, Steam blowing etc.. After the test is over, all the temporary piping, pumps, etc will be removed. It may also specifically be noted that servicing, erection and dismantling of piping and equipments for conducting above tests will be done by the contractor. No separate payment shall be made for this purpose.

23.3

All the above tests shall be repeated till all the equipments, piping and systems satisfy the technical and statutory requirements. All related works form part of the scope.

23.4

Suitable welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration/ venting /drain points with valves as per BHEL engineer's instruction, for performing hydro test of piping is within the scope of work**.** Required valves, fasteners, blank flanges, blanks or steel for blank flanges shall be provided by contractor. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL engineers' instruction.

23.5

Hydro test of piping may have to be repeated several times to meet technical and statutory requirements before application of insulation.

23.6

While conducting hydraulic test of steam lines, water lines, oil lines either individually or grouping a few lines or in portions. Blanks/spools may have to be put up at terminal points, strainers, walls, flanges etc. After conducting the tests, the blanks shall be removed and the lines restored. Also interconnecting piping between boiler and turbine, the hydraulic test may have to be done section wise and some–times piping of other agencies may have to be combined. Contractor shall carry out all such incidental work to satisfactorily conduct the hydro test. Wherever work is involved in the terminal points, Contractor shall carryout the same as per instruction of BHEL engineer. The decision of BHEL engineer is final and the same is binding on the contractor.

The contractor shall carry out any other tests as desired by BHEL engineers on erected equipment covered in the scope of this contract during testing and commissioning to demonstrate the satisfactory completion of any part or whole of work performed by the contractor.

24.1 PAINTING

BHEL/Customer Specification for Shop & Field Painting with regard to surface preparation and final painting with colour codes / scheme for surface preparation and finish paints coating including primer coating for shop and field painting will be given at site at the time of painting work. Contractor shall carry out surface preparation and final painting works as per BHEL/Customer specification and instruction of BHEL engineer at site.

24.2
Paints and painting work carried at site shall confirm to the following codes and standards:

IS:5 – Colour for ready mixed paints and enamels

IS : 101 Part 1 to 9 – Methods of sampling and test for paints, varnishes and related products

IS : 1477 Part I&II – Code of practice for painting of ferrous metals in building

IS : 2932 – Specifications for enamel, synthetic and exterior,
a) Under Coating
b) Finishing

IS: 9407 – Colour code for identification of pipelines used in thermal power plants.

Contractor shall satisfy himself, availability of all information in the specifications for proper selection of the paints and ensure their applications as per Codes.

24.3
All the primer, thinner & paints for final painting and all other consumables like brush, cleaning agents etc and all T&P including scaffolding materials, manpower, supervision is in contractor's scope.

24.4 Primer Painting:

a) After surface preparation, two coats of **epoxy resin based zinc primer** shall be applied. Dry film thickness of each coat shall be as per the recommendations of primer/paint manufacturer. Primer shall be applied by either spraying or bushing ensuring a continuous film without "holidays". Primer coat shall be immediately applied without any time lag after the surface preparation.

b) Any equipment shall be carefully examined and where ever the primer coat is damaged shall be recoated with primer. However over the field welds, bolts and nuts etc. two primer coats as per a) shall be applied.

24.5 Finish Painting

a) After the primer coat has dried out, the surface shall be cleaned of dust without scratching or in any way damaging the primer coat. Over this, dry surface finish painting shall be carried out.

b) Finish painting shall be carried out in two coats. Dry film thickness of each coat shall be as per the recommendation of the primer/paint manufacturer. Minimum thickness including primer and paint coating shall be 400 microns.

c) Paint shall be applied either by brushing or spraying. It shall be ensured that brush marks are a minimum and the requirements of workmanship are as specified in IS: 1477 (for site painting works on systems, structures and components).

d) Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of ready mixed type in original sealed containers as packed by the paint manufacturer. Addition of thinners shall not be permitted.

e) No painting shall be done in frost/foggy weather or when the humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be painted is 5^{o} C or below.

24.6
Components of TG and auxiliaries will in general be supplied painted by BHEL manufacturing units as per their standard applicable painting schemes. Contractor shall carry out primer and finish painting coats and DFT requirement with colour codes & specifications as per requirement of customer.

All exposed metal parts of the equipment including piping, structures, railings etc. wherever applicable, after installation unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oils and other foreign materials by wire brushing, scraping or sand blasting, and the same being inspected and approved by BHEL engineer for painting. Afterwards, the above parts shall be finished with two coats of alloyed resin machinery enamel paints.

24.7
Touch-up painting on damaged areas –

a) For coatings damaged up to metal surface

Surface preparation shall be carried out by manual cleaning. Minimum 6 inches adjoining area with existing coating shall be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch primer. Primer coat of touch-up primer has to be applied by brush immediately after the surface preparation.
Over this primer coat, finish coat and final finish coat shall be applied as covered above by brush within maximum seven (7) days of application of touch up primer.

24.8
Painting of welded areas / painting of areas exposed after removal of temporary supports / touch-up painting on damaged areas of employer's structures, where inter-connection, welding / modification etc. has been carried out by the bidder.

(a.) Clean the surface to remove flux spatters and loose rust, loose coatings in the adjoining areas of weld seams by wire brush and emery paper.

(b.) Painting procedure to be followed for touch-up painting on damaged areas.

24.9
The scope of work includes painting of colour bands, lettering, marking and signs for direction of flow/rotation, names etc of approved colours as per the standard colour codes and specifications specified in tender specification or as advised by BHEL/Customer engineer at site for the equipments / components covered in these specifications. Supply of applicable paints and primer is in Bidder's scope.

24.10
All exposed metal parts of the equipment including piping, structures, hand railing, grating etc shall be thoroughly cleaned off dust, rust, scales and other foreign materials by manual or mechanized wire brushing, scrapping, sand blasting etc and the same being inspected and approved by BHEL/customer engineer before application of primer. Afterwards, the above parts shall be finish painted with specified number of coats as per specification

24.11
In certain isolated instances where it is not possible to clean the equipments as explained above, cleaning by grinding might have to be resorted to. No damage to the equipment/components should be caused.

24.12
Surface to be painted should be free of oil and grease. It should be removed by using suitable cleaning agents including permitted solvents. Surface cleaned by chemical agent, if required, shall be treated further as prescribed in use of such cleaning agents. The Contractor at his own cost shall provide all the consumables and application implements.

24.13
During the preparation of surface, if the shop coat is damage by chemical cleaning or by mechanical means, contractor shall repair the same free of cost.

24.14
Specified drying time shall be permitted from one to another coat.

22.15
This work requires working at higher altitudes from ground level to as high as 50 mtr and more. The work spread is also substantial involving substantial run of structures and piping. Contractor shall take sufficient precautions to avoid any accident and hazard in all respects. The ropes, ladders, scaffolding materials, clamps etc and climber used should be of standard quality for safe and smooth execution of work.

24.16
Contractor shall carry out the work in such a way that other erected equipment, structure, civil foundations and other property are not damaged. For damages in any of such cases due to lapses by Contractor, BHEL shall have the right to recover the cost of such damages from the Contractor.

24.17

Contractor shall take due care to cover/protect the equipment which are already painted while carrying out the painting of other adjacent equipment. If so happens, it shall be cleaned and repainted by the Contractor without any extra charges.

24.18

In general, painting of structural parts and colour bands, lettering, marking of direction of flow/rotation etc will be carried out by brush painting. However, areas/equipments inaccessible for manual painting have to be painted by spray painting. The decision of BHEL engineer, in this regard, shall be final and binding on the Contractor. Laying of air hose pipe and any other line required shall be done by Contractor at his cost. The Contractor shall provide spray equipment set.

24.19

The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc, during execution of the work.

24.20

Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions.

24.21 PRIMER AND PAINTS FOR FINAL PAINTING

Supply of Paints/Primer/Thinner and application of paints for final painting and all other consumables like brush, cleaning agents etc and all T&P including scaffolding materials, manpower, and supervision is in contractor's scope.

25 PRE-COMMISSIONING TESTS, COMMISSIONING, POST COMMISSIONING

25.1
Commissioning of the TG equipments with associated Aux. and other Equipments with auxiliaries shall involve the following tests and activities of the equipments erected:

(a) Trial run of Vacuum Pumps, Booster Pump, etc and other pumps/equipments like Misc pumps etc and other various rotating machineries / pumps as per tender specification.

(b) Trial run of motors/ drives for various auxiliaries.

(c) Hydraulic Test, Chemical Cleaning, Oil flushing of lube oil system, Jacking oil/Lifting oil, HP oil supply system, Governing oil system/Control oil system, LP Bypass system, Air cleaning/blowing of pipelines, closed systems, Tanks and Vessels.

(d) Flushing of all pipelines by air/oil/water/Chemicals/steam as the case may be.

(e) Servicing of all valves, Hydraulic Power cylinders, HP Valves (ESV), HP Overload Bypass valves, IP Valves, LP Bypass valves, CRHNRV and fittings.

(f) Manual/mechanical cleaning of Oil tanks, Suction Strainers / Filter elements of CEP, BFP, Booster Pump, Vacuum Pumps, Misc. Pumps, and other various equipments & tanks /vessels erected by the contractor. This may have to be repeated several times during the commissioning process.

(g) Chemical cleaning of piping systems as per requirement. Contractor shall carry out disassembly and reassembly of vulnerable components like spray nozzles, gauges, instruments etc. as instructed by BHEL during this process.

(h) Putting turbine on barring gear.

(i) Rolling and synchronization.

(j) Full load operation.

(k) Trial operation

The above activities/tests/trial runs may have to be repeated till satisfactory results are obtained and also to meet the technical and statutory requirements.

25.2
Contractor shall lay temporary pipelines with fittings and accessories etc. as instructed by BHEL engineer for the purpose of pre-commissioning and commissioning activities like Hydraulic testing, chemical cleaning, oil flushing, steam blowing etc. of piping and other equipments as part of the scope of work. Temporary installations shall be dismantled by contractor and returned to BHEL stores as specified elsewhere in this technical specification.

25.3
The contractor shall provide necessary assistance to facilitate/enable electrical and instrumentation testing and commissioning of equipments under this scope of work, to BHEL and their Testing & Commissioning agency.

25.4
The contractor shall carry out any other test as desired by BHEL engineer on erected equipments covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or parts of work performed by the contractor.

25.5
In case any malfunctioning and / or defect is found during tests / trial runs such as loose components, undue noise or vibrations, strain on connected equipments etc. The contractor shall immediately attend to these defects/ malfunctioning and take necessary corrective measures. If any readjustment and realignments are necessary, the same shall be done as per BHEL engineer's instructions, free of cost.

25.6
Cleaning of oil tank by sand blasting or other methods as per instructions of BHEL engineer before and after oil flushing is responsibility of contractor.

25.7
The contractor shall associate for initial and subsequent fillings of gas in generator gas system as and when required till unit is handed over to Customer.

25.8
The contractor shall carry out leak test of generator air cooling system to the satisfaction of BHEL engineer.

25.9
Replacing/changing mechanical/other seals of equipment, pumps etc. during commissioning stage is within the scope of work.

25.10
During the stages of commissioning, and till Unit is handed over, if any part of TG and auxiliaries need repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim if any, for such repair/rectification/rework/ replacement etc for reasons not attributable to the contractor will be governed by relevant clauses of 'General Conditions of Contract'. The parts to be replaced shall however, be provided by BHEL free of cost.

25.11
During this period, though BHEL's and customer's engineers will also be associated in the work, the contractor's responsibility will be to make available resources in his scope till such time the commissioned units are taken over by the customer.

25.12
In case any malfunctioning and/or defects are found during tests, trial run such as loose component, undue noise or vibration, strain on connected equipment etc., The contractor shall immediately attend to these

defects/ malfunctions and take necessary corrective measures. If any readjustment or realignment is necessary, same shall be done as per BHEL engineer's instruction.

25.13

The pre-commissioning activities will start prior to Lube oil, HP Oil supply System, Governing/ Control oil flushing etc. of the TG and various trials, commissioning operations shall continue till the TG is handed over to customer. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of equipment erected, making ready for trial runs, filling up of lubricants, chemicals etc. All these works need specialized gangs including electricians, Instrument Technicians, Fitters, in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilization of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work is to be undertaken round the clock if required.

25.14

Contractor shall cut open works if needed as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over, without any extra payment.

25.15

After the start of commercial operation of machine, commissioning activities will continue. It shall be the responsibility of contractor to provide following manpower along with supervisor as part of commissioning assistance

1) Supervisor 2 Nos.
2) Pipe fitter/Millwright fitter 2 Nos.
3) Welder 2 Nos.
4) Rigger 2 Nos.
5) Electrician/instrument technician 1 No. each
6) Unskilled worker 6 Nos.

25.16

The above figures shows only minimum required over and above labour required for completing pending erection and commissioning works and clearing of punch lists. Contractor has to provide number of personnel and other resources as per work demand.

25.17

It shall be specifically noted that above employees of the contractor may have to work round the clock along with BHEL commissioning engineers.

25.18

During commissioning, opening of valves, changing of gaskets, checking, realigning of rotating and other equipment, attending to leakages in piping, tanks etc and adjustments of erected equipment may arise. Valves shall be serviced and lubricated to the satisfaction of BHEL engineer during the erection and commissioning as per BHEL engineer's instructions.

25.19

It is the responsibility of the contractor to provide for necessary resources till the completion of work under these specifications, even in case erection, testing and commissioning of the TG and other equipments are delayed due to reasons not attributable to the contractor.

26.1 PRESERVATION & PROTECTION OF COMPONENTS

At all stages of work, equipments/materials in the custody of Contractor, including those erected, will have to be preserved as per the instructions of BHEL. Necessary preservation agents including the primer & paint, for the above work shall be provided by the Contractor.

26.1.1
The Contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/ equipment in their custody and installed equipments from theft/fire/pilferage and any other damages and losses.

26.1.2
Contractor shall collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL/ client's stores. In case of failure of Contractor in compliance of this requirement, BHEL will make suitable arrangement at Contractor's risk and cost.

26.1.3
The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, etc shall be returned to BHEL stores by the Contractor.

26.1.3
The Contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage/excess utilization of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with departmental charges from the Contractor. Decision of BHEL on this will be final and binding on the Contractor.

26.1.4
For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL.

26.2 WELD FIT-UP AND WELD JOINT PROTECTIVE PAINT, COMPONENT PRESERVATIVE PAINTING ETC.

26.2.1
All protective paints for the protection of weld joint fit-ups, application of primers on finished weld joints are in the scope of contractor.

26.2.2
Two coats of steam washable paints shall be applied on steam side of LP turbine and condenser components, as advised by BHEL. The steam washable paints, primer and thinner will be provided by contractor as part of scope of work along with other like arrangements for surface preparation and paint application like sand/shot-blasting, consumables like surface cleaning agents, paint brush, brush cleanser, labour and necessary tools and plants as required for completion of work.

26.2.3
The water boxes shall be sandblasted to remove all traces of primer applied at the works. Thereafter apply two coats of primer paint followed by two/three coats of alloyed resin machinery enamel paints as approved by BHEL. Contractor shall submit manufacturer's batch test certificate / test certificate from BHEL approved laboratory for the primers and paints. Prior approval of BHEL for each and every batch of the primer & paints shall be mandatory. In order to achieve a desired minimum paint dry film thickness (DFT) as specified in BHEL drawing, number of coats may be applied and method of application shall be as recommended by the paint manufacturer. Required paints & primers and other consumables shall be arranged by contractor.

26.2.4
All site weld joints falling in steam side shall be painted with two coats of steam washable paint.

26.2.5
All water side surfaces of water chambers including tube plate shall be thoroughly surface prepared and painted. Required primer & paints and other consumables for condenser water box and tube plates shall be provided by Contractor.

26.2.6
After the successful completion of hydraulic testing, the interior surfaces of the water boxes, main tube plates shall be painted with suitable anticorrosive paints as per special procedures laid down by BHEL. Required necessary paints along with primers and other consumables shall be arranged by Contractor.

26.2.7
Prior to hydraulic testing of water side of condenser, interior surfaces of water boxes shall be painted.

26.2.8
After completion of tubing and tube side hydro test, all water side surfaces of water chambers including tube plate shall be painted.

26.2.9
Preservation of all components/equipments during various stages of erection, commissioning till handing over is in the contractor's scope. All prescribed methods of surface cleaning prior to application of preservative paint shall be followed by the contractor. Contractor has to arrange all primer and paints, and other consumables like wire brush, painting brush required for this work.

26.2.10
Condenser internal components/parts/surfaces have to be surface protected with steam washable paint as per BHEL standards.

27 ACID CLEANING/ ALKALI FLUSHING/ STEAM BLOWING/ OIL FLUSHING ETC

27.1
Contractor shall lay and erect temporary pipelines with fittings and accessories. As such no chemical cleaning work in permanent system of piping is involved; however, contractor shall carry chemical pickling of temporary piping work for erection, testing, pre-commissioning, commissioning operation (steam blowing, steam washing, steam flushing, water flushing, water washing, oil flushing of piping) . Contractor shall arrange his own arrangement for such chemical pickling including chemicals etc. as per instructions of customer/BHEL site engineer and shall provide all other arrangements as per requirement as part of scope of work.

It shall be specifically noted by the contractor that all pipes for above works shall be supplied in random length and in loose condition. Contractor has to assemble and erect them as per schemes / drawings provided by BHEL. Further, flanges bend etc for completing the scheme shall be machined/ fabricated by the contractor at his own cost. However, plates/ steel etc for the same will be provided by BHEL free of charges.

27.2
After the chemical pickling/ flushing have been successfully completed, dismantling of all temporary installations as instructed by BHEL is within the scope of work under this specification. The dismantled materials shall be dressed and returned to BHEL as stated elsewhere in this tender spec.

27.3
Preservation of the cleaned surfaces will be the responsibility of contractor under the guidance of BHEL engineer.

27.4
Hydraulic test of temporary piping is to be carried out as per the instructions of BHEL Engineer. Carrying out repairs, if any, is in the scope of work/specification.

27.5
For chemical cleaning of the piping system, contractor will have to lay temporary piping to connect the entire system irrespective of whether the equipment/system connected is in the scope of contractor or not. Decision of BHEL Engineer in this regard will be final and binding on the contractor.

27.6
During the initial stages of work, trenches for draining water may not be available after alkali flushing or mass flushing for discharging and emptying. Necessary low point drains and temporary piping for this will have to be provided by contractor from materials provided by BHEL.

27.7
Radiographic examination of weld joints on temporary pipes as required by the Engineer In-charge should be carried out.

27.8

Contractor shall also carry out the repairs or attend leaks etc., in the temporary piping and equipments for the above operations / activities while carrying out the above activities / operations.

27.9

For chemical pickling of system which consist of temporary piping erected by the contractor, contractor has to arrange for workers and supervisory staff as required supplementing/complimenting the labour and supervisory staff mobilized by other agencies for chemical cleaning of the portion of equipment erected by them in the system. Decision on the strength of gangs and supervisory staff for deployment of labour and allocation of work for them at site by BHEL engineer is final and binding on the contractor.

27.10

Contractors quoted rate shall be inclusive of fabrication, cost of consumables, erection, dismantling of temporary piping and servicing of the equipments and valves and handing over to BHEL. No separate payment on this account shall be entertained.

27.11

For full welding of structures, tanks and piping etc, only welding generators shall be used. The use of welding transformers will be subject to the approval of BHEL Engineer.

27.12

Erection and commissioning of connecting piping – permanent and temporary for oil purification equipments and all operations for cleaning, oil flushing, dismantling of temporary piping during pre and post-commissioning of equipment up to full load shall be the responsibility of contractor as part of scope of work

28 TOOLS AND TACKLES, MEASURING AND MONITORING DEVICES

28.1
The contractor shall provide all (except those indicated in BHEL scope) required tools and plants, monitoring and measuring devices (MMD) and handling & transportation equipments for the scope of work covered under these specifications**.** Contractor has to provide suitable cranes for material handling at BHEL/client's stores/storage yard**.** Please refer relevant appendix for the list of T&P being provided by BHEL free of charges on sharing basis.

28.2
All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL/NPCIL engineer with regard to brand, quality and specification. Indicative list of major T&P to be arranged by contractor has been furnished in relevant appendix. Contractor shall also mobilize all other T&P necessary for timely and satisfactory completion of the work in scope.

28.3
Contractor shall provide all required suitable cranes and trailers for materials handling during collection from BHEL/ client's stores/ storage yard, transportation to site of work and at work site for all equipments and consignments including heavy and voluminous equipments/ components/ consignments like HP turbine module, LP turbine casings, LP rotor, generator rotor, brushless exciter, HP heaters, etc. BHEL/customer shall not provide any T&P other than mentioned in relevant appendix for the purpose identified. The contractor shall make suitable arrangements/arrange crane well in advance for erection activities.

28.4
Contractor has to provide spanners of all sizes for carrying out the complete erection / commissioning works. No spanners will be provided by BHEL to the contractor.

28.5
Contractor has to arrange slings of all sizes for completing the works covered under these specifications except the special slings for generator stator lifting/handling, which will be provided by BHEL free of charges on returnable basis.

28.6
All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification.

28.7
Timely deployment of adequate quantity of T&P is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned program and to achieve the milestones.

28.8

All jack bolts that are required during erection for carrying out roll-check etc will have to be arranged by the contractor. No jack bolts will be provided by BHEL.

28.9

Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.

28.10

In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make the alternative arrangement at the risk and cost of the contractor.

28.11

The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. Contractor shall obtain prior approval of BHEL for all the T&P before deploying in actual work. The movement of cranes and other equipment should be such that no damage / breakage occur to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility.

28.12

Normally, use of welding generators only is permitted for welding. The use of welding transformers will be subject to prior approval of BHEL.

28.13

The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of measuring & monitoring devices (MMD). Test / calibration certificates shall be furnished to BHEL. MMD shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL. All calibration shall be traceable to national or international standards.

29.0 INDUSTRIAL SAFETY

The contractor shall comply with all provisions of "AERB Safety Guide for Works Contract" Document No. AERB/SG/IS-1 (annexure-3) and other safety requirements as applicable to specific site. The Contractor shall meet statutory requirements as well as regulatory requirements applicable to the project, in general and NPCIL in particular, especially the requirements as per Factory Act-1948 (amended in 1987). Atomic Energy Factories Rule-1996 (AEFR-1996 or latest version applicable at the time of work execution), safety guidelines for Job Hazard Analysis (JHA) and AERB notifications on Industrial Fire & Safety. The copies of the same can be obtained from BHEL/NPCIL on request.

29.1 SAFETY GUIDLINES

29.1.1

The contractor shall ensure minimum first aid arrangements available at all times at site and other arrangements in collaboration with local health authorities. The contractor shall establish a first aid center at site with full time ambulance facility with a male nurse/first aider.

29.1.2

The contractor shall provide and maintain all lights, fencing, guards, warning signs and caution board and similar items as required to ensuring safe working conditions at work site.

29.1.3

The contractor shall comply with the instructions given by departmental safety officer or his representative regarding safety precautions, protection measures and housekeeping etc.

29.1.4

The contractor shall comply with all provisions of AERB Safety Guide for Works Contract Document no. AERB/SG/IS-1 and other safety requirements as applicable to specific site, A copy of guide can be requested from BHEL/NPCIL on request.

29.1.5

The contractor shall provide proper access and working platforms for all place of work as per laid down standards or as advised by Engineer –in-charge or Head-IS&F.

29.1.6

The contractor shall ensure that all floor openings in his work are guarded/barricaded during the course of work and at the end of each day's work.

29.1.7

The contractor shall meet statutory requirements applicable to the project in general and NPCIL in particular especially the requirements as per Factory Act-1948 (amended in 1987), Atomic Energy factories rule-1996 (AEFR-1006 or latest version available at the time of work execution) safety guidelines for Job Hazard Analysis (JHA) & AERB notifications on Industrial & Fire safety. The copies of the same can be obtained from BHEL/NPCIL on request.

29.1.8

The contractor's safety professionals shall be aware about Acts, Rules connected with Industrial Safety and practices particularly applicable to the project and to threat effect they have to undergo an assessment a the project within 15 days of their placement at the project at the cost of the contractor and then only he/she would be given permanent entry pass and considered in required strength of the safety professionals.

29.1.9

All PPE procured and provided to workers shall confirm to relevant Indian Standards and should be maintained in healthy condition by suitable storage, maintenance and inspection.

29.1.10

Contractor working at the height of more than 2.5 metres above stable floor or ground floor must acquire height pass as per procedure including the worker's medical fitness certificate by certifying surgeon (having MBBS qualification) and worker's height qualification etc. If in any height work, the worker is found without having height pass, it will be recorded for regulation of payment. The decision of BHEL engineer with regards to the regulation of payment shall be final and binding.

29.1.11

Contractor shall ensure safe movement of man and material as well as vehicles in site premises as per rules/regulations applicable at or issued by plant. In case of violation of the rules/regulation it will be recorded for regulation of payment. The decision of BHEL engineer with regards to the regulation of payment shall be final and binding.

29.2 SAFETY PLAN

29.2.1

Contractor at his cost shall perform following tasks for the job having high risk as identified by Department Safety Group:

a) Prepare Safe Working Procedures and ensure its implementation in field.
b) Carry out Job Hazard Analysis (JHA) and implement in field.
c) Based on JHA, the safe working procedures should be modified especially to include checklists as necessary checkpoints for job safety supervision.
d) Worker (s) must be trained based on safe working procedure and explained about DOs and DON'Ts prior to assigning him the job.
e) The workers must adhere to the safe working procedure for the job.
f) Contractor shall ensure that all Tools, Appliances, erecting equipments and their safe use by the contractor work force shall be meeting Indian Standards. The contractor must ensure that necessary authorization exist with workmen prior to their deployment on a particular appliance/tool/equipment. The workmen would be required to acquire additional authorization for crane operation, crane signaling, blasting operation, welding and cutting operation, electrical work etc. And then only workmen shall be deployed for such job. He shall maintain all record of tools and equipment for their healthiness and safe use with a copy to departmental safety group.

AERB SAFETY GUIDELINES ARE NOT UPLOADED IN WEBSITE. SAME SHALL FORM PART OF VOLUME IA 'TECHNICAL SPECIFICATION. BIDDERS ARE REQUIRED TO OBTAIN THE SAME FROM BHEL OFFICE SEPERATELY.

NPCIL SPECIFICATIONS FOR FIELD WELDING OF PIPING ARE NOT UPLOADED IN WEBSITE. SAME SHALL FORM PART OF VOLUME IA 'TECHNICAL SPECIFICATION. BIDDERS ARE REQUIRED TO OBTAIN THE SAME FROM BHEL OFFICE SEPERATELY.