BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
Power Sector, Southern Region,
Service After Sales - Ek Tara Building,
39, Sarojini Devi Road, Secunderabad 500 003, A.P
Phone: 040-27802056/27700827, Fax : 040-27701768.

SUB CONTRACT DEPARTMENT

ENQUIRY REF NO.	BHEL/PS/SR/SAS/SER/SCT/VZ1117-098/T-04/08-09
PROJECT	SILK ROAD SUGAR PRIVATE LIMITED VAKALAPUDI , KAKINADA, ANDHRA PRADESH
DESCRIPTION OF WORK	Handling at Site Stores / Storage yard, Transportation to site of work, Erection, Testing and Commissioning of Frame VI B Gas Turbine, Generator and its connected Auxiliaries and Piping, including Supply & Application of Final Painting for 1 x 38 MW Gas Turbo Generator
Earnest Money Deposit	Rs.2,00,000/-
Date of Tender Sale	From 02.05.2008
Due Date & Time of Tender submission	20.05.2008 / 15.00 Hrs.
Date & Time for Opening of Technical Bids	21.05.2008 / 11.30 Hrs
Tender to be submitted in two parts. i.e., Technical Bid & Price Bid.	

This Tender contains:-

1. General Condition of Contract – No. of Pages = 59 Pages
2. Tender Specification(Technical Bid) – No. of Pages = 5-107 Pages
3. Price Bid – No. of Pages = 4 Pages

Name of the Firm to whom Tender is issued:

DATE OF ISSUE: HEAD/SUBCONTRACTS

Bharat Heavy Electricals Limited

(A Govt. of India Undertaking)

Power Sector – Southern Region – Service After Sales Division
39, Sarojini Devi Road, Ek Tara Building, Secunderabad – 500 003
Phone: 040-27802056/27700827, Fax : 040-27701768.

TENDER NOTICE

Sealed tenders are invited from reputed contractors for the following scope of work at **Silk Road Sugars Pvt. Ltd. – Material Handling, Erection & Commissioning of Mechanical works of 1xFr6B 38 MW Gas Turbine Generator –Vakalapudi - Kakinada-Andhra Pradesh.**

I) **Tender Specification No. BHEL/ PS/SR/SAS/ SCT/ VZ1117-098/T-04/2008-09. Silk Road Sugars Pvt. Ltd. – Material Handling, Erection & Commissioning of Mechanical Works of 1xFr6B 38 MW GTG.**

EMD FOR EACH TENDER **Rs. 2,00,000/-**
COST OF EACH TENDER DOCUMENTS **Rs. 1,700/- (incl. ST)**

	1xFr6BGTG
Sale Starts from	**02.05.08**
Due date & Time for Tender Submission	**15.00 PM 20.05.2008**
Date & Time for opening of Technical bids	**11.30 AM 21.05.2008**

Interested parties can get the Tender documents from the office of the Senior Deputy General Manager / C & C on all working days by remitting the cost of tender documents either by cash or A/c payee Demand Draft drawn in favour of **M/s.Bharat Heavy Electricals Limited.** Money orders, cheques and postal orders will not be accepted.

Bharat Heavy Electricals Limited takes no responsibility for any delay, loss or non-receipt of tender documents sent by post. The tenders not accompanied by the prescribed Earnest Money Deposit are liable to be summarily rejected.

For qualification requirement, tender documents and other details, please also visit our website at **www.bhel.com.** Corrigendum if any issued after the publication of this tender notice may be viewed only in our web site.

Sr. Deputy General Manager / Commercial & Contracts.

TENDER SPECIFICATION

BHEL: PSSR: SAS:SER:SCT:VZ1117-098:T-04/08-09

FOR

Handling at Site Stores / Storage yard, Transportation to site of work, Erection, Testing and Commissioning of Frame VI B Gas Turbine, Generator and its connected Auxiliaries and Piping, including Supply & Application of Final Painting for 1 x 38 MW Gas Turbo Generator

at

SILK ROAD SUGAR PRIVATE LIMITED
KAKINADA
ANDHRA PRADESH

PART – I TECHNICAL BID

BOOK NO :1

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector – Southern Region-Services After Sales Division
39, Sarojini Devi Road, Ek Tara Building, Secunderabad-500 003

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
Power Sector – Southern Region-Services After Sales Division
39, Sarojini Devi Road, Ek Tara Building, Secunderabad- 003

Tender Specification No.
BHEL: PSSR: SAS:SER:SCT:VZ1117-098:T-04:08-09

Issued to :
Messrs Date :

Dear Sir,

SUB: Handling at Site Stores / Storage yard, Transportation to site of work, Erection, Testing and Commissioning of Frame VI B Gas Turbine , Generator and its connected Auxiliaries, Balance of Plants and Piping, including supply and application of final painting for 1 x 38 MW Silk Road Sugars Private Limited Gas Turbine Power Plant at Kakinada, in Andhra Pradesh.

Please find enclosed one set of non-transferable tender documents containing 106 pages of Tender Specification Booklet for the above work.

You are requested to go through the tender documents and offer your most competitive rate and submit the tender documents duly filled in as per procedure indicated in the tender specification along with requisite EMD of **Rs. 2,00,000/-** (**Rupees Two Lakhs only**) in the form of Demand Draft drawn in favour of M/s. Bharat Heavy Electrical Limited.

Bids with Deviations from the tender conditions will be rejected.

A SEPARATE LETTER SHALL BE FURNISHED INDICATING THAT THERE ARE NO DEVIATIONS FROM THE TENDER CONDITIONS (As in Page 9.)

The completed quotations shall reach the office of the under signed on or before 20.05.2008 at 15.00 Hrs. The Technical bids, will be opened on the 21.05.2008 at 11.30 hrs.

ANY REVISION OF RATES / PRICES WHATSOEVER AFTER THE TIME AND DATE MENTIONED IN TENDER SPECIFICATION FOR SUBMISSION OF COMPLETED QUOTATIONS SHALL NOT BE ENTERTAINED UNLESS CALLED FOR SPECIFICALLY BY BHEL.

After opening of Technical bids, after ascertaining the submission of **" NO DEVIATION DECLARATION "** by the bidders, the price bids of parties who have furnished the no deviation declaration certificate only will be opened**.**

You are requested to depute your authorised representative at the time of opening.

Incase you are not participating in this , you may return the document immediately.

Kindly acknowledge the receipt of the tender documents and confirm your participation.

Kindly note that BHEL reserves the right to reject any or all tenders without assigning any reason.

Thanking you,

Yours faithfully,
For and on behalf of
BHARAT HEAVY ELECTRICALS LIMITED

Sr.Dy. General Manager / Contracts

This Tender document is not transferable.

Bharat Heavy Electricals Limited
(A Govt. of India Undertaking)
Power Sector – Southern Region
Services After Sales Division
39, Sarojini Devi Road, Ek-Tara Building, Secunderabad – 500 003

SPECIAL INSTRUCTIONS TO BIDDERS

The Bidder must submit their bids as requested in a sealed cover prominently superscribing the Tender Specification number, due date and time of submission as mentioned in the **TENDER NOTICE**.

The following information shall be furnished by the Bidder along with their offer (Technical Bid cover)

01. Declaration sheets as per Appendix of Tender specification.

02. Check list and schedule of general particulars as per Appendix in GCC.

03. T & P owned / deployment details as per GCC.

04. Technical Man power deployment details as per GCC.

05. Other relevant details as per GCC and checklist.

06. These terms and conditions will be read and construed along with General Conditions of Contract and incase of any conflict or inconsistency between the General Conditions and the terms and Conditions of the tender specification, the provisions contained in the term and conditions (NIT, Rate schedule, Common Conditions, Special Conditions including Appendices) shall prevail.

07. **A DECLARATION SHEET INDICATING THAT THERE IS NO DEVIATION IN TENDER DOCUMENTS (AS IN PAGE 11) TENDERERS MAY FURTHER NOTE THAT THIS DECLARATION IS A PREREQUISITE FOR BHEL TO CONSIDER THEIR BIDS. BIDS SUBMITTED WITHOUT "NO DEVIATION DECLARATION "WILL BE REJECTED BY BHEL**.

08. SAFETY PLAN

Bidder may further note that the submission of safety plan is a prerequisite for BHEL to consider their bids.

Bharat Heavy Electricals Limited
(A Govt. of India Undertaking)
Power Sector – Southern Region
Services After Sales Division
39, Sarojini Devi Road, Ek-Tara Building, Secunderabad – 500 003

PROCEDURE FOR SUBMISSION OF SEALED BIDS

The Tenderers must submit their bids as required in two parts in separate sealed covers prominently superscribed as Part I "Technical Bid" and Part II "Price Bid" and also indicating on each of the covers the tender specification number and due date and time as mentioned in the Tender Notice.

Part I (Technical Bid) Cover I

Except Rate Schedule, all other schedules, data sheets and details called for in the specification shall be enclosed, in part I Technical Bid only.

Part II (Price Bid) Cover II

All indications of price shall be given in this part II Price Bid.

Tenderers are requested to quote their rates, only in the price bid (Part II) provided by BHEL. Quoting of rates in any other form / formats will not be entertained.

These two separate covers I & II (Part I and Part II) shall together be enclosed in a third envelope (Cover III) along with requisite EMD as indicated and this sealed cover shall be super scribed and submitted to Senior Deputy General Manager/Contracts at the above mentioned address before the due date as indicated. The Tenderers will be intimated separately in case any clarifications are required.

NOTE:

Tenderers are issued with 2 Nos. of Technical Bids, 2 Nos. of Price Bids and 2 Nos. of GCC booklet, out of which one set of each document shall be retained by them for their reference. Balance one set shall be submitted along with their offer as per procedure indicated above.

EMD amount for this Tender is Rs.2,00,000/- (Rupees Two Lakhs only). This EMD amount shall be submitted in the form demand draft only drawn in favour of M/s. Bharat Heavy Electricals Limited.

EMD amount in the form of Bank Guarantee / fixed deposit receipt or in any other form will not be Accepted.

ANY REVISION OF RATES / PRICES WHATSOEVER AFTER THE TIME AND DATE MENTIONED IN TENDER SPECIFICATION FOR SUBMISSION OF COMPLETED QUOTATIONS SHALL NOT BE ENTERTAINED UNLESS CALLED FOR SPECIFICALLY BY BHEL.

Sr. Deputy General Manager/Contracts.

Bharat Heavy Electricals Limited
(A Govt. of India Undertaking)
Power Sector – Southern Region
Services After Sales Division
39, Sarojini Devi Road, Ek-Tara Building, Secunderabad – 500 003

TENDER NOTICE

Sealed Tenders are invited from reputed contractors with sufficient previous experience in the under mentioned similar nature of work:

Tender Specification No. BHEL:PSSR:SAS:SER:SCT:VZ1117-098:T-04/08-09

Description	EMD
Handling at Site Stores / Storage yard, Transportation to Site of Work, Erection, Testing and Commissioning of Gas Turbine (frame VIB) ,Generator and its connected auxiliaries, balance of plants and piping including supply and application of final painting for unit 1 x 38 MW capacity Silk Road Sugars Private Limited, Kakinada, A.P.	Rs.2,00,000/- (Rupees Two Lakhs only)

Due date and Time for Submission : **20.05.2008** **15.00 Hrs.**

Date and time for opening Of Technical Bids : **21.05.2008** **11.30 Hrs**.

After opening of Technical bids , after ascertaining the submission of " **No Deviation Declaration** " by the bidders. Price bids of parties who have furnished no deviation declaration certificate only will be opened.

Sealed tenders, complete in all respects shall be submitted duly super scribing the tender specification no and name of the work duly addressed to the Addl. General Manager / Services After Sales Division at the above address. BHEL

SR. DEPUTY GENERAL MANAGER/CONTRACTS

TENDER SPECIFICATION :

BHEL:PSSR:SAS:SER:SCT:VZ1117-098:T-04/08-09

CERTIFICATE FOR NO DEVIATION

I,_____of

M/s_____

hereby certify that there is no deviation from the Tender conditions either technical or commercial and I am agreeing to all the terms and conditions mentioned in the Tender Specification.

SIGNATURE OF THE TENDERER

(Seal of firm)

OFFER OF CONTRACTOR Dt:

To,

Additional General Manager
Bharat Heavy Electricals Limited,
Power Sector – Southern Region
Services After Sales Division
39, Sarojini Devi Road,
Ek-Tara Building, Secunderabad – 500 003

Sir,

I/We hereby offer to carry out the work detailed in Tender Specification No.**BHEL:PSSR:SAS:SER:SCT:VZ1117-098:T-04/08-09** issued by Bharat Heavy Electricals Limited, Power Sector : Southern Region, SAS in accordance with the terms and conditions thereof.

I/We have carefully perused the following documents connected with the above work and agree to abide by the same.

1. Instructions to Tenderer
2. General Conditions of Contract
3. Special conditions of Contract
4. Other Section, Appendices and Schedules

I/We have deposited/forwarded herewith the Earnest Money Deposit/a sum of Rs.2,00,000/- (Rupee Two Lakhs only) vide DD.No. . Dt. which shall be refunded should our offer not be accepted. Should our offer be accepted, I/We further agree to deposit such additional sum which along with the sum of Rs.2,00,000/- (Rupees Two Lakhs only) mentioned above, make up the Security Deposit for the work as provided for in the Tender Specification within the stipulated time as may be indicated by BHEL, Power Sector : Southern Region, SAS, Secunderabad-500 003

I/We further agree to execute all the works referred to in the said documents upon the terms and conditions obtained or referred to therein and as detailed in the appendices annexed thereto.

DATE: CONTRACTOR:
PLACE: ADDRESS:

Witness with their address

Signature Name Address

PROJECT INFORMATION

01	**Owner**	**EID Parry India Limited**
02	**Project Title**	**Silk Road Sugars Private Limited 1 x 38MW**
03	**Location**	**Kakinada, East Godavari, A.P**
04	**Power Station Site**	**Elevation Above Mean Sea Level 2 M**
05	**Nearest Railway Station**	**Kakinada**
06	**Nearest City**	**Kakinada**
07	**Nearest Air port**	**Visakhapatnam**
08	**Nearest Sea Port**	**Kakinada**
09	**Road Approach**	**Available**
10	**Dry Bulb Temperature**	**35 deg C**
11	**Relative Humidity**	**75%**
12	**Ambient Range**	
	Min Ambient Temperature	**17 deg C**
	Normal / Average Temperature	**35 deg C**
	Maximum Temperature	**43 deg C**
13	**Design Wind Speed**	**As per 15-875**
14	**Seismic-Zone** **Importance Factor**	**Zone-III** **1.75**
15	**Distance**	**From Kakinada Railway Station to Site 15 Kms.**

GENERAL TECHNICAL SPECIFICATION

1.0.0 INTODUCTION

Silkroad Sugar Private Limited propose to put up a Captive Power Plant in Kakinada, Andhra Pradesh to meet the requirement for sugar refining of 2000 TPD initially, which will be later increased to 3000 TPD.

The Project comprises of a gas turbine based Captive Power Plant, consisting of One (1) Gas Turbine and Generator.

2.0.0 PROJECT DESCRIPTION

2.1.0 General

Silkroad Sugar Private Limited intends to install a new 38MW Gas Turbine based Captive Power Plant (hereinafter called "Project") in Kakinada, in the state of Andhra Pradesh. The objective of the Project is to cater to the steam requirement of the 3000 TPD Sugar Refinery. The power available after meeting it's internal demand may be sold to the State Electricity Board.

2.2.0 Scope of Present Project

The project shall include a (1) gas turbine generators to be located outdoor complete with all necessary auxiliary plant and equipment and auxiliary and ancillary buildings and associated infrastructure. The gas turbine generators will run on gas fuel with an option for liquid fuel.

2.3.0 Site Conditions

2.3.1 Site Location

The proposed project site is located closer to the Godavari Fertilisers and Chemicals near the town Kakinada, Andhra Pradesh

2.3.2 Access to the Site

Proper access to the site is available via State Highway and the site internal roads.

3.0.0 SCOPE OF WORK

The entire scope of work of the project is as stated below.

S. No.	Description	Part
1.	ONE NUMBER Fr 6B GAS TURBINES & ITS AUXILIARIES	A1
2.	ONE NUMBER GENERATOR (MATCHING FOR GAS TURBINE) AND ITS AUXILIARIES	A2
3.	TERMINAL POINTS	A3

Part- A1

SCOPE OF SUPPLY FOR FRAME-6B GAS TURBINE & AUXILIARIES

One number Frame-6B [PG6581B] Gas Turbine each of which is characterized by the following equipment and accessories except where mentioned otherwise:

1. Outdoor installed, Base mounted, single-shaft Frame-6B Split base, Gas Turbine and accessory compartment consisting of :

Accessory compartment consisting of:

- Diesel Engine starting system.
- Hydraulically operated, solenoid-valve controlled jaw clutch with automatic disengagement at turbine self-sustaining speed.
- Hydraulic torque converter
- Heavy duty, multi-shaft accessory gear box (OFE scope)
- Diaphragm type accessory coupling.
- DC motor driven hydraulic ratchet rotor turning device
- On-base Fuel system consisting of :
  - Gas Fuel System :
    - Stop/speed ratio valve & Control valve located in Gas Module
    - Piping, valves filters & necessary instrumentation etc.
    - 400 micron Gas strainer (mounted off-base)
- Interconnection wiring in rigid metal conduits.
- Base mounted terminal boxes.
- Closed, forced fed lubricating oil system including :
  - Shaft driven main oil pump
  - Full flow AC motor driven auxiliary lube oil pump
  - Partial flow DC motor driven emergency oil pump
  - Dual LO coolers (oil to water) (HE scope)
  - Dual filters with transfer valve for Lube Oil & Hydraulic oil systems
  - Dual filters with transfer valve for Trip oil system
  - Full flow AC motor driven auxiliary Hydraulic pump
  - Necessary piping, controls and instrumentation etc.
- Off-base Enclosure thermal & acoustic for Accessory compartment limiting near field noise level to 85 dBA @ 1.0 m laterally & 1.5 m elevation from GT enclosure
- Negative ventilation system
- Fire & Gas detection cum & monitoring system with CO_2 protection
- Necessary on-base piping
- Necessary on-base cables(power, control & signal), electrical equipment & instrumentation – suitable for Class-1, Division-2, Group-D
- Lighting in accessory compartment

Turbine compartment consisting of:

- Seventeen stage, axial flow, corrosion protected compressor

- Ten-chamber, reverse flow type combustion system with standard combustors with DM injection for NOx control to 42 ppmvd@ 15 % O2 for Gas firing
- 3-stage turbine with PLASMA GUARD coated first stage buckets
- Dual ignition system
- Vibration sensors (seismic type) with monitoring by GT Mark-VI panel
- Thermocouples for measuring critical turbine temperature (exhaust)
- Thermocouples for measuring bearing drain temperatures
- Boroscope openings
- Inlet and exhaust plenums
- Off-base Enclosure thermal & acoustic for Accessory compartment limiting near field noise level to 85 dBA @ 1.0 m laterally & 1.5 m elevation from GT enclosure
- Negative ventilation system
- Fire & Gas detection cum & monitoring system with CO_2 protection
- Interconnection wiring in rigid metal conduits.
- Base mounted terminal boxes.
- Necessary on-base piping
- Necessary on-base cables(power, control & signal), electrical equipment & instrumentation – suitable for Class-1, Division-2, Group-D
- Lighting in turbine compartment

2. Inlet Air Systems consisting of:

- Filter compartment with:
  - Self cleaning filter cartridges
  - Lighting and instrumentation
- Air processing unit
- Inlet ducting with silencer
- Transition piece from inlet ducting to inlet plenum
- Necessary structural supports

3. Exhaust Gas system consisting of:

- Exhaust duct till the expansion joint after the exhaust plenum

4. Walkways
5. Foundation hardware
6. Special tools & tackles (one set common for the project)
7. Off-base compressor cleaning and washing skid for off-line/on-line cleaning Boroscope kit (one number for the project)
8. Mobile Lube oil centrifuge - 1000 LPH
9. Lube oil drain pump (2 m3)
10. DM water injection skid (off-base) for NOx control consisting of single pump, stop valve & re-circulation arrangement etc.
11. Diaphragm type load coupling.
12. Load gear box between GT & Generator (OFE scope)
13. Interconnecting piping between BHEL supplied skids.

Part - A2

SCOPE OF SUPPLY FOR GT GENERATOR AND AUXILIARIES

Rating : 1 x Fr6B GTG, 11kV, 0.8p.f.lag., 3000 RPM
TG Type : TARI 800-24P

1. **Closed circuit air cooled Generator (VPI)** consisting of
   - Stator with output leads (3 phase + 3 neutral) taken out from top of the machine
   - Rotor suitable for Overhang BLE
   - Bearings, base frame, built in RTDs, space heaters
   - Side mounted air to water coolers with (n+1) cooler elements (HE scope)
   - Liquid leakage detector
   - Enclosure to limit noise level to 85dBA at 1m distance
   - Walkway
2. Overhang Brushless Exciter and PMG along with portable stroboscope.
3. Generator Auxiliary Compartment (GAC) comprising of CTs, PTs, LA&SP equpt and NGT with secondary loading resistor.
4. CO2 fire protection.

Part – A3

TERMINAL POINTS

A) BOP (Mechanical)

1 N.GAS: At the Gas Turbine Flange AT REQUIRED PARAMETERS& shall meet GT fuel spec. enclosed in offer (21atg, 5 Micron filtered, 28 Deg C min superheated
2 DM water at 1.0 atg at the inlet of compressor water wash skid, DM injection skid.
3 Cooling Water : Supply and return at GT & Generator Flanges
4 GT exhaust at expansion joint outlet after the exhaust plenum
5 All drains at skids & vents to safe height

B) BOP (Electrical) , C & I

1 11 KV Generator power at GAC terminals.
2 LT power : 415 V at GT MCC
3 UPS power at HMI station & Ignition transformer of Mark VI
4 220V/110V DC at Consumption points (Generator Control & Relay panels, AVR)

3.1.0 Mechanical

3.1.1 Gas turbine

One (1) no. Gas turbine synchronous generator (two / four pole three phase, 11 kV, 50 Hz, 0.8 pf) unit, with wound stator, rotor, built in RTDs and all other auxiliaries complete with, atleast including the following equipments.

- Gas turbine capable of firing on Natural gas.
- Air intake system & filtration complete with inlet screen, filters, air tight duct from filters to compressor inlet, outlet trash screen, sound attenuators, all controls & instrumentation necessary for safe control. A skid-mounted air-processing unit shall be provided to supply dry air for pulse cleaning of filter elements.
- Air compressor with anti-surge system
- Starting system consisting of Hydraulic coupled Diesel engine with auxiliaries and shut down system.
- Gas fuel combustion complete system with water injection for NOx abatement.
- All field piping within BHEL supplied equipment.
- Accessory drive gear box
- Main load gearbox
- Mounting System
- Hydraulic oil system comprising of main oil pump (turbine shaft driven) standby / start-up Rundown full duty auxiliary hydraulic oil pump (AC motor drive) complete with necessary filters, accumulators, piping etc.,
- Lubricating oil system complete with shaft driven main oil pump, AC motor driven auxiliary oil pump, Emergency rundown oil pump (DC motor driven), Oil coolers (2 x 100% duty) with online changeover, Oil storage & settling tank (complete with vents, vapor extraction fans, drain, fill line), controls, interlocks and instrumentation, alarms.
- Barring facilities as per manufacturers own design comprising of either Turning Gear system with an ac drive, or an Auxiliary Hydraulic Ratchet System. Provision of manually turning the turbine generator shall be available.
- One (1) number centrifugal oil purifier comprising of centrifuge, necessary piping, strainers, filters etc.
- One (1) number on-line / off line compressor-water wash system comprising of detergent & DM water tank, motor driven wash pump, motor driven detergent pump, interconnecting SS piping, etc. The water wash system shall be skid mounted & shall be provided with a weatherproof enclosure.
- Drain system with dirty oil drain collection tank, associated pipe works and transfer pump.
- Bolt tightening system of hydraulic type.
- Turbine shell & exhaust frame cooling system.
- Machinery equipment unit enclosures with insulation and ventilation, interior lighting etc.
- Integral Fire Detection & Protection System for the turbine enclosures.

- Interconnecting piping, valves etc.,
- Generator relay panel, generator control metering and synchronizing panel.
- Motor control centre for auxiliaries.
- One (1) set of generator neutral grounding equipment consisting of grounding transformer, secondary resistor, current transformer, disconnect isolator etc.
- 125V DC battery & battery charger for GTG auxiliaries.
- One (1) set of CT, P.T. and surge protection cubicle containing current transformer and potential transformer for metering / relaying systems, automatic voltage regulator system lightning arrestor and surge capacitors.
- Cabling between Supplier supplied equipment except HT cables.
- All drive motors, valve actuators / motors required for turbo generator.
- All the above ground earthing for all equipment supplied through this package.
- Local push button station for all motors supplied through this package.
- DC starter panel complete with resistor for DC motor auxiliaries required for turbine.
- Packing, Forwarding, Transport, Transit insurance etc.

3.1.2 Common equipment and services

- All control, measuring and monitoring equipment, to an extent at least in accordance with the corresponding descriptions of and additional instrumentation necessary for matching to specific designs of equipment and units.
- Drain tanks, interconnection piping instruments, controls etc.
- All necessary pipework fittings, expansion joints, valves, automatic actuators, safety devices, fastenings, etc.
- Foundations anchor tools, spring guides, embedded parts, base frame, bedplates, sole plates, shims, packers, supports, etc. for all equipment.
- All necessary insulation as required.
- All necessary painting, corrosion protection and preservation measures.
- Complete detailed labeling of all installations.
- Documentation.
- All necessary service platforms, stairs, ladders, for the complete Gas turbine generator area, together with all auxiliary equipment.
- All necessary noise prevention measures as required.
- Motor operated turbine drain valves with drain piping, hangers, orifices etc.
- All necessary couplings and coupling covers.
- All necessary venting, draining and emptying equipment
- All necessary safety measures
- One set of special tools and equipment for maintenance, inspection and repair in steel boxes including identification and operation instructions as well as equipment for balancing of the rotor, etc. Equipment necessary during inspections for storing dismantled parts for carrying out specific inspection work (for example lifting tackle, frames for storing rotors, etc.)

and one set of testing equipment necessary for adjusting specific device after maintenance.

- Complete electrical system including drive motors suitable for area specified, control panel, local push button stations, transformers rectifier set, power & control cables, cabling complete with supports, cable trays, glands, lugs, for the successful operation of the plant.
- All consumables such as lubricants, chemical, CO_2 for fire protection, etc. for the complete commissioning, tests on completion, performance guarantee test and reliability run for 15 days.
- Tapping points complete with isolation and all necessary instruments for performance testing.
- All standard equipment and accessories normally included in the supply schedule but not separately listed.
- One set of special tools and tackles

4.0.0 Battery Limits

All the Incoming & Outgoing lines / cables shall be terminated at the following points now referred as BL points:

4.1.0 Mechanical

- Natural Gas: At the Gas turbine Flange at the required parameters and shall meet the GT fuel specification.
- HSD (For GT starting Diesel Engine)
- Drains and vents: at GTG and other skids.
- Cooling Water: Supply and return at GTG Flanges
- DM Water: At DM injection skid & Compressor water wash skid.
- Expansion bellow at the exit end of exhaust plenum for HRSG connection
- Generator Power: at GAC terminals
- All Power: 415V, 220V AC, 125V DC & 110V/220V DC at consumption points
- UPS power at 1 station of Mark-VI
- All the control / Signal cable at skid / Field junction boxes

4.2.0 Electrical

- Generator terminals.
- Generator neutral grounding resistor panel terminal point.
- Terminals at PT & SP cubicles.
- At incomer of 415V MCC.
- At incomer of DC motor starter panel.
- Above ground earthing terminal.

5.0.0 GENERATOR

5.1.0 GENERAL

This specification covers the design, manufacture and supply of Generator, its auxiliaries, control and relay panel, motor control centre and associated equipment.

It is not the intent to specify completely herein all details of the equipment, nevertheless, the equipment shall be complete and operative in all respects and shall conform to the highest standard of engineering, design and workmanship.

5.2.0 SCOPE OF WORK

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

One (1) no. two / four pole three phase, 11 kV, 50 Hz, 0.8 pf synchronous generator complete with wound stator, rotor, built in RTDs and all other auxiliaries. It shall comprise of the following:

- One (1) no. brushless excitation system complete with pilot exciter, AVR with all accessories, cubicles, including associated cables. These cables shall include all the cables between AVR/Exciter/ PTSP cubicle.
- One (1) no. generator air cooling system (CACW) with coolers.
- Stator winding and bearing RTD's.
- All required space heaters.
- Generator relay panel, generator control metering and synchronizing panel.
- Motor control centre for auxiliaries
- One (1) set of generator neutral grounding equipment consisting of grounding transformer, secondary resistor, current transformer, disconnect isolator etc. including busduct connection from generator neutral to neutral grounding equipment.
- 125V DC battery & battery charger for GTG auxiliaries.
- One (1) set of CT, P.T. and surge protection cubicle containing current transformer and potential transformer for metering/relaying systems, automatic voltage regulator system lightning arrestor and surge capacitors.
- Cabling between Supplier supplied equipment except HT cables.
- All drive motors, valve actuators/motors required for turbo generator.
- All the above ground earthing for all equipment supplied through this package.
- Local push button station for all motors supplied through this package.
- DC starter panel complete with resistor for DC motor auxiliaries required for turbine.

ii. One set of special tools and equipment for maintenance and inspection in steel boxes including identification and operation instruction.

iii. Necessary erection hardwares and touch up paints.

SCHEDULE OF TECHNICAL DATA

A. MECHANICAL

EID Parry – Kakinada		**Name of the Supplier**
TECHNICAL DATA BY THE SUPPLIER		
SECTION : GAS TURBINE & AUXILIARIES SYSTEM	**Unit**	**Data**
General		
Manufacturer		BHEL
Model number		PG – 6581B
No. of units		1 (One)
Type		Heavy Duty
Parameters at Guaranteed Conditions - Natural Gas		**Base Load**
Output at generator terminal with power factor of 0.8	MW	36000
Water injection quantity	TPH	4.085
Heat rate for net calorific value	kJ/kWh	12200
NOx level in exhaust gas	ppm vd	50 (max)
Inlet air pressure drop	mmwc	114.3
Pressure ratio		12.2:1
Turbine exhaust gas pressure drop	mmwc	279.4
Max. noise level at a distance of 1 m	dBA	85
Layout Data		
Total size of gas turbine generator unit (l x w x h)	m x m x m	7 x 3.3 x 3.8
Weight of gas turbine generator		
a Gas turbine	kg	66000
b Electrical generator (Skid)	kg	90000
c Gas turbine Rotor	kg	11343
Gas turbine Air compressor		
Type of compressor		Axial
No. of compressor stages		17

EID Parry – Kakinada		**Name of the Supplier**
No. of compressor casings		2 Split Horizontally
Compressor speed	rpm	5163
Gas Turbine		
No. of stages		Three
Type of casing		Axial
Oil reservoir		
Total quantity of oil in the system	m^3	10.2
Capacity of the oil reservoir	m^3	8.7
Retention Time (Minimum)	min.	5
Oil reservoir tank Lining material		Epoxy Phenolic
Main Lube oil pumps		
Make		Part of Accessory Gear
Type		Positive Displacement - Gear
Capacity	m^3/hr	104.46 (1741 LPM)
Suction pressure	Kg/cm^2 (g)	1.72
Discharge pressure	Kg/cm^2 (g)	4.48
Auxiliary Lube oil pump		
Type/ make		Centrifugal – (Explosion Proof)
Mounting		Vertical
Capacity	m^3/hr	104.46 (1741 LPM)
Discharge pressure	Kg/cm^2 (g)	4.57
Rotational speed	rpm	2900
Drive motor rating type/make	HP	50

EID Parry – Kakinada		**Name of the Supplier**
Emergency lube oil pump (DC motor driven)		
Type/ make		Centrifugal – (Explosion Proof)
Number		
Capacity	m^3/hr	56.76 (946 LPM)
Discharge pressure	Kg/cm^2 (g)	
Speed	rpm	1750
Continuous motor rating	HP	10
Mounting		Vertical
Oil filters		
Type		Duplex
Nos. offered		Two
Filtration size	microns	5
Turning Gear or Barring system		Lube oil filter
Type/Make		Hydraulic Ratchet Mechanism
Barring speed	rpm	1/8 rev. / 3 minutes
Power required (if motor driven)	HP	0.75
Starting Device		
Type/Make		Diesel Engine with Torque Converter
Output rating	HP	600

SPECIFIED DESIGN DATA

	Silkroad Sugar - Kakinada		Min. Requirements
	GAS TURBINE & AUXILIARY SYSTEMS	**UNIT**	**DATA**
A	**Gas Turbine & Auxiliaries**		
1.0	**Mechanical**		
1.1.0	**General**		
1.1.1	Numbers required	No.	1(one)
1.1.2	Model No.		PG 6581B
1.1.3	Location		Outdoor
1.1.4	Thermodynamic cycle		Joule Brayton
1.2.0	**Compressor**		
1.2.1	Type		Axial flow
1.2.2	Casing type		Horizontally split
1.2.3	Inlet pressure of air	bar	Ambient
1.2.4	Inlet temp of air	°C	Ambient
1.2.5	Regenerator / Recuperator		Not required
1.2.6	Bleeding of air for turbine blade cooling		As Required
1.2.7	Bleeding of air for atomisation of liquid fuel		Not applicable
1.2.8	Variable inlet guide vanes		Required
1.2.9	Bleeding of air for purging intake air filters		Required
1.2.10	Surge control Supplier to indicate method)		Required
1.2.11	Compressor washing / Cleaning arrangements		Required.
1.2.12	Protective coating on discs and blades in hot end of compressor		Required
1.3.0	**Combustion Chamber**		
1.3.1	Type		Multican type / External silo type
1.3.2	Ignitor type / Numbers		HEA type / As per manufacturers standard
1.3.3	Flame detector Nos. and type	No.s	2 nos. (min.) ultra violet
1.4.0	**Gas Turbine**		
1.4.1	Application		To drive electric generator
1.4.2	Duty		Heavy duty / base load

	Silkroad Sugar - Kakinada		**Min. Requirements**
	GAS TURBINE & AUXILIARY SYSTEMS	**UNIT**	**DATA**
1.4.3	Installation		Outdoor
1.4.4	Operation class (As per BS3868/ISO3977)	hrs	Class D (Operating hours 6001 - 8760)
1.4.5	Capabilities for quick start up and load pick up		Required
1.4.6	Range (As per BS3868 / ISO 3977)		Range V
1.4.7	Capability of continuous operation of the gas turbine being connected to heat recovery steam generator		Required
1.4.8	Power required at generator terminals at site design ambient conditions	MW	36MW
1.4.9	Lowest ambient temperature corresponding to max. GT output to be considered for sizing of associated equipment such as Generator, Transformer, Breakers, etc.	°C	21
1.4.10	Critical speed of rotor		Must not be within the range of ± 20% of rated speed (RPM)
1.4.11	Design maximum speed of rotor		Greater than 1.10 times the rated speed
1.4.12	Noise level @ 1.0m from the equipment and 1.5m from the ground	dB(A)	< 85
1.4.13	Vibration (in any direction at the journals under all loads)		25 microns (max) (peak to peak)
1.4.14	Weather proof enclosure		Required
1.4.15	Acoustic enclosure		Required
1.4.16	Casing type		Horizontal split
1.4.17	Design pressure of turbine casing		1.25 times rated pressure
1.4.18	Method of cooling of turbine nozzles and blades		By bleeding air from compressor / manufacturer's standard
1.4.19	Method of cooling turbine casing		By external fans
1.4.20	Variable inlet guide vanes		Required
1.4.21	Protective coating on discs and buckets in hot end of turbine		Required
1.4.22	Turbine wash / cleaning		Not Required

	Silkroad Sugar - Kakinada		Min. Requirements
	GAS TURBINE & AUXILIARY SYSTEMS	**UNIT**	**DATA**
	arrangements		
1.4.23	Bearings		
	a) Type of radial bearing		Spherical / Journal
	b) Type of thrust bearing		Kingsbury or equivalent
1.4.24	Gas turbine shaft glands type		Labyrinth
1.4.25	Method of sealing labyrinth		By compressor air
1.4.26	Gas turbine shafts thrust indicator		Required
1.4.27	Mechanical bolt over speed trip provision		Required
1.5.0	**Air intake System**		
1.5.1	Location		Outdoor
1.5.2	Duty		Continuous
1.5.3	Weather proof protection		Required
1.5.4	Intake air filter type		Self-cleaning type
1.5.5	Expansion joints		Required
1.5.6	High pressure compressors for creating pulse of air through the filter		Not applicable. Bleed from GT compressor.
1.5.7	Silencer		Required
1.5.8	Quality of outlet air (dust content)		Less than 5 microns
1.5.9	Filter elements		Replaceable
1.5.10	Walkways, ladders and access for the filter elements		Required
1.5.11	Inspection doors for clean air plenum		Required
1.5.12	Intake air silencer		
	a) Location		Inlet air duct
	b) Material		Stainless steel / HDG perforated steel sheet
1.5.13	Acoustic insulation		Required
1.5.14	Expansion joint		
	a) Type		Elastic
	b) Material		Reinforced rubber
1.6.0	**Oil system**		
1.6.1	Type of oil		Mineral oil
1.6.2	Protection against fire hazard for oil piping around high temperature piping and around oil tank		Required to be provided by the Supplier
1.6.3	Type of oil purification system and nos. to be installed		One (1) no. of Centrifuge type

	Silkroad Sugar - Kakinada		**Min. Requirements**
	GAS TURBINE & AUXILIARY SYSTEMS	**UNIT**	**DATA**
1.6.4	Flow through purification equipment		15% of total lube oil in the system per hour
1.6.5	Mode of operation of oil conditioning equipment		As and when necessary as per Supplier's recommendation
1.6.6	Main Lube oil pump		
	a) Type of pump		Positive displacement
	b) Type of drive		Shaft driven (Supplier shall state the standard)
1.6.7	Auxiliary Lube oil pump		
	a) No. required		Two (2)
	b) Type of pump		Positive Displacement / Self priming
	c) Type of drive		AC motor driven
1.6.8	Main hydraulic oil pump		
	a) Type of pump		Positive displacement
	b) Type of drive		Shaft driven
1.6.9	Auxiliary hydraulic oil pump		
	a) Number required		1 (one)
	b) Type of pump		Positive displacement / self priming
	c) Type of drive		AC motor driven
1.6.10	Emergency oil pump		
	a) No. required		One (1)
	b) Type of pump		Positive displacement type
	c) Type of drive		DC motor driven
1.6.11	Oil cooler		
	a) Type		Lube oil / water heat exchanger
	b) Tube material		Admiralty brass
	Oil tank Electric heater to heat the oil in the tank during cold season		Required
1.6.12	Vapour extractors		
	a) No. required		Two (2)
	b) Type of drive		AC motor driven

	Silkroad Sugar - Kakinada		**Min. Requirements**
	GAS TURBINE & AUXILIARY SYSTEMS	**UNIT**	**DATA**
	c) Oil separators / mist eliminators		Required
1.7.0	**Turning gear / Ratchet Mechanism**		
	a) Type of drive for turning gear		AC motor or hydraulic turning drive
	b) Hand barring facility		Required
1.8.0	Lube Oil Filters		To be provided with standby element (Duplex type)

COMMON CONDITIONS OF CONTRACT

1.1 SCOPE OF WORK

1.1.1 The scope of contract includes handling, transportation to site of work, Erection, testing and commissioning, of Gas turbine (Frame) , Generator and its connected auxiliaries, Balance of plants and piping including supply and application of final painting for unit 1 x 38 MW capacity Gas Turbo Generator.

1.1.2 The Intent of this specification is to provide erection and commissioning services for execution of projects according to most modern and proven techniques and codes. The omission of specific reference to any method and equipment or material necessary for the proper and efficient services towards installation of the Plant shall not relieve the contractor from the responsibility of providing such services, facilities to complete project or portion of project awarded to him. The quoted rate shall deem to be inclusive of all such contingencies.

1.1.3 The contractor shall carry out the work in accordance with Instructions / drawings / specification / standard practices supplied by BHEL from time to time.

1.1.4 Provision of all types of labour, Supervisors, Engineers, watch and ward as required, tools and tackles as required, consumables as required under various clauses of tender specification for handling, transportation, erection, testing and commissioning. Tenderer is liable to arrange all necessary T&P except those being supplied by BHEL for use.

1.1.5 Proper out-turn as per BHEL plan and commitment.

1.1.6 Completion of work in time as per monthly erection plan which will be worked out to adhere to project completion schedule.

1.1.7 Good quality and accurate workmanship for proper performance of equipment. BHEL Site Engineer shall be the deciding authority with reference to quality requirement.

1.1.8 Preservation of all components at all stages of pre-assembly/ erection/ testing and commissioning is also covered in this scope of work.

1.2 FACILITIES TO BE PROVIDED BY BHEL

1.2.1 Minimum Open space for building of 1 No. temporary office shed / Storage shed will be provided by BHEL free of cost.

1.2.2 WATER

Water will be provided at one point free of cost nearer to the project site. Further distribution shall be arranged by the contractor at his own cost. For drinking purpose the contractor has to make his own arrangement at his cost.

1.2.3 ELECTRICITY

1.2.3.1 For construction purpose and for Contractor's office / stores shed electricity will be provided at one single point Free of cost nearer to the project site. Further distribution shall be arranged by the contractor.

1.2.3.2 BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variations in voltage / frequency or interruptions in power supply.

1.2.4 CONSUMABLES

Consumables like filler wires, electrodes, gas etc. are to be arranged by the contractor at his cost.

1.3 FACILITIES TO BE PROVIDED AND DEVELOPED BY THE TENDERER AT HIS COST.

1.3.1 It shall be the responsibility of the contractor to construct his own office shed, stores shed with all facilities like electricity, water, supply, sanitary arrangements in the area allocated to him for the purpose.

1.3.2 Distribution of water from the given single point to the required places shall be arranged by the contractor at his cost.

1.3.2 Any duty deposit involved in getting the Electricity shall be borne by the bidder. As regards contractors office shed also all such expenditure shall be borne by the contractor.

1.3.3 Distribution of electrical power from the given single central common point to the required places with proper distribution boards, approved cable and cable laying including supply of all materials like cables, switch boards, pipes etc. observing the safety rules laid down by electrical authority of the State / BHEL / their customer with the appropriate statutory requirements shall be the responsibility of the tenderer / contractor.

1.3.4 Necessary meters for recording consumption of power and water for cost calculation purpose and maintenance of the same during execution period shall be contractor's responsibility.

1.3.5 As there are bound to be interruptions in regular power supply power cut/loading shedding in any construction site due to inherent power shortage in Stage on this account, suitable extension of time if found necessary only by given and Contractor is not entitled for any compensation. It shall be the responsibility of the tenderer/contractor to provide, maintain the complete installation on the load side of the supply with due regard to safety requirements at site. It shall be responsibility of the contractor to have at least (2 to 4) diesel operated welding generator sets to get urgent and important work to go on without interruptions. The consumables required to operate the generators are to be provided by the tenderer at his cost. This may also be noted while quoting.

1.3.6 Adequate lighting facilities such as flood lamps, low volt hand lamps and area lighting shall be arranged by the contractor at the site of construction, contractor's material storage area etc. at his cost.

1.3.7 For the purpose of planning contractor shall furnish along with tender the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

1.3.8 On completion of work all the temporary buildings, structures, pipelines, cables etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the Contractor at his cost. In the event of his failure to do so BHEL will undertake such work and the cost of the same will be recovered from the Contractor including overhead charges. The decision of BHEL Engineer in this regard is final.

1.3.9 Depending upon the nature of work and availability of facilities locally, contractor may have to arrange for a temporary workshop for facilitating uninterrupted progress of work.

1.4 GASES

1.4.1 All required gases like Oxygen/acetylene/argon/Nitrogen required for construction purpose shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of those gases. Non-availability of gases cannot be considered as reason for not attaining the required progress of erection.

1.4.2 In case of improper arrangement of above gases, BHEL reserves the right to procure the same from any source and for issues made, recover the cost from the contractor's bill at the market value plus BHEL departmental charges. Postponement of recoveries is not permissible.

1.4.3 BHEL reserves the right to reject the use of any gas in case required purity is not maintained.

1.4.4 All the integral lube and control oil pipelines required TIG welding operations are to be purged with **Nitrogen gas / Argon gas** for the purpose of creating inert atmosphere in the pipelines during the process of TIG welding. Nitrogen, Argon gas required for this purpose shall have to be arranged by the contractor at his cost.

1.4.5 Monthly gas consumption reports are to be furnished by the Tenderer to BHEL for statistical purposes, every month.

1.5 ELECTRODES

1.5.1 All welding consumables for all works including TIG wires, electrodes, filler wires for HP welding are to be arranged by the contractor only.

1.5.2 All the required electrodes, filler wires, TIG wires as above are to be approved by BHEL. It shall be the responsibility of the contractor to obtain prior approval of BHEL before procurement regarding suppliers, type of electrodes etc. On receipt of the electrodes at site it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes batch No. date of expiry etc.

1.5.3 Storage of electrodes shall be done by the contractor in an air conditioned / controlled humidity room as per requirement.

1.5.4 All electrodes shall be dried in the electrode drying oven to the temperature and period specified by the BHEL Engineer before they are used in erection work and each HP Welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by the contractor.

1.5.5 All filler wires and electrodes shall be preserved by the contractor carefully to prevent deterioration of their properties. Special care shall be taken to preserve alloy steel and other special electrodes/filler wires. Contractor shall exercise maximum care in using these electrodes/filler wires to minimise wastage by maintaining a record of all usages.

1.5.6 In case of improper arrangement of procurement of above electrodes BHEL reserve the right to procure the same from any source and recover the cost from the contractor's first, subsequent bill at market value plus departmental charges of BHEL. Postponement of such recovery is not permissible.

1.5.7 BHEL reserves the right to reject the use of any electrodes at any stages if found defective because of bad quality, improper storage, date of expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.

1.6 TOOLS & TACKLES

1.6.1 T&Ps' and other facilities to be arranged by contractor are given in tender.

1.6.2 The Contractor shall be responsible for the safe and proper use of the equipments. Day-to-day maintenance and operation of the equipment shall be the contractor's responsibility and shall be as per instructions/standard practice of BHEL Engineer.

1.6.3 Any loss/damage to any or part of the above equipment shall be to contractor's account and the expenditures on these account will be recovered from contractor's bills in case contractor fails to make good the loss.

1.6.4 Necessary electrical/water/air connection required for operation of any of the above equipment shall be to Contractor's account.

1.6.5 Non-availability of any of the above equipment either due to breakdown / routine maintenance or due to distribution pattern of BHEL, shall not be quoted as reason for delay of work.

1.6.6 Regular utilization report of the above equipment shall be furnished by the contractor for cost analysis purpose.

1.6.7 The contractor shall return the T & P issued to him by BHEL in good working condition as and when so desired by BHEL (Completion or reduction in work load) for diversion for other work. If such return is delayed by contractor due to his fault without written consent of BHEL, hire charges as applicable according to BHEL policy will be levied from such time it was requisitioned by BHEL to the time of actual return and the amount so decided and arrived at will be recovered from the contractor's bill.

1.6.8 Excepting those indicated as BHEL supply, all the other T & P and instruments required for proper and safe handling, transportation, erection, testing and commissioning shall be arranged by the contractor and the quoted rates shall deem to include the same.

1.6.9 In the event of failure of contractor to bring necessary and sufficient T & P, BHEL may arrange for the same at risk and cost of contractor including transportation of the same from any of BHEL's other site and hire charges as applicable shall be deducted from the bidder's bill. Decision of BHEL in this regard is final.

1.6.10 All the T & P arranged by contractor including electrical connections wherein required shall be reliable / proven / tested and necessary test certificates to be submitted as per statutory rules of the State/Central Government in force from time to time.

1.6.11 Contractor shall have at all times experienced operators and technicians/ for routine and breakdown maintenance of the equipment. Any delay in rectification of defects will warrant to BHEL rectifying the defect and charging the cost to the contractor.

1.6.12 If at all any time it is noticed that contractor is not using any of the T & P or equipment properly according to the instructions of BHEL, BHEL will have the right to withdraw any and all such equipment and any cost due to this shall be contractor's account.

1.6.13 The T & P indicated in Appendix – VI would be issued only at stores and it shall be the responsibility of contractor to take the delivery from stores, transport the same to site and return the same in good condition after use.

1.6.14 All the T & P, lifting tackles including wire ropes, slings shackles and electrically operated equipment shall be got approved by BHEL Engineer before they are actually put on use. Test certificates should be submitted before their usage.

1.6.15 All instruments, measuring tools etc are to be celebrated periodically as per the requirement of BHEL and necessary calibration certificates are to be submitted to BHEL before use.

1.6.16 The contractor has to return the T & P in good working condition and cost of any replacement required has to be borne by the contractor

1.6.17 The crane operators arranged by the contractor shall be tested by BHEL before they are going to operate the crane.

1.6.18 Contractor shall take into consideration the above clauses and quote the rates as called for in the Rate Schedule.

1.6.19 For movement of cranes etc., it may become necessary to lay sleeper bed for obtaining leveled safe approach for usage of equipment. It shall be the responsibility of the contractor to lay necessary sleepers. The required sleepers are to be arranged by the contractor at their cost.

1.7 Cranes

1.7.1 Minimum T & P to be arranged by contractor

SlNo	**Description**	**Qty**
01	15T mobile crane	1
02	100 T or above capacity suitable crane with tested slings for GT, GTG, GT accessories skids	1
03	Hydraulic testing pump	1

1.7.2 BHEL will not provide any crane for the erection works . For all the above cranes operator, fuel and lubricants shall be arranged by the contractor at his cost. Operator arranged / Deployed for the above cranes shall be tested by BHEL before he is allowed to operate the crane. Contractor should arrange preferably tire mounted cranes since crawler crane is not permitted inside the project. If crawler crane is arranged the crane has to be moved only on wooden sleepers bed. Required wooden sleepers should be arranged by the contractor at his cost.

No EOT (Electrical Operated Traveling crane is envisaged in the regular project.)

1.7.3 It shall be the responsibility of the contractor to arrange for all other lifting equipment/plant and machineries other tools and tackles required for satisfactory completion of work. The contractor shall indicate the list of T & P proposes to use in the work along with his offer.

1.7.4 For the movement of cranes & trailors etc. of contractor (during material handling) it may become necessary to lay sleeper bed for obtaining safe approach for usage of equipment. It shall be the contractor's responsibility to lay necessary sleepers. Necessary sleepers shall be arranged by the contractor at his cost.

1.8 SUPERVISORY STAFF AND WORKMEN

1.8.1 The Contractor shall deploy experienced Engineers, Supervisors all the skilled workmen like High Pressure Welders (gas, TIG and arc) Carbon, alloy steel welders, Gas cutters, electricians, Riggers, Sarongs, Erectors, carpenters, fitters etc. in addition to other skilled semi-skilled and unskilled workmen required for all the works of handling and transportation from site storage to erection site, transportation, erection, testing and commissioning contemplated under this specification. Only fully trained and competent men with previous experience of the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserves the right to decide on the suitability of the workers and other personnel who will be employed by the contractor, BHEL reserves right to insist on removal of any employee of the contractor at any time, if they find them unsuitable and the contractor shall forthwith remove him.

1.8.2 The supervisory staff employed by the contractor shall ensure proper out-turn of work and discipline on the part of labour put on the job by the contractor and in general see that the works are carried out in safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL's client.

1.8.3 The Tenderer shall also furnish **DAILY & MONTHLY** report showing the number of employees engaged in various categories of work and a progress report of work as required by BHEL Engineer.

1.8.4 The work shall be executed under the usual conditions existing in major power plant construction and in conjunction with numerous other operations at site. The bidder and his personnel shall co-operate with other personnel and other contractors personnel working in site and proceed the work in a manner that shall not delay or hinder the progress of work as a whole.

1.8.5 The contractor's supervisory staff shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work, good workmanship and aesthetic finish are essential part of this contract. The contractor shall be responsible to ensure that assembly and workmanship conform to the dimensions and tolerances given in the drawings/instructions given by BHEL Engineers from time to time.

1.8.6 The contractor shall employ the necessary number of qualified and approved full time electricians at his cost to maintain his temporary electrical installation till the completion of work.

1.8.7 It is the responsibility of the bidder to carryout the work for achieving the target set by BHEL by working for 12 hours a day including holidays during erection and 24 hours continuously in shifts during commissioning and testing periods.

1.8.8 If the contractor or his workmen or employees shall break, deface, injure or destroy any part of a building, road, curb, fence, enclosure, water pipes, cables, drains, electric or telephone posts or wires, trees or any other property or to any part of erected components etc. The contractor shall make the same good at his own expense or in default BHEL may cause the same to be good by other workmen or by other means and deduct the expenses (of which BHEL's decision is final) from any money due to the contractor.

1.9 CIVIL WORKS

1.9.1 Foundations of all equipments and plants and necessary civil works shall be provided by BHEL. The dimensions of the foundation and anchor bolt pits shall be checked by the contractor for its correctness as per drawings. Further top elevation of foundations shall be checked with respect to bench mark etc. All minor adjustments upto 25 mm of foundation level, dressing, chipping of foundation surface enlarging the pockets in foundations and grouting of equipments etc. as may be required for the erection of equipment/ plants shall be carried out by the Contractor. All the

materials like cement, sand, gravel etc. and cleaning consumables shall also be arranged by the contractor at his cost. The required special cement CONBEXTRA-GP2 with necessary test certificates and expiry validity for grouting of turbine, generator shall be arranged by the contractor at their cost. The contractor should also arrange required nos. of mixing machines and vibrators at their cost.

1.9.2 The contractor shall ensure perfect matching of packer plates with foundation by dressing the foundation and between the packer plates and the base plate of structural column/equipment to the satisfaction of BHEL Engineer. Machining/matching of packer shall be carried out by the Contractor at his own cost.

1.9.3 The contractor shall arrange for grouting of foundation bolt holes of equipment and final grouting of equipment as per the drawings / specification or as advised by the Engineer or BHEL after preparing the foundation surface for grouting.

1.9.4 Contractor has to carry out the grouting as per the work instructions for grouting available at site.

1.10 SCOPE OF MATERIAL HANDLING

1.10.1 All the equipment furnished under this contract shall be received from the project stores, sheds / storage yards and transported to pre assembly area / erection site and stored in the storage spaces in a manner so that they are easily retrievable till the contractor erects them. While drawing / lifting material from BHEL / customer stores, contractor shall ensure that the balance / other materials are stacked back immediately.

1.10.2 While BHEL will endeavour to store/stack/identify materials properly in their open/closed storage yard/shed it shall be contractor's responsibility to assist BHEL in identifying material well in time for erection, taking delivery of the same in time following the procedure indicated by BHEL and transport the material safely to pre-assembly yard/erection site in time according to programme.

1.10.3 The contractor shall identify necessary supervisor/labour for the above work in sufficient quantity as may be needed by BHEL for areas covering their scope.

1.10.4 It shall be contractor's responsibility to arrange necessary cranes/tractors, trailor or trucks/slings/tools and tackles/labour including operators and load the materials/equipments on to transport equipment, move it to erection site/pre-assembly yard and unload the same at pre-assembly yard/erection site and the quoted rate shall include the same.

1.10.5 In the event of Contractor's inability to arrange in time any of the above equipment/T & P etc. BHEL shall provide the same on specific written request from contractor subject to availability of equipment of the normal hire charges of BHEL/Customer applicable from time to time and recoverable from contractor's subsequent months running bills.

1.10.6 All equipment so used by contractor shall be of proven quality and safe in operation as approved by the statutory authorities as per the law in force.

1.10.7 Any loss/damage to materials issued to contractor shall be made good by him or BHEL will arrange for replacement at cost recovery basis and decision of BHEL shall be final. Any loss/damage must be intimated to site in-charge of BHEL in writing within 24 hours of the occurrence.

1.10.8 All the surplus damaged, unused materials, package materials/ containers / special transporting frames, gunny bags etc. supplied by BHEL shall be returned to the BHEL Stores by the contractor immediately.

1.10.9 The contractor shall take delivery of the components and equipment and special consumables from the storage area after getting the approval of the BHEL Engineer on standard indent forms to be specified by BHEL. At periodic/intervals of work, complete and detailed account of the equipment so erected and electrodes used shall be submitted to the BHEL Engineer.

1.10.10 Open installation. Neither EOT nor any power house structure available at site for regular plant.

1.11 OTHER RESPONSIBILITIES OF THE CONTRACTOR

1.11.1 BHEL Engineers shall make out a plan for erection and the contractor shall arrange for labour force and tools and plants and consumables to suit the above plan and execute the work accordingly.

1.11.2 The contractor shall have total responsibility for all equipment and materials in his custody, stores, loose, semi-assembled, assembled or erected by him at site.

1.11.3 The contractor shall make suitable security arrangement including employment of security personnel to ensure the protection of all materials/equipments and works from theft, fire, pilferage and any other damage and loss.

1.11.4 The contractor shall ensure that the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipments are installed.

1.11.5 All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc. shall be used for unloading / handling of the equipments without the specific written permission of the Engineer. The equipments from the storage yard shall be moved to the actual site of erection/location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage for such equipments at site.

1.11.6 The work covered under this scope of work is of highly sophisticated nature requiring best quality, proven workmanship engineering and construction management. It should also ensure successful and timely commercial operation of equipment installed. The contractor must have adequate quantity of precision tools, construction aides in possession. Contractor must also have adequate trained qualified and experienced supervisory staff and skilled personnel.

1.11.7 All the necessary certificates and licenses required to carry out this scope of work are to arranged by the contractor then and there at no extra cost.

1.11.8 The Contractor shall take all reasonable care to protect the materials and work till such time the erected equipment has been taken over by BHEL/their client. Necessary suitable temporary fencing and lighting shall be provided by the contractor as a safety measure against accident and damage of property of BHEL. Suitable caution notices shall be displayed where access to any part may be deemed to be unsafe and hazardous.

1.11.9 The contractor shall be responsible for taking all safety precautions during the construction and leaving the site safe at all times. When the work is temporarily suspended he shall protect all construction materials, equipments and facilities from causing damage to existing property interfering with the operation of the station when it goes into service. The contractor shall comply with all applicable provisions of the safety regulations clean-up programme and other precautionary measures which the BHEL has in effect at the site.

1.11.10 The contractor shall be responsible for good house-keeping, neat stacking and arrangement of materials on the floors. The contractor shall also be responsible for periodic regreasing, reconservation of components like bearings and machined surfaces etc.

1.11.11 Contractor shall provide at his cost watch and staff round the clock for the safety of the equipment under erection in his stores at site.

1.11.12 All lifting tackles including wire ropes, slings, shackles etc. used by the contractor shall be got approved by BHEL Engineer at site before they are actually put on the work. It will be the responsibility of the contractor to ensure safe lifting of the equipment taking due precautions to avoid any

accidents and damage to other equipments and personnel. All piping shall be adequately supported and protected to prevent damage during handling and erection.

1.11.13 The contractor shall take delivery of equipment as received and handed over to him at site and make arrangements for verification of equipment maintain records and keep safe custody watch and ward of equipment after it has been received at site till these are fully erected, tested and commissioned and taken over by BHEL's client. The stolen/lost damaged goods shall have to be made good by the contractor at his own cost. Contractor should assist in claiming from the insurance to minimise his liability for the above.

1.11.14 The contractor shall carry out scrapping wherever required and machining of all the matching parts. The chipping of concrete surface to achieve the true contact as per specification between packers and the concrete is also covered in this scope of work. While on job care is essential to avoid too much of chipping and lowering of level.

1.11.15 All hangers, supports and anchors (Including concreting or welding) shall be installed as per drawing to obtain safe reliable and complete pipe installation as per instructions of BHEL Engineers.

1.12 WELDING, HEAT TREATMENT, RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

1.12.1. Erection of equipment involve good quality welding, dyepenetration test and heat treatment/Radiography work. Wherever required, 100% dye penetration test have to be carried out as per instructions of BHEL Engineer. Contractor's personnel Technicians along with labourers engaged should have adequate knowledge on the above works.

1.12.2. The contractor shall carry out the edge preparation of weld joints at site in accordance with details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting will be allowed only for edge preparation. Some extra lengths in various fabricated pipes given as erection allowance shall have to be cut and edges prepared to suit the site conditions at no extra cost.

1.13 DRAWINGS AND DOCUMENTS

1.13.1 The detailed drawing specification available with BHEL Engineers will form part of this tender specification. These documents will be made available to the contractor during execution of work at site.

1.13.2 One set of necessary drawings to carry out the erection work will be furnished to the contractor by BHEL. on loan which shall be returned to

BHEL Engineer at site after completion of work. Contractor's personnel shall take care of these documents given to them.

1.13.3 The data furnished in various appendices and the drawings enclosed with this Tender Specifications, are only for the guidance purpose and describes the equipment to be installed, tested and commissioned under this specifications. However, the changes in the design and in the quantity may be expected to occur as is usual in any such large scales of work.

1.13.4 Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimensions/details without specific approval of BHEL.

1.13.5 Should any error or ambiguity be discovered in the specification or information the contractor shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.

1.14 SITE CLEANLINESS AND SAFETY REQUIREMENTS

1.14.1 Contractor shall strictly follow all safety requirements/conditions as per clause 2.15.0 and its sub clauses of General Conditions of contract booklet enclosed with this tender, including specification of Health, Safety and Environment (HSE) management of customer / consultant.

1.14.2 Non-conformity of safety rules and safety appliances will be viewed seriously and the BHEL has right to impose fines on the contractors as under. BHEL Engineers decision is final and binding in this regard.

Sl.No	**Safety Measures**	**Fine (Rs.)**
01	Not wearing safety helmet	50/-
02	Not wearing safety belt	100/-
03	Grinding without goggles	50/-
04	Not using 24V supply for internal work	500/-
05	Electrical plugs not used for hand machines	100/-
06	Not slinging properly	200/-
07	Using damaged sling	200/-
08	Lifting cylinders without cage	500/-
09	Not using proper welding cable with lot of joints and not insulated properly	200/-

10	Not removing small scrap from platforms	200/-
11	Gas cutting without taking proper precaution or not using sheet below gas cutting	200/-
12	Not maintaining elec. Winches which are being operated dangerously	500/-
13	Improper earthing of electrical T & Ps	500/-

The contractor should exclusively deploy one safety Engineer along with a safety supervisor for effective implementation and co-ordination of safe working conditions

1.15.0 PROGRESS OF WORK

1.15.1 During the course of erection if the progress is found unsatisfactory or if the target dates fixed from time to time for every milestone are to be advanced or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians etc. employed are not sufficient, BHEL will induct required additional workmen to improve the progress or take over a part of the job and get it done on risk and cost of the contractor and recover from contractor's bill, all charges incurred on this account including all expenses together with BHEL overheads.

1.15.2 The progress reports shall indicate the progress achieved against planned with reasons indicating delays if any and shall give remedial action which the contractor intends to take to make good the slippage or lost time so that further works can proceed as per the original programme and the slippage do not accumulate and affect the overall programme.

1.15.3 The contractor shall submit daily, weekly and monthly progress reports manpower reports material reports consumables report and other reports considered necessary by the BHEL Engineer.

1.15.4 The manpower reports shall clearly indicate the manpower deployed categorywise daily specifying also the activities in which they are engaged. The periodicity of the reports will be decided by BHEL Engineer at site.

1.15.5 The contractor shall arrange for weekly progress review meeting with the "Engineers" at site during which actual progress during the week vis-a-vis scheduled programme shall be discussed for action to be taken for achieving targets. The programme for subsequent work shall also be presented by contractor for discussion. The contractor shall constantly update/revise his work programme to meet the overall requirements and suit the material availability.

1.15.6The contractor shall submit detailed advance monthly plan and the same has to forwarded by the first week of each month of discussion and finalization by 15th of the month which shall be basic document to be followed for the next month erection plan.

SPECIFIC REQUIREMENTS FOR ISO 9001 - 2000

1.16.0 IMPORTANT NOTE

Contractors shall ensure that all their Staff/Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on ISO 9002 Standards.

Contractors shall ensure that the Quality is maintained in all the works connected with this contract at all stages of the requirement of BHEL.

Contractor shall ensure that all Inspection, Measuring and Testing equipment that are used, whether owned by the contractors or used on loan, are calibrated by the authorized agencies and the valid calibration certificate will be available with them for verification by BHEL. A list of such instruments possessed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.

Contractors shall arrange for the inspection of the works at various stages as required by BHEL. Immediate corrective action shall be taken by the contractors for the non-conformances if any, observed and pointed out by BHEL.

1.17.0 INSPECTION / QUALITY ASSURANCE / QUALITY CONTROL STATUTORY INSPECTION

1.17.1 Various Inspection / quality control / quality assurance procedures/methods at various stages of erection and commissioning will be as per BHEL / Customer quality control procedure/codes and other statutory provisions and as per BHEL Engineer's instructions.

1.17.2Preparation of quality assurance log sheets and protocols with customer's Engineers, welding logs and other quality control and quality assurance documentation as per BHEL Engineer's Instructions, is within the scope of work / specification.

1.17.3 The protocols between contractor and customer/BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of Installation, generally as per the requirement of

Customer/BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.

1.17.4 A Daily log Book should be maintained by every supervisor/Engineer of contractor on the job in Duplicate (One for BHEL and one for Contractor) for detailing and incorporating Alignment/ clearance/ centering/Levelling Readings and Inspection details.

1.17.5 All the Important Measurements shall be recorded in the Daily Log Book with sketches based on BHEL Drawings indicating Readings / Measurements actually Taken and Signed by BHEL/Customer / Contractor Representatives.

1.17.6 Approval given by Customer / BHEL for welding, results and other tests of pressure parts etc. shall also be recorded in the log book, if applicable.

1.17.7 Welding Details like number of joints, welder's Name Date of welding, Details of Repair, Heat Treatment, Etc. will be documented in welding Logs as per BHEL Engineer's Instructions. Welder's Performance Record shall be furnished every month. The performance Report of Welders shall indicate the percentage of Repair for each welder, if applicable.

1.17.8 Heat Treatment details of Welds indicating minimum, Temperature Recorded, Heating Rate, Cooling Rate, soaking Time, Etc., shall also be Recorded and Documented by Contractor as per BHEL Engineer's Instructions. Welder's performance Record shall be furnished every month. The performance Report of Welders shall indicate the percentage of Repair for each welder.

1.17.9 All the Electrical/Technical Measuring and Testing Instruments/ Guages, Feeler Guages, Height Guages, Dial Guages, Micrometers, Levels Spirit Levels, Surface plates, straight Edges, vernier calipers and all measuring instruments shall be provided by the contractor for checking, leveling, Alignment, Centering etc of Erected Equipments at various stages. The Instruments / gauges / Tools etc. provided should be of Brand, Quality and Accuracy, specified by BHEL Engineer and should have necessary Calibration and other Certificates as per the Requirements BHEL Engineer.

1.17.10 Total Quality is the Watch Ward of the work and Standard, Procedures laid down by BHEL. You shall follow all the Instructions as per BHEL Drawings and Quality / Standards. Contractor shall provide for the services of quality Assurance Engineer.

1.17.11 The Welders performance will be reviewed from time to time as per the BHEL standards and any welders not performing to the Standards set by

BHEL Standards will be removed from working. Contractor shall arrange for the Alternate welders immediately, if applicable.

1.17.12 All the welders shall carry identity cards as per the proforma prescribed by BHEL only Welders Duly authorized by BHEL / Boiler Inspector / Consultant shall be engaged on the work.

1.17.13 Contractor shall ensure speedy alignment and welding of all Equipment erected by him after placement. Also all alignments, Welding, NDT Tests required for stage Inspection shall be completed as per Quality Assurance Procedures. All the Quality assurance procedures have to be complied with before effecting Gas turbine erection, Generator erection, Structural work, Dampers erection, Ducts erection, Trial Run of Equipment, Pre-commissioning and any other tests required to be conducted for completing erection and commissioning.

1.18.0 STAGE INSPECTION BY FES / QA ENGINEERS

1.18.1 Apart from Day-to-Day Inspection by BHEL Engineers stationed at site and also by Customer's Engineers, Stage Inspection of Equipment under Erection and commissioning at various stages of Erection and commissioning by TEAMS of Engineers from Field Engineering Services of BHEL's Manufacturing units and Quality Assurance Teams from Unit / Factory Quality Assurance Teams and Commissioning Engineers. Contractor shall arrange all labour, Tools and Tackles, etc. for such stage inspections free of cost.

1.18.2 Any modifications suggested by FES and QA Engineers Team shall be carried out. Claims of Contractor, if any shall be dealt as applicable.

1.18.3 Any minor rectifications or minor repairs of defective work found out during stage Inspection shall be rectified free of cost, by the contractor.

1.18.4 Any major Rectification or Major Repair / Major Rework of Defective work found out during stage Inspection verification / checking, but not attributable to contractor shall also be carried out. Claims of contractor if any, shall be dealt as applicable.

1.19.0 STATUTORY INSPECTIONS

1.19.1 The scope includes getting the approvals from the Statutory Authorities like Labour officers etc. This includes arranging for inspection visits periodically as per BHEL Engineer's instructions, submitting documents etc. and following up the matter with them.

HSE SPECIFIC REQUIREMENT

OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM

SUB CONTRACTOR TO ENSURE COMPLIANCE OF THE FOLLOWING **HEALTH** RELATED POINTS

01. Sub-contractor to identify nearest hospital for Health check up of his staff and workers and intimate BHEL site office & PSSR -SAS.

02. To arrange for occupational health check up / screening of contractor's staff and workers engaged in sub contracting activities. In this, category of workmen such as welders, gas cutters, grinders, radiographers, crane operators are to be given exclusive attention in respect of health screening.

03. Sub-contractor to arrange an ambulance vehicle or emergency vehicle on a continous basis to meet any emergency situation arising at site work in which his staff and workers are engaged.

04. To provide appropriate facilities for prompt first aid treatment of injuries and illness at work. One first Aider for each sub contractor to be provided. First Aider should undergo training on first aid.

05. To provide filtered drinking water at selected place in a clean container.

SUB CONTRACTOR TO ENSURE COMPLIANCE OF THE FOLLOWING **SAFETY** RELATED POINTS

01. Personnel protective equipment (PPES): Required number of following PPES (Confirming to Relevant is Standards) to be made available to workmen at site and ensured that they are used .
    - Helmet
    - Safety goggles
    - Welding face shields
    - Safety belts for working at heights
    - Safety shoes
    - Ear plugs
    - Rubber gloves and mats for low tension (I.T) electrical works
    - Gum boots & aprons
    - Other items as required by BHEL site

02. Sub contractor to liase with nearest fire station and inform contact telephone number and contact person to meet any emergency.

03. To provide appropriate fire fighting equipment at designated work place and to provide fire fighting training to selected persons in his group of workmen to meet emergencies.

04. To provide adequate number of 24 V power supply points to work in a constrained and enclosed space.

05 . All power tapping points / switch boards /power & control cabling should fulfill required electrical safety aspects as per relevant is standard.

06 ELCH's (Earth leak circuit breakers) at all electrical distribution points to be provided.

07. Red and white caution tape of proper width (1.5 to 2 inch) to be used for cordoning unsafe area such as open trench, excavated area, etc.

08. To provide sub-contractors company logo or clothing to all staff and workers for identification including identity cards with photographs approved by BHEL.

09. High pressure and structural welders to be identified with colour clothing and to display copy of welders certificate with photographs of welder at the work place. They also should be in possession of valid welding procedure.

10. To display safe handling procedure for all chemicals such as lube oil, grease, sealing compound, kerosene, diesel etc. At stores & respective work place.

11. Contractor should authorise a person at site to stop work if there is a unsafe work noticed as per his knowledge.

12. Fitness for use of erected scaffolding to be certified by the contractors approved scaffolder and the certificate should be displayed on the scaffolding itself. If the scaffolding is unsafe , the same will not be used. the certificate to be updated daily. The scaffolding to be made as per the relevant is standard.

13. For making platform on the scaffolding , proper thickness and size of the plank of required quality wood to be used. The safe working load of the platform to be displayed on the scaffolding itself. Proper use of platform to be explained to the user.

14. All plant equipment should have inspection report before put in to use.

15. All T&Ps should be of reputed brand and having quality certificates..

16. All IMTE's should have valid calibration certificate from recommended institution / testing lab and these should be in place.

17. All lifting tackle and plant equipment should have safe working load certificate.

18. The right worker should be deployed for right job and the resume of site in charge, supervisors, and key workers to be submitted before commencement of work..

19. Sub-contractor should submit inspection / testing matrix of all T&Ps and to be approved by BHEL.

20. Sub-contractor to display safety slogan, safety board, caution boards wherever required in consultation with BHEL.

21. Sub-contractor to provide gas detectors of reputed make at desired locations.

22. Sub-contractor to conduct emergency mock drills. one drill per 3 month and submit report to BHEL.

23. Safe handling and storing of all equipment with adequate space to be ensured.

24. Sub contractor to deploy safety supervisor till the completion of the project.

25. Sub contractor to comply the safety reporting procedure of BHEL as practiced at present and also additional requirements that may arise out of future improvements in the safety management system. This includes computation of safety indices such as frequency rate, severity rate & incident rate.

26. Sub contractor to identify probable emergency situations such as electric shocks to workmen , caving in of shored earth , fall from height, collapse of scaffolding fire etc., and should have clear action plan to overcome them. Sub contractor to take required guidance from BHEL in this regard.

27. Sub contractor to identify hazardous activities which he may carryout and should train his workmen in those activities with the relevant operation control procedures. Sub contractor to take required guidance from BHEL in this regard.

28. Safe work permit system to be followed while working in confined space / near electric systems.

SUB CONTRACTOR TO ENSURE COMPLIANCE OF THE FOLLOWING **ENVIRONMENT** RELATED POINTS

1. HOUSE KEEPING : Sub contractor to carry out daily house keeping of work areas / stores through a check list prepared in consultation with BHEL.

2. Sub contractor shall adopt pollution prevention / reduce /control approach in all his site activities. this shall include:

a. Transporting of oil / chemicals from stores to site safely without causing spillage. in case of any spillage, the area shall be cleaned and the remanant spilled oil disposed off to a safe place, identified for such disposal.

b. To use required containers / cans / safety gadgets /appliances for transporting and for usage of oil / chemicals at site.

3. Sub contractor shall arrange for segregation / collection of scraps and dispose off to the identified place meant for scrap collection.

4. Sub contractor to adopt good erection practices / procedures with the objective of reduction of waste generation / rework

OTHER HSE REQUIREMENTS TO BE COMPLIED BY SUB CONTRACTOR

1. Sub contractor to clearly understand and accept the HCE policy of PSSR with a commitment to comply the requirements of the policy.

2. Sub contractors to arrange for daily meeting of their supervisors and work force before they disperse for their daily planned activities where in the relevant health, safety and environment aspects of the job and use of PPES are explained

3. Sub contractor to conduct monthly HSE meeting (internal) and submit the report to BHEL.

4. HSE slogans to be displayed in a proper board – hoarding at designated places in consultation with BHEL.

5. Sub contractor to submit a structured programme for training & occupational Health Screening of their work force at site after the Award of LOI.

SPECIAL CONDITIONS OF THE CONTRACT

1.0.0 The scope of work under this specification covers, but not limited to the following:

1.0.1 Handling at site stores /Storage yard, transporting to site, inspection, preparation of foundation, erection, leveling, centering, alignment, grouting s& final alignment of Gas turbine, GT generator and auxiliaries, pre-assembly, erection, alignment welding, NDT, fixing hangers & supports, chemical cleaning/pickling, oil flushing, water flushing, hydro testing, & steam blowing of integral piping / oil piping, surface finish, supply & application of primer & finish paints including labeling on equipments, & piping, pre-commissioning, commissioning, trail operation & handing over of Frame VIB Gas Turbine & Generator Auxiliaries at Silk Road Sugars Private Limited, Kakinada.

1.0.2 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

1.0.3 Contractor shall erect all the equipments as per the sequence prescribed by BHEL at site. The sequence of erection and methodology will be decided by the BHEL Engineers depending upon the availability of materials, fronts and other in puts etc., No claim for extra payment from contractor will be entertained on the grounds of deviation from the methods of erection adopted in erection of similar GTG set in other places.

1.0.4 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management. The contractor should ensure successful and timely operation of equipment installed. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequate trained, qualified and experienced supervisory staff and skilled personnel.

1.2.0 TRANSPORTATION FROM STORES/ STORAGE YARD

1.2.1 Loading at BHEL/Customer stores and storage yard, transport to site, unloading at site/working area of equipment placement on respective foundation/location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall inclusive of the same. Required cranes for loading & unloading of materials will be in the scope of contractor. The contractor shall provide any

fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting of the components at site.

1.2.2 Contractor shall take delivery of the components and equipments from the storage area after getting the approval of BHEL Engineer on standard indent forms to be specified by BHEL. Complete and detailed account of the equipments erected as well as the progress shall be submitted to the Engineer as directed.

1.2.3 All the equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc., shall be used for unloading and/or handling of equipments with out the specific permission of BHEL Engineer. The equipment from the storage yard shall be moved to the actual site of erection /location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage/loss of such equipment at site.

1.2.4 Contractor shall plan and transport equipments, components from storage yard 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/work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area/site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.

1.3.0 ERECTION

1.3.1 Preparation of foundation: Providing necessary skilled and other labour to BHEL/Customer for checking of dimensional accuracy, axis, elevation, levels etc., with reference to bench marks of foundations and anchor bolts pits. Also adjustments of foundation level, dressing and chipping of foundation surfaces up to 25mm depth, as per BHEL Engineers instructions, should be done by the contractor as a part of work. Contractor should log before taking over the foundations for erection.

1.3.2 Contractor shall carry out scrapping and blue matching of embedment plates/packers of rotating equipments so as to achieve prescribed percentage of contact. Chipping and bedding of concrete surfaces, finely dressing up to the extent required to obtain contact between packer and concrete, is also covered in the scope of the work. The fine dressing of concrete shall be with Prussian blue matching checks.

1.3.3 BHEL will provide only shims and packer plates(either machined or plain), which will go as permanent parts of the equipment, at free of cost. Certain packer plates and shims over and above the quantity received as part of supplies from manufacturing units of BHEL, will have to be cut out from steel plates/sheets at site to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting or chiseling, grinding and filling

for de-burring the packers. However machining of the packers, wherever necessary, will be arranged by contractor as per the BHEL Engineer guidelines.

1.3.4 Packer plates should not only be blue matched with foundation but also inter-packer contact surfaces between the packers and foundation frame etc., shall also be blue matched by Prussian Blue match checks and required percentage contact shall be achieved by chipping and scrapping as per BHEL Engineers instructions.

1.3.5 Grouting of equipments is included in the scope of contractor. Cleaning of foundation surfaces, pocket holes and anchor bolt pits etc., de-watering, making them free of oil, grease, sand and other foreign materials by soda wash, water wash, compressed air or any other approved methods etc., form/shuttering work are within the scope this work. All grouting materials like cement, including special cements such as non-shrinkable free flow cements like Conbextra GP2 as approved by BHEL, shall be arranged by the contractor within his quoted rate.

1.3.6 Brief list of equipments/sub-assemblies to be erected by the contractor & approximate weight and size of individual heavy components are given in the appendices and is meant for giving general idea to the tender only about magnitude of the work involved. The components are sent in parts for convenient transportation. They are to be cleaned, assembled in stage by stage, welded, erected and aligned as per the drawing dimensions/tolerance and instructions of BHEL Engineers.

1.3.7 All the works such as cleaning, leveling, aligning, trial assembly, dismantling of certain 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, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work with in the quoted rate. Major machining work, which is only to be carried out in workshops, will be arranged by BHEL.

1.3.8 GTG is received in Skid mounted form in three main packages.

1.3.9 Air filter, inlet ducting, will be supplied in individual loose sections. Site job involves complete assembly, welding and erection.

1.3.10 Water wash skid shall involve welding of stainless steel pipe to and from skid. The piping shall be site routed.

1.3.11 Normally weld neck valves will have prepared edges for welding. It may be occasionally necessary to prepare new edges, re-prepare the edges to suit site conditions, which shall be done by the contractor at no extra cost. All fittings like elbows, tees, reducers, flanges, inserts etc., shall be matched with pipes for welding which may required re-edge preparation, grinding etc., The valves will have to be checked, lapped or overhauled in full or in parts before erection/after chemical cleaning/during commissioning. Experienced technicians shall be arranged by the contractor at his own cost.

1.3.12 For skid mounted equipment, the checking and re-alignment required at site is in the scope of work.

1.3.13 All rotating machineries and equipments shall be cleaned, lubricated checked for their smooth rotation, if necessary by dismantling and re-fitting before erection by the contractor. If, in the opinion of the BHEL engineer, the equipment is to be further checked at any stage of the work, necessary manpower, complete facilities for dismantling, cleaning & refitting, consumable, shall be provided by the contractor at no extra cost.

1.3.14 All the shafts of rotating equipment shall have to be properly aligned to those of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibration so as to avoid overheating of bearings or other conditions which may tend to shorten the life of the equipment.

1.3.15 All the equipments /material to be taken inside the plant building shall be cleaned thoroughly before taking them inside and erect. The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks, Rubber expansion joints assemble and other components as per instruction of BHEL Engineer during erection at the quoted rate. Necessary paints and consumables to be arranged by contractor.

1.3.16 Wherever equipments are supplied in pre-fabricated assembled packages, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor's scope.

1.3.17 All the bearings, Gearboxes etc., of the equipment and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the engineer for cleaning the bearing/gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing/lubricating them with recommended lubricants and assembling back. Lubricants will however be supplied by BHEL at free of cost.

1.3.18 The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered.

1.3.19 Certain instruments like pressure switches, gauges, air sets, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipments. Contractor shall dismantle such instruments and re-erect whenever required prior to commissioning. Some time this may have to be handed over to store or instrumentation contractor.

1.3.20 All the motors/pumps shall be stripped opened, thoroughly serviced with proper care and re-assembled properly before erection by the contractor. During servicing, pre-commissioning & commissioning, if any deficiency is observed the same should be taken up with BHEL Engineer at site and rectified at site without any delay.

1.3.21 All the oil & gas piping flanges, wherever provided are to be blue matched using surface plates for at least 80% contact area to attain leak proof of joints.

1.3.22 All the lubricant oil for flushing and during trail run of the equipment including first fill up, chemicals for detergent flushing, acid pickling/cleaning/trail run etc., will be arranged by BHEL at free of cost. Required manpower shall be provided by the contractor for handling, filling, emptying and re-filling etc., as part of the work without any extra cost, till the unit is handed over. Transportation of all the above shall be arranged by the contractor from BHEL store/yard to work site and returning of the empty barrels/drums to stores at their cost. Care should be taken to avoid any spillage/wastage.

1.3.23 The contractor shall also carry out erection, testing, and commissioning of the oil centrifuge with in their quoted rate.

1.3.24 Transportation of CO2 cylinders from the store and filling of Gas in their generator stator cooling systems, GT CO2 protection system etc., as and when required till the unit is commissioned and handed over shall be the responsibility of the contractor.

1.3.25 For other agencies, such CW piping, Cabling, instrumentation etc., to commence their work from/on the equipments coming under this scope, Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer. Some time it may be required to re-schedule the activities to enable other agencies to commence/continue the work so as to keep the over all project schedule.

1.3.26 All dimensions/elevations refers to centerline of pipe unless otherwise specified, the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per site engineer's advice.

1.3.27 All site-fabricated pipes will be issued in running metres as straight. These are to be cut and edge prepared at site to required length to suit layout as given in the erection drawing. All the attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing Necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor. Fittings like bends, tees, elbow, mitre bends, reducers, flanges etc., will be supplied as loose items.

1.3.28 Certain extra lengths of portions/parts of various site fabricated ducts/components parts/bellows/piping etc. are provided as erection allowance and they shall have to be cut to suit site conditions and layout or certain length of portions/parts of ducts/components/bellows/piping casing etc. may have to be added to suit conditions and layouts. No extra payment will be admitted for such works.

1.3.29 Erection of all the piping systems supplied along with equipments pumps and other auxiliaries covered in this contract, is to be erected by the contractor with in the quoted rate.

1.3.30 Carrying out piping as per the specification between equipments constituting terminal points, whether the terminal equipments fall with in the scope of work/specification, contractor shall carry out the terminal joints at either end. Also where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with- in the quoted rate.

1.3.31 Certain adjustments in length may be necessary while erecting pipelines of GTG & Auxiliaries and the contractor should remove the extra lengths/add extra lengths to suit the final layout after preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work.

1.3.32 Minor adjustment like removal of ovalities in pipes and opening or closing of the fabricated bends by process of heat correction or any other method approved by BHEL Engineer to suit the layout, with specified heat treatment procedure with in the quoted rate.

1.3.33 Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. For pipes below 2" diameter, shall be sponge cleaned with air flushing.

1.3.34 Contractor shall arrange all the equipments, alignment bolts, tools, consumables like welding electrodes (all type), TIG wires (all type) and argon gas cylinders etc. for welding of pipes at his cost. Consumables like jute, cotton waste, hacksaw blades, petrol, Kerosene oil etc. are in contractor's scope.

1.3.35 Contractor shall use only bolted clamps for achieving alignment of piping. Wherever "L" shaped stoppers and wedges are to be used for aligning piping and equipments, the same shall be subject to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., and not by hammer. Any burrs left on the equipments/piping, after welding, shall be ground off or any scar or cavity made good by welding and grinding. NDT tests shall be carried out if necessary to detect surface and sub-surface cracks in these ground areas.

1.3.36 Flame cutting of piping and other equipment shall be strictly done as per BHEL Engineer's instructions and in his presence only.

1.3.37 All piping have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position.

1.3.38 Suspension for piping etc. will be supplied in running lengths and shall be cut to suitable sizes and adjusted as required. Hangers components which are being supplied in loose shall be assembled at site and erected as part of the work.

1.3.39 In case of piping connected to equipment, matching of flanges for achieving the parallelism and alignment at equipment end by suitably resorting to heat correction or other method as instructed by BHEL Engineer is within scope of work.

1.3.40 The surface of the pipes to be joined shall be suitably prepared as per instructions of BHEL Engineers. Edge preparation shall be done by chamfering machine, whenever required and all welding surfaces must be cleaned thoroughly. All works due to the mistake of the contractor, shall be repaired / redone at contractor's cost. Instrumentation drains, stubs which are sent in loose from manufacturing units are to be welded at site as per BHEL Engineer's instructions.

1.3.41 Impulse piping wherever required for BHEL equipment is to be fabricated by the contractor including erection and welding of root valves as per the

instructions of BHEL Engineer. The required piping and root valves will be supplied by BHEL free of cost.

1.3.42 All the weld joints on equipments and piping shall be ground or filed after completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.,

1.3.43 Pipelines shall be cleaned off welding slag and burrs by hand files, wire brushes and flexible grinders wherever required and using cloth.

1.3.44 All piping items including pipes, valves, flanges, fittings etc. shall be supplied as commercially available. Hence Fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope.

1.3.45 Wherever elbows of 45 deg or any other angle are required, the same shall be cut from 90 deg. elbow supplied and used. No extra cost shall be paid.

1.3.46 The work on piping systems (air, water, oil, steam, gas etc.) will include laying, edge preparation, fixing and welding of the elbows/ fittings/ valves etc. welded on the lines, fixing and adjustment of supports/hangers/shock absorbers and carrying out all other activities/ works to complete the erection and also carrying out all pre-commissioning/ commissioning operations mentioned in the specification as per BHEL Engineer's instructions and/or as per approved drawings/ documents.

1.3.47 Flow nozzles, orifice, spray nozzles etc shall be mounted/ erected after chemical cleaning/flushing/or steam blowing at site.

1.3.48 Erection of flow switches, steam traps, filters, flow meters, other metering elements, flow orifices, flow indicators, control valves supplied either by BHEL or customer forming part of the system is in the scope of work. This will include collecting from BHEL/Customer stores, transport to site, suitably cutting the erected piping, cleaning, erection, welding, radiography and stress relieving and commissioning.

1.3.49 Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles/orifices/ metering elements fixed on piping as per the instructions of BHEL Engineer.

1.3.50 All drains/ vents/ relief/ escape/ safety valve piping to various tanks/ sewage/ drain canal/ flash box/ flash tank/ condenser/ sump/ atmosphere etc. from the stubs on the piping and equipments erected by the contractor is completely covered in the scope of work.

1.3.51 Contractor should fabricate bends at site from running meters of piping for the above and cut, edge prepare and lay the piping as per BHEL Engineer's instructions.

1.3.52 Cooling water line segmental bend is to be fabricated at site from the supplied pipes. The fabrication of segmental bends is to be carried out within the quoted rate. No extra payment will be made for fabrication of segmental bends.

1.3.53 The contractor has to fabricate stainless steel orifice plate within the quoted rate. No extra payment will be made for fabrication of above orifice plates. The required stainless steel plate will be supplied by BHEL.

1.3.54 Fixing / fitting / welding of thermo wells, stubs, hoses, tapping points, root valves and instruments etc. on different lines / equipments (which will be supplied by BHEL) is within the scope of work. Fixing of Pick-Ups, Probes & Accessories for vibration monitoring system is the scope of this specification.

1.3.55 Fixing and seal welding of thermo well plugs before hydro test 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 thermo wells after hydro test / steam blowing of lines as part of work.

1.3.56 Welding of all thermo wells, draft, pressure and temperature instrumentation points and all other instrumentation points on piping and auxiliaries and welding of thermocouple pads for permanent system as well as for performance guarantee test is in the scope of work.

1.3.57 The contractor shall also weld all thermo wells, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipment under scope of erection of this contract. All embedded temperature measuring elements provided in the bearings will have to be terminated at the junction box by the contractor. Thermo wells tapping point connections incorporated shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation all thermo wells and flow elements with branch pipes be installed and welded.

1.3.58 All instrumentation impulse lines up to root valves shall also be erected and welded by TIG welding only by the contractor within their quoted value.

1.3.59 Contractor has to fabricate and erect temporary spool pieces wherever required hue to non receipt of valves in time and after receipt of valves the spool pieces are to be replaced with regular valves at free of cost. For spool pieces materials will be supplied free of cost by BHEL.

1.3.60 The contractor shall conduct non destructive tests like radiography ultrasonic test for weld defects etc., ultrasonic test for finding thickness, dye penetrant tests, magnetic particle test etc. on weld joints, castings, valve bodies and other equipments etc. as per BHEL Engineer's instructions.

1.3.61 Plate/Pipe shoes for piping supports shall be fabricated at site by the contractor at no extra cost. Other supports namely Hangers, U-clamps etc. shall be supplied by BHEL duly bent and threaded. Assembly and necessarily cutting work etc. shall be carried out at site by contractor within the quoted rate.

1.3.62 Wherever hanger and support materials of piping are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the piping system on temporary supports to ensure the progress of work. The required structural steel materials will be issued on free of charges by BHEL, either from scrap/spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports.

1.3.63 All Operating/ Approach platforms, cross over, canopies, ladders etc., shall have to be fabricated from raw materials supplied by BHEL and erect as per instruction of BHEL, by the contractor with in the quoted rate.

1.3.64 Contractor shall be supplied with two extra blue prints of the layout & isometrics. Contractor to incorporate in one of the blue prints with red ink all the changes/deviations/alterations etc. carried out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.

1.3.65 All piping will be supplied in running metres, contractor has to cut and edge prepare as per the standards / drawings and as per the instruction of BHEL Engineer. The total number of edge preparation is approximately equal to the total number of joints indicated in the welding schedule. Contractor has to note this aspect and quote accordingly. No separate payment will be made for the edge preparation Standard fittings such as bends, Tees etc. will be supplied by BHEL for piping work.

1.3.66 Contractor has to carryout fabrication works such as welding of stubs / nipples, attachments etc, preparation of surface for rust preventive coating and application of rust preventive is within the quoted / accepted rate.

1.3.67 Contractor has to made fittings like bends etc. for pipe size less than 2” Dia at site within the quoted / accepted rate.

1.4.0 PRESERVATION / TOUCH UP PAINTING

1.4.1 Contractor shall carryout cleaning and preservation/ touch up painting as a part of erection work for the materials / equipments under this tender specification right from pre- assembly stage, during erection and after erection till the equipment is cleared for final painting, wherever deficiency in painting / rusting is noticed. The primer paint shall be matching shop primer. Required manpower, Primer and other Paints, other required consumables, T&P etc shall be provided by the contractor with in the quoted rate.

1.4.2 The contractor shall effectively protect the finished work from action of weather and from damage or defacement and shall cover the finished parts, then and there, for their protection.

1.4.3 Any failure on the part of contractor to carry out work according to above clauses will entitle BHEL to carryout the job though any other party and recover the cost from contractor.

1.5.0 HYDRAULIC TEST, PRE – COMMISSIONING & COMMISSIONING

1.5.1 Contractor at his cost shall lay all necessary temporary piping, install the pumps, blanks ,valves required for the test, pressure gauges etc. Required pipes, valves, plates etc., will be given by BHEL. Temporary piping, pumps, valves, flanges, blanks etc shall be removed by him and returned to BHEL.

1.5.2 Lube oil piping shall be flushed. Contractor will have to lay temporary piping to connects the entire system irrespective of whether the equipment/system connected has been erected by the contractor or not. Decisions of BHEL Engineer in this regard will be final and binding on the contractor.

1.5.3 Transportation of oil drums from customer's/BHEL's stores. Filling of lubricants and filling of oil for flushing and first filling and subsequent topping up during commissioning and post commissioning is included in the scope of this contract. The contractor shall have to return all the empty drums to the customer/BHEL stores. Similarly transport of chemicals for various pre-commissioning activities/processes mentioned in the above clauses and returning of remaining and/or the empty containers of the chemicals to customer/BHEL stores is the responsibility of the contractor.

1.5.4 Cleaning of oil tank as per the instructions of BHEL Engineer before and after oil flushing is responsibility of the contractor.

1.5.5 Replacing / changing mechanical / other seals of removal and cleaning / replacing of filters etc. during pre-commissioning / commissioning stage is within the scope of work.

1.5.6 Overhauling, cleaning, Servicing of tanks, pumps, equipments, barring gear, valves, governing system during erection and commissioning stages are in the scope of work. Gaskets packing for replacement will be provided by BHEL free of cost.

1.5.7 Pre commissioning of oil lines includes oil flushing of the pipelines till the entire system and the pipelines are accepted as satisfactorily cleaned after inspection of sediments in the centrifuge bowl and laboratory tests of the oil samples taken from the system. After declaration of complete oil flushing of system including oil tank and coolers shall be completely drained thoroughly cleaned and refilled with fresh oil for putting the set on operation. The contractor shall provide in three shifts requisite Man-power like skilled/semi skilled workmen during oil flushing as a part of this contract without any extra charges. Before commissioning of oil system the pipelines should be hydraulically tested using the hydraulic test pump to the required pressure.

1.5.8 Contractor shall lay all necessary electric cables and switches etc. required for the hydraulic tests and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.

1.5.9 The contractor as per BHEL requirements will suitably make preservation of cleaned surfaces. All shaft journals and bearings shall be periodically inspected and preservation will be done as per BHEL Engineer's instructions/BHEL quality instruction manuals.

1.5.10 The contractor shall carryout the required tests on the equipments and the pipelines such as gas tightness test/air tightness test, kerosene test, hydrostatic testing of the equipment/piping etc. and rectify all the defects caused due to contractor's fault at his own cost. Contractor may have to replace old/damaged gaskets / packing etc. for equipments and the same shall be carried out by contractor as per requirement. Compressed air for pneumatic testing is to be arranged by contractor. The contractor shall carry out the trial run of motors including checking the direction of rotation in the uncoupled condition checking aligning and coupling the motor to the respective driven equipment. Before starting the motor IR values of insulation shall be recorded and if found necessary dry out by the contractor to improve the IR value at no extra cost.

1.5.11 In case any erection defect is detected during various tests / operations trial runs as detailed above such as loose components undue noises or vibration strain on connected equipment steam or oil or water leakage etc. the contractor shall immediately attend these defects and take necessary corrective measures. If any readjustment and realignments are necessary

the same shall be done as per BHEL Engineer's instructions. If any part needs repairs rectification and replacement the same shall be done by the contractor at no extra cost. The parts to be replaced shall be provided by BHEL free of cost If insulation is to be removed to attend any of the defects the cost of removal and reapplication of insulation should be borne by the contractor.

1.5.12 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.

1.5.13 Transportation of CO2 cylinders from the plant stores and filling of gas in the generator stator cooling system as and when required till the unit is commissioned and handed over shall be the responsibility of the contractor.

1.5.14 The contractor shall carryout kerosene test of all the bearing housing of turbine and generator, bearing housing of pumps and other equipments and do the repair work if any. The contractor at his cost shall also arrange kerosene.

1.5.15 The contractor shall carryout any other test as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.

1.5.16 In case any malfunctioning and/or defect is found during tests/trials runs such as loose components, undue noise or vibrations, strains etc. on equipment, the contractor shall immediately attend to these defects/malfunctioning and take necessary corrective measures. If any readjustment and re-alignment are necessary the same shall be done as per BHEL Engineer's instructions as part of work at no extra cost.

1.5.17 During the stages of pre-commissioning / commissioning / post commissioning, if any part of the GTG, and auxiliaries need, repair/rectification / rework / replacement, the same shall be done expeditiously and promptly by the contractor.

1.5.18 During this period, though BHEL's and customer's staff 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 by the customer.

1.5.19 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. This contingency shall be included within the quoted value. During commissioning opening of

valves changing of gaskets attending to leakages minor modification rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower in all the three shifts. In case any rework is required because of contractor's faulty erection and which is noticed during commissioning the same has to be rectified by the contractor at his cost.

1.5.20 Contractor to provide necessary commissioning assistance from pre-commissioning stage onwards and up to continuous operation of Gas turbine, GTG and Auxiliaries. The category of personnel to be as per site requirement and to meet the various pre-commissioning and commissioning programmes made to achieve the schedule agreed with customer.

1.5.21 After synchronization, the commissioning activities will continue. It shall be the responsibility of the contractor to provide manpower including necessary consumables, hand tools and supervision as part commissioning assistance for a period of six months or till handing over of sets to customer, which ever is earlier.

1.5.22 It shall be specifically noted that the contractor may have to work round the clock during the pre-commissioning, commissioning and post-commissioning period along with BHEL Engineers and hence considerable overtime payment is involved. The contractor's quoted rates shall be inclusive of all these factors.

1.5.23 During commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously.

1.5.24 It is the responsibility of the contractor to provide necessary manpower, tools, tackles and consumable till the completion of work under these specifications including for trial operation, commissioning of GTG and the other equipments is delayed due to reasons not attributable to the contractor.

1.6.0 UTILITY POINTS

1.6.1 No of utility points (Service / plant air, service / plant water, service / washing steam, inert gas (N2) etc. shall be indicated in the P & I diagram. Contractor to locate the utility points as adviced by site engineer and shall route the piping to these points as per site conditions, and shall submit as built layout with B O M to BHEL for approval.

1.6.2 The utility points shall be located at convenient point to handle and to be terminated with brass / bronze valve with suitable connection for hose pipe.

1.7.0 PLATFORMS, CROSSOVERS & CANOPIES

Platforms, ladders crossovers for sleepers and canopies shall be fabricated by contractor at site as per site engineer's advice within the quoted / accepted rate. Platforms shall also be provided at places where it has not been shown in drawings but felt necessary by site engineer.

Canopies shall be provided for all out door pumps and motors.

1.8.0 AS BUILT DRAWINGS

Contractor shall be supplied with two extra blue paints of the layout & isometrics. Contractor to incorporate in one of the blue prints with Red ink all the changes / deviations / alterations etc carried out at site due to various reasons, with site engineer's endorsement. Marked up drawings shall be submitted to BHEL for approval.

1.9.0 WELDING DETAILS

For edge preparation of pipe / pipe fittings refer plant standard HY-062 05 99 and Drg. No. 3-0381033-00033 welding details for fillet welts. For welding details as electrodes, heat treatment and testing details refer the relevant standards.

1.9.1 INSULATION :

The insulation scope of GTG and its auxiliaries is minimum. The contractor has to carryout insulation of the following.

i. Diesel Engine exhaust
ii. Ducting Joints
iii. Duct with expansion joints

No insulation work of piping envisaged in this contract.

1.10.0 PAINTING

1.10.1 The scope of work shall include supply and application of final painting as required and specified for the components of Gas turbine, Generator and its auxiliaries, piping and enclosure.

1.10.2 All exposed metal parts of the Gas turbine, Generator and its auxiliaries and piping, structures, tanks vessels etc. shall be cleaned and Painted (Primer & final paint) as per the customer painting specification.

1.10.3 Required paints, thinner and other consumables like wire brush, cotton waste, Emery paper etc shall have to be arranged by the contractor at his cost.

1.10.4 If needed and insisted either by BHEL / Customer in certain cases spray painting has to be carried out within the Quoted rates.

1.10.5 Before commencement of final painting, contractor has to obtained written clearance from BHEL / Customer for surface preparation.

1.10.6 Contractor has to procure paints from the BHEL/ Customer approved agencies only, and the paints should be as per the customer painting specification.

1.10.7 Before applying the subsequent coats, the thickness of each coat shall be measured and recorded with BHEL/ Customer. The instrument for checking the thickness of the coat is to be procured by the contractor and should be calibrated after periodic intervals.

1.10.8 GI, Stainless steel, Brass, Aluminum, Copper and other non ferrous materials shall not be painted unless other wise specified.

1.10.9 The customer painting specification which forms part of the tender, and should be strictly followed.

1.11.0 TIME SCHEDULE

1.11.1 The contractor has to mobilise in all respects with in two weeks from the date of issue of Fax Letter Of Intent.

1.11.2 The entire work of erection, testing and commissioning of Gas Turbine & Generator with associated auxiliaries, turbine integral piping as detailed under this tender specifications shall be carried out and completed with in **six (06)** months from the date of actual commencement of work at site.

1.11.3 In case BHEL desires to advance the commissioning activities contractor has to complete all the works with in the quoted / accepted rate, to suit the advanced commissioning.

1.11.4 For the above purpose, the erection work shall be commenced as may be stipulated in the letter of intent and shall deemed to have been completed in all respect only when the unit is operation. The decision of BHEL in this regard shall be final and binding of the contractor.

1.11.5 During the total period of contract the contractor has to carryout the activities in a phased manner as required by BHEL and the program of milestone events.

1.12.0 TERMS OF PAYMENT

1.12.1 Gas Turbine - 25%

1.	Foundation preparation and soleplate grouting	2%
2.	Placement of Gas Turbine	6%
3.	Alignment of GT with Generator	4%
4.	Erection of GT base enclosure (incl. acoustic enclosures)	4%
5.	Erection of Lube oil & Gas Fuel module including LO centrifuge	4%
6.	GT vent fans & Exhaust frame cooler fans	2%
7.	GT CO2 Racks	1%
8.	Miscellaneous works on GT	2%

TOTAL (25%)

1.12.2 Ducting – 25%

1.	Inlet Filter Unit	6%
2.	Inlet Ducting inlet Silencer	2%
3.	Exhaust Diffuser	1%
4.	Exhaust Duct & By pass Duct	10%
5.	Support Structures	2%
6.	Dampers with Seal air fans	4%

TOTAL (25%)

1.12.3 Generator – 15%

1.	Preparation of Foundation and leveling of Base Plates & packers etc.	1%
2.	Erection of Generator Stator	5%
3.	Erection of L.G.B	2%
4.	Erection of starting means	2%
5.	Alignment of starting means and Generator	1%
6.	Erection of Generator cooling duct	1%
7.	Erection of Gen. and ACC module Co2 rack	1%
8.	PT, NGT,VT of Generator	1%
9.	Enclosure, Mist eliminator with blower & Miscellaneous Items	1%

TOTAL (15%)

1.12.4 Piping Works – 10%

Includes GTG Field piping and supports Gas piping, Naptha piping, Auxiliary cooling water piping, service water piping, instrument piping, service air piping, Nitrogen piping, DM vent piping, Water piping, drain piping and valves, fittings and supports for the above pipings.(Within GT Area.)	10%

TOTAL (10%)

1.12.5 BOP for GT – 10%

Skid, Drain Tank, Pumps, Strainers, centrifuge plant, Duplex filters & other connected equipments, GTG Enclosure as given in BOP weight schedule.	10%

TOTAL (10%)

1.12.6 Commissioning (5%)

1. Cranking of GT	1%
2. Full speed no load	1%
3. Synchronisation	1%
4. Completion of Trial Operation	2%

TOTAL (5%)

1.12.7 Completion of all works including supply & application of final painting.	3%
1.12.8 Submission of protocols / FQA checks and work completion certificate by BHEL, Submission and passing of final bill & materials reconciliation	2%

1.12.9 Field Quality Assurance formats: It is the responsibility of the contractor to collect and fill up the relevant FQA Log sheets/Welding logs & Heat treatment charts and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL in token of their acceptance. Monthly RB Payment to the contractor will be linked with the submission of these Log sheets.

1.12.10 The balance amount of 5% of the contract value will be paid after the guarantee period of 12 months is over separately. The guarantee period shall commence from the date of handing over of the set to customer or 6 months after date of successful completion of synchronization and full load whichever is earlier. Provided all erection, testing and commissioning works are completed in all respects. However the above 5% payment can be released against submission of a matching Bank guarantee from a nationalized / Schedule Bank guarantee in the prescribed Performa of BHEL valid for one year from the date commencement of guarantee period.

1.12.11 No levy or payment or charge made or imposed shall be impeached by reason for any clerical error or demanded or charged.

1.12.12 BHEL at discretion may further split up the above percentage and effect payment to suit the site conditions cash flow requirements according to the progress of work.

1.12.13 CONTRACTOR SHALL NOTE THAT THE FINAL BILL BE RELEASED ONLY ON PRODUCTION OF A CERTIFICATE ISSUED BY SITE IN CHARGE THAT THE CONTRACTOR HAS FULFILLED ALL THE CONTRACTUAL / STATUTORY REQUIREMENT.

1.13.0 EXTRA CHARGES FOR MODIFICATION AND RECTIFICATION WORK

a) BHEL may consider payment for extra works on man day basis for such of those works which require major revamping / rework/rectification/ modification which is totally unusual to normal erection or commissioning work which are not due to contractor's faulty erection.

b) The decision of BHEL in this regard shall be final and binding on the contractor. The contractor may submit his work claim bills (Specifically agreed by BHEL Engineer) along with the labour sheet duly certified by BHEL Engineer at site. But BHEL also got the option to get these work done through other agencies if they so desire.

1.13.1 All the extra work, if any, carried out should be done by a separate gang which should be identified prior to start of work for certification, of man hours. Daily labour sheets should be maintained and should be signed by contractor's representative and BHEL Engineer. Signing of the labour sheets does not necessarily mean the acceptance of extra works. Only those works which are identified as not usual to normal erection and certified so by the Project Manager, and accepted by designer/supplier or competent authority only will be considered for payment.

1.13.2 The decision of BHEL in this regard shall be final and binding on the contractor.

1.13.3 The following man hour rates will be applicable for modification/ rectification work.

1.13.4 Average single man hour rate including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, including consumables for carrying out any rework, re-vamping as may arise during the course of erection Rs.40/- man hour.

1.13.5 Average single man hour rate including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals excluding consumables for carrying out any rework/revamping as may arise during the course of erection Rs.25/- per man hour.

1.14.0 EXTRA WORK DOES NOT INCLUDE

1.14.1 Nominal dressing of foundations, holes, bases, nuts and bolts, in case of abnormal conditions, this can be mutually discussed before starting of such work.

1.15.0 Extra works are broadly defined as below:

Design changes which will be intimated to the contractor after the start of erection and same refers to dismantling of erected components rectification of components which have been received in damaged conditions during transit, rectification of components wrongly manufactured at work, any other works which do not fall in the scope of this contract.

1.15.1 The decision of BHEL in this regard shall be final and binding on the contractor.

1.16.0 OVER RUN CHARGES

1.16.1 Incase due to reasons not attributable to the contractor, the work gets delayed and completion time gets extended beyond **Six (06) months** from the date of commencement of the work, the contractor shall not be entitled for any over run compensation (ORC) for a period of first **Two (2) months** after the expiry of **Six (06) months**. Incase of ORC arise the same will apply at **Rs.30,000/- (Rupees Thirty Thousand only)** per month for extension of the completion period beyond **08 (06+02) months** as stated above duly taking into account the balance work at the end of that period.

1.16.2 The period of overrun will have to be ascertained before the commencement of grace period.

1.16.3 During the period of over run targets will be fixed on month to month basis, which have to be adhered. In case of any shortfall due to the reasons attributable to the contractor, ORC amount will be proportionately reduced.

1.16.4 The payment of overrun charges for extended stay for reasons not attributable to contractor will be subject to achieving the monthly programme of work as mutually agreed upon during the extended stay.

1.17.0 PRICE ESCALATION

1.17.1 The quoted / accepted rate have to be kept firm for the entire contractual period including total extended period if any and no claim for revision of rates is allowed under any circumstances.

1.17.2 However the contractor shall maintain sufficient work force and other resources required for completion of the job expeditiously for the entire contractual period including total extended period.

1.18.0 TAXES

1.18.1 This unit being in SEZ, is exempted from all taxes and duties and the owner shall furnish necessary documentation to the contractor to avail the exemption.

Price is exclusive of all taxes, duties, (viz. Customs Duty, works contract tax, VAT etc), levies, octroi, entry tax etc on finished goods as well as Raw material and components.

If charged, all these taxes duties, levies are payable extra at actual by OWNER.

The price mentioned in this contract is firm but is subject to statutory variation and imposition/ levy of taxes duties etc.

1.18.2 Not withstanding the fact that this is only an erection service contract not involving any transfer of materials whatsoever and not attracting any sales tax liability, being labour oriented job work, for the purpose of Sales Tax the contractor has to maintain the complete data relating to the expenditure incurred towards wages etc. in respect of the staff/workers employed for this work as also details of purchase of materials like consumables, spares etc., interalia indicating the name of the supplier, address and ST Registration No. and ST paid and should furnish to BHEL at the year end.

1.18.3 The contractor has to register under local Sales Tax-Law and get assessed. The contractor has to give a certificate each year that the returns and submitted regularly and the turnover on this contract is included in his

sales tax return. The sales tax registration number and certificate is to be furnished at site soon after the award of contract. However in case delay is anticipated in obtaining S.T. Regn.No. a copy of application for registration filed with ST authorities shall be submitted along with first running bills and the ST Regn.No. will be submitted within a reasonable time.

1.18.4 The final bill amount would be paid only after submission of proof of inclusion of the turnover of this contract in the ST Returns or ST Clearance certificate. The ST deduction at source will be made from running bills, unless necessary exemption is produced.

1.19.0 IMPORTANT CONDITIONS FOR PAYMENT

It may be noted that the first running bill will be released only on production of the following.

i. PF Regn. No.

ii. Labour Licence No.

iii. Workmen Insurance Policy No.

iv. Un Qualified Acceptance for Detuiled L.O.I.

v. Initial 50% Security Deposit.

vi. Rs. 100/- Stamp Paper for Preparation of contract agreement

1.20.0 PROVIDENT FUND & MINIMUM WAGES

1.20.1 Your are required to extend the benefit of Provident Fund to the labour employed by you in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, you are hereby required to get yourself registered with the Provident Fund authorities for the purpose of reconciliation of PF dues and furnish to us the code number allotted to you by the Provident Fund authorities within one month from the date of issue of this letter of intent. Incase you are exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of your failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to us by the customer or paid to statutory authorities by us, such amount will be recovered from payments due to you.

1.20.2 The contractor shall ensure the payments of minimum labour wages to the workmen under him as per the rules applicable from time to time in the state.

1.20.3 The final bill amount would be released only on production of clearance certificate from PF/ESI and labour authorities as applicable.

1.21.0 SERVICE TAX

This unit being in Special Economic Zone(SEZ), is exempted from all taxes and duties and we shall furnish necessary documentation to the contractor to avail the exemption. In case in exemption can not be availed the taxes and duties shall be reimbursed extra at actuals.

TAXES , DUTIES , LEVIES

Refer to clause 2.8.4 of General Conditions of Contract in this regard.

NEW LEVIES / TAXES

Incase the Government imposes any new levy / tax after award of the work, BHEL shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy / Tax is applicable to this contract.

1.22.0 OTHER STATUTORY REQUIREMENTS

1) The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no along with the **first** running bill.

2) The contactor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI contribution with Challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.

3) The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. Incase of "Non-compliance of Sec 21 or non-payment of wages" to the workmen before the expiry of wage period by the contactor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.

4) The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workmen under I D Act 1948, copies of Form 6-A(Annual Return of PF Contribution) along with Copies of PF Contribution Card of each member under PF Act and

copies of monthly return on ESI Contribution – Form 6 under ESI Act1948 (If applicable) to BHEL along with the Final Bill.

5) In case of any dispute pending before the Appropriate authority under I D act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.

In case of any dispute prolonged/pending before the authority for the reasons not attributable to the contractor, BHEL reserves the right to release the final bill of the contractor on submission of Indemnity bond by the contractor indemnifying BHEL against any claims that may arise at a later date without prejudice to the rights of BHEL.

SCOPE AT A GLANCE - SITE FACILITIES

APPENDIX I
BHEL:PSSR:SAS:SER:SCT: VZ1117-098:T-04/08-09
Frame VI B GTG Erection
PROJECT : Silk Road Refinery Limited
RATING: 1 X 38 MW GTG Plant Unit – 1

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
1.1.0	**ESTABLISHMENT**			
1.1.1	**FOR CONSTRUCTION PURPOSE:**			
A	Open space for office	Yes	--	
B	Open space for storage	Yes	--	
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	
1.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
A	Open space		Yes	
B	Living accommodation		Yes	
1.2.0	**ELECTRICITY**			

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
1.2.1	Electricity For construction purposes **(to be specified whether chargeable or free)**			
1.2.1.1	Single point source	Yes	--	Free of cost.
1.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	
1.2.2	Electricity for the office, stores, canteen etc of the bidder which include:		Yes	
1.2.2.1	Distribution from single point including supply of materials and service		Yes	
1.2.2.2	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	
1.2.2.3	Duties and deposits including statutory clearances for the above		Yes	
1.2.2.4	Living facilities for office use including charges		Yes	
1.2.2.5	Demobilization of the facilities after completion of works		Yes	
1.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc on the above lines.(**in case BHEL provides this facility, the scope should be given without ambiguity)**		Yes	
1.3.0	**WATER SUPPLY**			
1.3.1	**For construction purposes:**			
1.3.1.1	Making the water available at single point	Yes		Free of cost
1.3.1.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.3.2	**Water supply for bidder's office, stores , canteen etc**			

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
1.3.2.1	Making the water available at single point	--	--	
1.3.2.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.4.0	**TRANSPORTATION**			
1.4.1	For construction purposes:		Yes	
1.4.1.1	For the site personnel of the bidder		Yes	
1.4.1.2	For the bidder's equipments and consumables (T&P, consumables etc)		Yes	
1.5.0	**LIGHTING**			
1.5.1	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	
1.5.2	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	
1.5.3	Providing the necessary consumables like bulbs, switches, etc during the course of construction		Yes	
1.5.4	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
1.6.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
1.6.1	Telephone, fax, internet, intranet, e-mail etc		Yes	
1.7.0	**COMPRESSED AIR SUPPLY**			

Sl.No	Description PART I	Scope / to be taken care by		Remarks
		BHEL	Bidder	
1.7.1	Supply of Compressor and all other equipments required for compressor and compressed air system including pipes, valves, storage systems etc		Yes	
1.7.2	Installation of the above system and operation and maintenance of the same .		Yes	
1.7.3	Supply of the all the consumables for the above system during the contract period		Yes	

SCOPE AT A GLANCE - SITE FACILITIES
APPENDIX – I

BHEL:PSSR:SAS:SER:SCT:VZ1117-098:T-04:08-09
Frame VI B GTG Erection
PROJECT : Silk Road Refinery Limited
RATING: 1 X 38 MW GTG Plant Unit – 1

Sl.No	Description PART II	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.1.0	Engineering works for Construction :			
2.1.1	Providing the erection drawings for all the equipments covered under this scope	Yes		
2.1.2	Drawings for construction methods	Yes		
2.1.3	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	
2.1.4	Shipping lists etc for reference and planning the activities	Yes		
2.1.5	Preparation of site erection schedules and other input requirements	Yes	Yes	
2.1.6	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes		
2.1.7	Weekly erection schedules based on Sl No 2.1.5		Yes	
2.1.8	Daily erection / work plan based on Sl No 2.1.7		Yes	
2.1.9	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 15 days.		Yes	
2.1.10	Preparation of preassembly bay		Yes	
2.1.11	Laying of racks for gantry crane brought by the contractor/bidder himself		Yes	
2.1.12	Arranging the materials required for preassembly		Yes	

Note : * All the tools and plants required for this scope of work, except the Tools & Plants provided by BHEL are to be arranged by the contractor within the quoted rates. The list is suggestive in nature. Any additional T & P required to be arranged by the contractor.

Sl.No	Description PART II	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.0	SUGGESTED LIST OF TOOLS AND PLANTS (BHEL should indicate the proposed number of items considered as free issue)			
2.2.1	15 T mobile crane One No. (1)	---	Yes	
2.2.1	18/20 T tyre mounted crane one			
2.2.1 A	8T Escort crane			
2.2.1	30T gantry crane	--	--	
2.2.2	15 T gantry crane	--	--	
2.2.3	10T gantry crane	--	--	
2.2.4	30T tractor trailor	--	--	
2.2.5	20T trailor	--	Yes	
2.2.6	10 T trailor / truck	--	Yes	
2.2.7	Electrical winches 15 T with / wire ropes			
2.2.8	Electrical winches 10T with / without wire ropes		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.9	Electrical winches 5 T with / without wire ropes			
2.2.10	Electrical winch 3 T with or without wire rope			
2.2.11	Electrical winches with/without wire ropes			
2.2.12	Pneumatic winches 1 T with / without wire rope			
2.2.13	Welding generators			
2.2.14	Welding rectifiers			
2.2.15	Welding transformers air cooled			
2.2.16	Welding transformers oil cooled			
2.2.17	Chain pulley block 10T			

Sl.No	Description PART II	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.18	Chain pulley block 5 T		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.19	Chain pulley block 3T			
2.2.20	Chain pulley block 1T /2T			
2.2.21	Pulling & lifting machines 5T			
2.2.22	Pulling & lifting machine 3T			
2.2.23	Pulling and lifting machine 2T / 1T			
2.2.24	Multi sheave pulley block 200 T (4) Drum Lifting			
2.2.25	Multi sheave pulley block 100 T			
2.2.26	Multi sheave pulley block 50T			
2.2.27	Multi sheave pulley block 30T			
2.2.28	Multi sheave pulley block 20T			
2.2.29	Multi sheave pulley block 5T			
2.2.30	Single sheave shackle pulley blocks 20T			
2.2.31	Single sheave shackle pulley block 10T			
2.2.32	Single sheave shackle pulley block 5 T			
2.2.33	25 V transformer with sufficient spare bulbs			
2.2.34	Gas cutting torches with regulators			
2.2.35	Torque wrench			
2.2.36	Pipe vice			
2.2.37	Bench vice			
2.2.38	Anvil			
2.2.39	Baking oven for welding electrodes			
2.2.40	Portable drying oven for baked welding electrodes			
2.2.41	GQA grinding machine			
2.2.42	FF2 grinding machine			
2.2.43	Angle grinders AG7			
2.2.44	Tig welding sets			

Sl.No	Description PART II	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.45	Air conditioners 1.5 T			
2.2.46	Sheet bending machine			
2.2.47	Sheet rolling m/c			
2.2.48	Sheet grooving m/c			
2.2.49	Pedestal drilling m/c			
2.2.50	Drilling m/c 31 mm			
2.2.51	Drilling m/c 20mm			
2.2.52	Drilling m/c 10 mm			
2.2.53	Hand drilling m/c 6 mm			
2.2.54	D shackles 30 T			
2.2.55	D shackles 20T			
2.2.56	D shackles 15 T Drum lifting			
2.2.57	D shackles 10T			
2.2.58	D shackles 5T/3T			
2.2.59	Wire rope sling 6x36 12mmx6m		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.60	Wire rope slings 12mmx10m			
2.2.61	Wire rope slings 16mmx4m			
2.2.62	Wire rope slings 16mmx6m			
2.2.63	Wire rope slings 16mmx10m			
2.2.64	Wire rope sling 19mmx15 m			
2.2.65	Loose wire rope 16mm			
2.2.66	Loose wire rope 19 mm			
2.2.67	Loose wire rope 25mm			
2.2.68	Loose wire rope 32mm			
2.2.69	Wire rope clamps for the above sizes sufficient quantity			
2.2.70	Manila ropes of sufficient quantity in different sizes			
2.2.71	Hydraulic jacks 100T 6Nos.			
2.2.72	Hydraulic jacks 50T			

Sl.No	Description PART II	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.73	Hydraulic jacks 25 T		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.74	Hydraulic jacks 10T			
2.2.75	EOT cranes in TG hall Handling arrangement in TG Hall			Not envisaged by customer.
2.2.76	Sleepers both wooden and concrete for movement of cranes at site			
2.2.77	Concrete blocks for pre assembly works at site			
2.2.78	15 T snatch pulley blocks Drum lifting			
2.2.79	Hydro test pump 250 bar			
2.2.80	Hand operated hydro test pump			
2.2.81	Pressure gauges 100 bar			
2.2.82	Stress relieving / preheating equipments including transformers, controllers, heating pads and insulating materials and consumables			
2.2.83	Hydrauli pipe bending machines to suit up to 80mm dia and 11 mm thick			
2.2.84	Electric driven pipe chamfering machines up to 100 mm dia tubes with necessary cutting tools and other consumables			
2.2.85	Electric driven pipe chamfering m/c to suit pipes from dia 100 mm to 500/600 mm			
2.2.86	Theodolite 1 min accuracy			
2.2.87	Dumpy level			
2.2.88	6 point temp. recorder			
2.2.89	Radiographic equipments with suitable isotopes/ x ray machines			

Sl.No	Description PART II	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.90	MPI test kit			
2.2.91	Ultrasonic flaw detector			
2.2.92	Dye penetrant test kits (as required)			
2.2.93	Dip lorries			
2.2.94	Rails and sleepers for dip lorries, both supply and installation			
2.2.95	Calibrated steel tapes of different sizes			
2.2.96	Plumb bobs			
2.2.97	Micro meters of different sizes both inside and out side			
2.2.98	Vernier calipers of different sizes			
2.2.99	Surface plate			
2.2.100	Straight edges of different lengths			
2.2.101	Feeler gauges of different lengths			
2.2.102	Inside and out side calipers			
2.2.103	Dial gauges with magnetic base			
2.2.104	Magnifying glass			
2.2.105	Piano wires			
2.2.106	Precision water level micrometer		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.107	Parallel blocks			
2.2.108	Taper wedges			
2.2.109	Micro jacks			
2.2.110	Lead wires			
2.2.111	Dial bore micro meter			
2.2.112	Thermo meters of different ranges			
2.2.113	Depth gauges			
2.2.114	“GO & “NO GO” gauges			

Sl.No	Description PART II	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.115	Drill sets			
2.2.116	Taps and die sets			
2.2.117	Spirit levels			
2.2.118	Master spirit level			
2.2.119	Spring balance			
2.2.120	Hg manometer			
2.2.121	Vibro meter			
2.2.122	Noise level meter			
2.2.123	Litmus paper			
2.2.124	Portable gas purity meter			
2.2.125	Dead weight tester			
2.2.126	Temp bath for calibration			
2.2.127	250V/500V megger			
2.2.128	½.5/5.0 KV motorised megger			
2.2.129	Ammeter and voltmeters			
2.2.130	HV test kit			
2.2.131	Double Kelvin Bridge			
2.2.132	DC bridge			
2.2.133	Mano meters			
2.2.134	Auto transformers		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.135	CT(100/5A)			
2.2.136	Purge test kits			
2.2.137	Multi meters			
2.2.138	Variac 3phase 10 A			
2.2.139	Phase sequence meter			
2.2.140	Dual beam osciloscope continuity tester			
2.2.141	Rheostats			
2.2.142	Milli seconds syn timer			
2.2.143	Ultra violet recorder			
2.2.144	Tong tester			
2.2.145	Hardness tester			

Sl.No	Description PART II	Scope / to be taken care by		Remarks
		BHEL	Bidder	
2.2.146	Reamers of various sizes			
2.2.147	Vacuam cleaner			
2.2.148	Sand blasting machine with accessories			
2.2.149	Spray painting equipments			
2.2.150	Oil filtration units			
2.2.151	Bearing pullers of different sizes			
2.2.152	Bearing scrappers			
2.2.153	Slip gauges			
2.2.154	Elko meter to measure paint thickness			
2.2.155	MIG welding machines			
2.2.156	Files of different sizes			
2.2.157	Socket wrenches			
2.2.158	Spanner and pipe wrenches sets			
2.2.159	Hammers of different sizes both soft and hard			
2.2.160	Allen keys sets		TO BE ARRANGED BY THE BIDDER AS PER SCOPE OF WORK	
2.2.161	Fire proof tarpaulins			
2.2.162	Steel scaffolding materials			
2.2.163	Pipe cutters			
2.2.164	Magnetic base for drilling machines			
2.2.165	Vibrator for grouting			
2.2.166	Mixing machine for grouting and concreting			
2.2.167	Tube expanding machine ie drives – hydraulic or pneumatic ( )			
2.2.168	Tube expanders – both for expansion and flaring			
2.2.169	Mercury plumb bob			
2.2.170	Band saw machines			
2.2.171	Copper rods			
2.2.172	Needle vibrators			
2.3.0	All consumables including :			
	Ordinary cement		Yes	
	Grouting cement		Yes	
	Any special cement		Yes	
	Sand, bricks etc		Yes	

Sl.No	Description **PART II**	Scope / to be taken care by		Remarks
		BHEL	**Bidder**	
	Tig wires	Yes	--	
	Electrodes		Yes	
	Brazing rod, flux etc		Yes	
	Soldering		Yes	
	DA, oxygen, argon		Yes	
	Nitrogen required for chemical cleaning	Yes		
	Nitrogen required for construction		Yes	
	Supply of Preservative paints and thinner etc. for preservation of components		Yes	Application & arrangement of brushes, cleaning materials etc by bidder.
	Supply of Final Paints including thinner, brushes, cleaning materials etc and application for final painting, as per specifications		Yes	
2.4.0	**WELDING**			
2.4.1	All welding works		Yes	
2.4.2	All radiography and other testing works like DPI, MPI, UT,		Yes	
2.4.3	To submit the welders to BHEL/client's approval (preproduction test) before putting them on regular work. Required materials for preproduction test to be arranged by BHEL.		Yes	
2.4.4	The accessories required for the welders to be arranged by the bidder		Yes	

SCOPE AT A GLANCE - SITE FACILITIES

APPENDIX – I

BHEL:PSSR:SAS:SER:SCT: VZ1117-098:T-04:08-09
Frame VIB GTG Erection

PROJECT : Sugar refinery Project
RATING: 1 X 38MW GTG Unit – 1

Sl.No	Description PART III ERECTION TESTING & COMMISSIONING	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.1.0	**SCOPE OF WORK**			
3.1.0.1	Handling at site stores/ storage yard		Yes	
3.1.0.2	Transportation within the site		Yes	
3.1.0.3	Erection testing & commissioning		Yes	
3.1.0.4	Final painting of erected materials including supply of paints, thinners etc		Yes	
3.1.0.5	Carrying out P.G. test	Yes		
3.1.1.0	**HANDLING & TRANSPORTATION**			
3.1.1.1	Stores/storage yard to preassy area/ erection site		Yes	
3.1.1.2	Pre assembly area to site of installation		Yes	
3.1.1.3	Erection site to pre assembly area / stores/ storage area if required		Yes	
3.1.1.4	Touch up painting wherever required till final painting.(please refer the relevant clause for supply of paints, thinners etc)		Yes	
3.1.1.5	Preparation storage at site for proper stacking of materials	Yes	Yes	
3.1.2	**ERECTION TESTING & COMMISSIONING**			
3.1.2.1	Erection drawings/ documents/ working instructions etc	Yes		

Sl.No	Description PART III ERECTION TESTING & COMMISSIONING	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.1.2.2	Welding schedules	Yes		
3.1.2.3	Engineering drawings for construction methods	Yes		
3.1.2.4	Organising the resources required for erection, testing &commissioning of the materials covered under the scope and executing the work as per instruction of BHEL engineer		Yes	
3.1.2.5	Final painting of all the materials erected		Yes	
3.1.2.6	Demobilization of the erection site		Yes	
3.1.2.7	Cleaning of / upkeep of erection / preassembly /storage areas		Yes	
3.1.2.8	Return of excess materials drawn to BHEL stores/ customer		Yes	
3.1.2.9	Reconciliation of all the consumables, T&P drawn from BHEL / customer ' s store		Yes	
3.1.2.10	Filling up quality log sheets		Yes	
3.1.2.11	Providing all temporary arrangements like platforms, scaffoldings etc for execution		Yes	
3.1.2.12	Assistance for P.G test		Yes	
3.1.3	**CIVIL WORKS**			
3.1.3.1	Taking over of foundations		Yes	
3.1.3.2	Checking, chipping and correcting final dimensions of the foundations if required		Yes	
3.1.3.3	Placement, erection of embedded parts integral for the scope of work and coordination with customer's civil/other agencies for embedments		Yes	
3.1.3.4	Bolt grouting with grout as specified		Yes	
3.1.3.5	Final grouting of all the equipments covered under this scope		Yes	

Sl.No	Description PART III ERECTION TESTING & COMMISSIONING	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.1.4	**STATUTORY CLEARANCES**			
3.1.4.1	Labour license		Yes	
3.1.4.2	Provident fund		Yes	
3.1.4.3	Insurance what ever comes under bidder's scope		Yes	
3.1.4.4	Workmen compensation		Yes	
3.1.4.5	Minimum wages		Yes	
3.1.4.6	Sales tax		Yes	
3.1.4.7	Local laws governing the works like electrical inspectorate, factory inspectorate, etc		Yes	
3.1.4.8	Professional tax		Yes	
3.1.4.9	Safety rules and regulations		Yes	
3.1.4.10	Approval from competent authority for installation like IBR etc		Yes	
3.1.5	**SUBMISSION OF REPORTS**			
3.1.5.1	Man power deployment category wise and area wise		Yes	
3.1.5.2	Deployment of tools and plant , area wise		Yes	
3.1.5.3	Consumables used		Yes	
3.1.5.4	Erection log		Yes	

Sl.No	Description PART III ERECTION TESTING & COMMISSIONING	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.1.5.5	Erection data PGMADU wise		Yes	
3.1.5.6	Data on joints welded as per log sheet/ welding schedule		Yes	
3.1.5.7	Materials management reports as per instruction of BHEL		Yes	
3.1.5.8	Meeting between BHEL and bidder at BHEL office every day for monitoring the progress	Yes	Yes	

APPENDIX – II

BHEL: PSSR:SAS:SER:SCT: VZ1117-098:T-04/08-09

Silk Road Sugars Pvt Ltd – Kakinada - 1 X 38 MW GTG

LIST OF EQUIPMENT TO BE ERECTED, EXCLUSIONS

A. Equipment for One No. – Frame – VI B Gas Turbine & Auxiliaries –includes the following

1. **Base mounted, single shaft Frame- VI B Gas turbine and accessory compartment consisting of:**

- Axial compressor
- Combustion system with standard combustor
- 3- Stage turbine
- Heavy duty, multi-shaft accessory gear
- Diesel Engine starting system
- Diaphragm type accessory coupling
- DC motor driven hydraulic ratchet rotor tuning device
- On- Base Fuel system consisting of
- Shaft driven fuel pump with stop & bypass valves
- Main atomizing air compressor (Shaft driven)
- Starting belt driven air compressor
- Atomizing air pre-cooler
- Flow divider
- Piping, valves, filters & necessary instrumentation etc
- Boro scope openings
- Closed, forced fed lubricating & Hydraulic oil system including:
- Shaft driven main lube oil pump
- Full flow AC motor driven auxiliary lube oil pump
- Partial flow DC motor driven Emergency lube oil pump
- Dual lube oil coolers (oil to water)
- Dual filters with transfer valve for lube oil & Hydraulic oil system
- Dual filters with transfer valve for trip oil system
- Full flow AC motor driven auxiliary hydraulic oil pump
- Necessary piping , controls and instrumentation etc.
- Inlet and Exhaust plenums
- Negative ventilation system
- Fire Gas detection cum & monitoring system with CO2 protection
- Necessary on – base piping

2. **Inlet Air System consisting of :**

- Filter compartments with self cleaning filter cartridges, lighting & instrumentation
- Air processing unit
- Inlet ducting with silencer
- Transition piece from inlet ducting to inlet plenum
- Necessary structural supports

3. Diaphragm type Load coupling
4. Skid mounted Load Gear Box between GT & Generator
5. **Internally insulated Exhaust Gas system (side Exhaust) consisting of :**
- Expansion joints
- Exhaust ducting
- Necessary structural supports
6. Walkways
7. Lube oil drain pump (2m3)
8. DM water injection skid (off-base) for Nox control consisting of 2X100% Pumps with motors.
9. Water wash skid.

B. Generator and its auxiliaries

1. GT Generator
- Skid mounted generator and bearing
- Exciter
- Enclosure
2. CO2 system
3. Drain tank
4. Centrifuge
5. Mist Eliminator

C. Package enclosure for Gas Turbine , Generator

The scope is only indicative but not exhaustive

D. Exclusions

1.) Off-base gas system including, Piping, flaring, gas conditioning skid, flow metering device, safety shut off and vent valves, field interconnecting piping.
2.) DM Water supply system & piping (for NOx control and online water washing)
3.) Cooling water supply system for GT requirement
4.) All field piping. Utility supply systems.
5.) Auxiliary Cooling Water System
6.) All utilities supply systems.
7.) EOT Crane / Mobile crane etc.
8.) Plant fire protection system (Except GT & Gen. CO_2 protection)
9.) All main and auxiliary transformers including generator transformer, station transformer alongwith protections & controls.
10.) 11Kv circuit breakers incl. GCB etc.
11.) Black start Diesel Generator.
12.) HT Cables
13.) All power, control, field cable trays and accessories.
14.) Electrical system studies.
15.) Underground earthing.
16.) HAZOP study

17.) UPS
18.) Lightning protection materials
19.) Plant illumination and communication.
20.) Safety equipments like rubber mats, danger boards etc.
21.) Exhaust emission monitoring system
22.) All civil works incl. pipe racks, trenches, foundations, buildings etc.

APPENDIX – III

BHEL PSSR :SAS:SER: SCT: VZ1117-098:T-04/08-09

Silk Road Sugars Pvt Ltd 1 X 38 MW GTG

DESCRIPTION OF FRAME – VI B – GAS TURBINE

FLANGE TO FLANGE DESCRIPTION:

Multi stage axial-flow compressor with position inlet guide vanes. The compressor is constructed to individually rabbetted discs held with through bolts. The blades in the first 8 stages of the compressor are Ni-Cd coated for corrosion protection.

A reverse-flow multiple chamber combustion System is utilized. Dual retractable spark plugs and dual flame detectors are a standard part of the combustion system with crossfire tubes connecting each combustion chamber. Transition pieces take the hot gas to the first stage nozzle. The nozzle is air-cooled to reduce metal temperatures.

The buckets are designed with long shanks to isolated the turbine wheel rim from the hot gas path, precision cast buckets are used for each turbine stage with the second stage incorporating an integral tip shround. Additional protection includes PLASMAGUARD coating on the first stage buckets. Compressor discharge and extraction air is used to cool the turbines wheels.

The turbine and compressor casings are horizontally split for case of inspection and maintenance. Boroscope holes are located in the turbine, combustion and compressor section to facilitate visual inspection.

LUBRICATION SYSTEM:

The lubricating provision for the turbines and accessory gear are incorporated in a common lubrication system.

The system is vented to atmosphere and includes the following equipment:

Main lubrication oil pump (shaft-driven from the accessory gear)

Oil reservoir integral with turbine base

- Full flow AC Motor – Driven Auxiliary lubrication oil pump.
- Partial – flow DC motor – driven emergency lubrication oil pump.

- Full – flow AC motor – driven auxiliary hydraulic oil pump.
- Pressure relief valve in the main pump discharge
- Dual lubrication oil to coolant finned U-tube heat exchanger.
- Dual, full-flow, five micron filters with transfer valve for lubrication and trip oil systems plus dual 0.5 micron filters for hydraulic oil system (replaceable cartridges are used for each filter)
- Bearing header pressure regulator.

Instruments for control, indication and protection of the lubrication oil system as follows:

- Temperature indicating gauge for bearing header temperature
- Provision for thermocouples in turbine bearing drains
- Permissive – start temperature switch
- Bearing header high temperature alarm and trip switches
- Bearing header low pressure alarm and start switches
- Auxiliary and emergency pump stop and start switches
- Tank mounted level indicator, with low and high level alarm switch.
- Lubrication oil heater and heater controls
- Panel mounted bearing header pressure gauge
- Panel mounted main and emergency pump discharge pressure gauge.
- Panel mounted trip oil pressure gauges.
- Panel mounted lubrication and hydraulic oil filter differential pressure gauges.

STARTING AND COOLDOWN SYSTEMS:

Starting system includes the drive equipment diesel engine to bring the unit to self-sustaining speed during the starting cycle.

The cool down system provides uniform cooling of the rotor after shut-down. The turbine is ready to restart anytime after it has come to rest.

Diesel starting engine with self-contained lubrication system, 125 VDC starter motor, dry-type filter, engine rpm indicator, plus fuel tank.

Hydraulic torque converter

Hydraulically operated solenoid valve controlled jaw clutch with automatic disengagement at turbine self – sustaining speed.

Connection to turbine through accessory gear

Electro-Hydraulic rotor turning device with a DC motor driven pump, mounted on the torque converter (the turbine shaft is turned through a

45 deg. Are at approximately three minute intervals during the cool down period).

ACCESSORY DRIVE SYSTEM

On-base accessories diving through or driven by the accessory gear are:
Starting device
Accessory coupling to the gas turbine compressor
Lubricating oil pump
Hydraulic oil pump

ON-BASE LIQUID FUEL SYSTEM (HSD)

(Fuels is in accordance with fuel specifications enclosed).

Fuel composition

Natural Gas:

Natural Gas Composition		
Sl. No.		**GAIL**
1	C_6	0.275%
2	N_2	0.156%
3	Methane	91.220%
4	CO_2	1.395%
5	Ethane	3.207%
6	Propane	2.396%
7	I – Butane	0.425%
8	N – Butane	0.621%
9	I – Pentane	0.145%
10	N - Pentane	0.129%
	Specific Gravity =	0.634
	Net Calorific Value, Kcal/S.m^3 =	8826.9

HSD SYSTEM:

- Fuel nozzle
- Stainless steel on-base fuel piping with carbon steel flanges
- Fuel stop valve
- Fuel control valve (by pass) with servo valve

PACKAGE ENCLOSURES:

Gas turbine consist of several connected sections forming a weather protection housing structurally attached to each compartment base. Enclosures provide thermal insulation, acoustic insulation and fire extinguishing media containment. The enclosures allow access to equipment for routine inspections and maintenance. Enclosures are lighted, as described below, for convenience and optimum performance of installed equipment.

Ventilation of compartments during operation is provided for as follows:

Turbine roof mounted ventilation fans will provided negative pressure inside the compartment.

FIRE PROTECTION SYSTEM:

Fixed temperature sensing fire detectors are provided in the gas turbine and accessory compartments. The detector provide a signal to actuate the high pressure CO2 automatic fire protection system, Nozzles in the gas turbine compartment and accessory compartment direct the CO2 to the respective compartment at a concentration sufficient for extinguishing flame. This concentration is maintained by gradual addition of CO2 for an extended period, concentration sufficient for extinguishing flame.

The fire protection system is capable of achieving a non-combustible atmosphere in less than one minute, which meets the requirements of the United States National Fire Protection Association (NEPA) 12.

The supply system is composed of high pressure CO2 Cylinders, a manifold and a release mechanism all located in the rack ®. Initiation of the system will trip the unit, provide an alarm on the annunciator, turn-off ventilation fans and close ventilation openings.

Lagging

Glass wool protected with perforated metal is used on the interior of the side and roof panels of the turbine, and accessory compartments.

The estimated near filed noise level of a single PG5371 is 85Dba at 3 feet laterally from the turbine package at 5 feet elevation above the base pads but not adjacent to inlet compartment, inlet, exhaust ducting or opening.

Lighting

The accessory compartment has AC lighting on an automatic Circuit. All other compartment AC lights are turned on with a manual switch. When AC power

is not available, a DC battery – operated circuit supplies a lower level of light automatically. The turbine compartment is not lighted.

Walkways

Walkways are provided on both sides of the accessory and turbine compartments.

INLET AND EXHAUST SYSTEMS:

Inlet System:

An up & over inlet duct arrangement has been envisaged.

The inlet system arrangement includes the filter compartment, silencing, ducting, trash screens, plenum, support structure, walkways and ladder.

The self-cleaning inlet compartment utilizes high efficiency media filters which are automatically cleaned of accumulated dust, thereby maintaining the inlet pressure drop below a preset upper limit. This design provides single-stage high efficiency filtration for prolonged periods without frequent replacements.

Dust-laden ambient air flows upward at low velocity into filter modules which are grouped around a clean-air plenum which will have higher inlet drop affecting GTR performance.

The filter elements, which are pleated to provide an extended surface, are mounted below the modules within metal skirts which protect them from mechanical damage and which also serve as weather protection. The air, after being filtered, passes upward through venturies, and then to the clean air plenum.

As the outside of the filter elements become laden with dust, increasing differential pressure is sensed by a pressure switch in plenum. When the set point is reached, a cleaning cycle is initiated. The elements are cleaned in a specific order, controlled by an automatic sequencer.

The sequencer operates a series of solenoid- operated valves, each of which controls the cleaning of a small number of filters. Each valve releases a brief pulse of high pressure air into a blowpipe which has orifices located just above the Venturies. This pulse shocks the filters and causes a momentary reverse flow, disturbing the filter cake.

Accumulated dust breaks loose, falls and disperses. The cleaning cycle continues until enough dust is removed for the compartment pressure drop to reach the lower set point.

The design of the sequencer is such that only a few of the many filter elements are cleaned at the same time. As a consequence, the air flow to the gas turbine is not significantly disturbed by the cleaning process.

Included with the filter compartment are a pulse air source, necessary support structures, walkways, and ladders. Access to the clean air plenum is by means of a bolt-on hatch. An interior safety light and convenience outlet are provided.

A differential pressure gauge is supplied to read plenum pressure. An alarm is provided for excessive differential pressure in the plenum or for low pressure in the pulse cleaning air supply.

Ducting, silencers are included in the ducting to attenuate sounds emitting form the compressor inlet.

EXHAUST SYSTEM (SIDE ORIENTATION):

Exhaust system includes BHEL supply of upto expansion joint outlet only. Around 4.15 Mtrs from central line of GT.

APPENDIX – IV

BHEL PSSR:SAS:SER: SCT: VZ1117-098:T-04/08-09

Silk Road Sugars Private Limited – Kakinada – 1 x 38MW GTG

WEIGHT AND DIMENSION SCHEDULE

WEIGHT SCHEDULE:-

Sl. No	**Description**	**No. of. Units**	**Approx. Total Design Wt. (MT)**
1	Gas Turbine and its auxiliaries skid	1	71
2	Generator and its auxiliaries skid	1	90
3	GT Accessories skid	1	35
4	Loose Items		204
5	Mark5,6, other control panels and cabling		20
		TOTAL WEIGHT	**420**

Note: Actual weight may vary ± 10%.

APPENDIX – V

BHEL PSSR:SAS:SER: SCT: VZ1117-098:T-04/08-09

Silk Road Sugars Private Limited – Kakinada – 1 x 38MW GTG

T&P ARRANGEMENT BY CONTRACTOR:

1. The contractor has to necessarily arrange 1 No. 15T , 1 No 100 T Crane along with fit to use slings, and 1 No hydraulic test pump at his cost as and when needed.

2. All the distribution boards, connecting cables, hoses etc., temporary connection work including electrical connections shall have to be arranged by the contractor at his cost.

   In addition to the above any special tools and tackles if supplied by the manufacturers will be provided to the contractor free of hire charges.

APPENDIX – VI

DECLARATION SHEET

I, hereby certify that, all the information and data furnished by me with regard to this Tender Specification No.BHEL:PSSR:SAS:SER:SCT:VZ1117-098:T-04:08-09 are true and complete to the best of my knowledge. I have gone through the specifications, conditions, stipulations in detail and agree to comply which the requirements and intent specifications.

I further certify that I am duly authorized representative of the under mentioned tenderer and a valid power of Attorney to this effect is also enclosed.

TENDERER'S NAME & ADDRESS

AUTHORISED REPRESENTATIVE'S
SIGNATURE WITH NAME & ADDRESS

APPENDIX – VII

TENDER SPECIFICATION NO :

BHEL:PSSR:SAS:SER: SCT: VZ1117-098:T-04:08-09

CERTIFICATE OF DECLARATION FOR CONFIRMING KNOWLEDGE ON SITE CONDITIONS

We,

hereby declare and confirm that we have visited the project site under subject, namely and acquired full knowledge and information about the site conditions. We further confirm that the above information is true and correct and we will not raise any claim of any nature due to lack of knowledge of site conditions.

TENDERER'S NAME AND ADDRESS

Place:

Date :

SIGNATURE OF AUTHORISED REPRESENTATIVE WITH NAME & ADDRESS:

OFFICE SEAL

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector: Southern Region
Services After Sales Division, 39, S.D.Road
Ek-Tara Building, Secunderabad – 500 003.

APPENDIX - VIII

CHECK LIST

TENDER SPECTFICATION NO:

BHEL: PSSR : SAS:SER:SCT : VZ1117-098:T-04:08-09

Tenderers are required to fill in the following details:

1.	a)	Name of the Tenderer with address	:	YES/NO
	b)	Telegraphic/Telex address	:	YES/NO
	c)	Phone (Office/Residence)	:	YES/NO
	d)	Management Structure of firm (Pvt. Ltd/Public Ltd./Partnership/Sole Proprietorship) Documentary proof For the same enclosed)	:	YES/NO
2.		Whether EMD submitted as per Tender specifications terms and Conditions	:	YES/NO
3.		Validity of offer (offer shall be kept open for acceptance for minimum six months)	:	YES/NO
4.		Whether tenderer visited the erection site and acquainted with the site conditions before quoting	:	YES/NO

SIGNATURE OF THE TENDERER

5.	Whether the following details are furnished		:	YES/NO
	a)	Previous Experience	:	YES/NO
	b)	Present assignments	:	YES/NO
	c)	organization chart of the company	:	YES/NO
	d)	Company financial status	:	YES/NO
	e)	Incase of company, proof of Registration of the company	:	YES/NO
	f)	Memorandum & Articles of Association of company/copy of Partnership deed	:	YES/NO
	g)	Profit & Loss account for the Last 3 years	:	YES/NO
	h)	Audited Balance sheet for the Last 3 years	:	YES/NO
	i)	Income Tax clearance certificate (latest)	:	YES/NO
	j)	Solvency Certificate from a Nationalised Bank	:	YES/NO
	k)	Power of Attorney of the person Signing the tender duly attested By a Notary Public	:	YES/NO
	l)	Manpower organization chart With deployment plan at site For posting of Engineers/super Visitors and workers/labourers For satisfactory completion of Work under this specification	:	YES/NO

SIGNATURE OF THE TENDERER

6.	Whether the Tenderer is conversant with local labour laws & conditions	:	YES/NO
7.	Whether the tenderer is aware of all safety rules and codes	:	YES/NO
8.	Whether the Declaration sheet (as per appendix enclosed	:	YES/NO
9.	Time required for mobilization of of site organization and start of work	:	YES/NO
10.	Whether list of tools and Plants available with the contractor and proposed to be deployed for this work enclosed	:	YES/NO
11.	Whether all the Pages are read understood and signed.	:	YES/NO
12.	Deviations, if any Pointed out	:	
13.	Whether PF exemption No. is allotted by RPFC of your area if so, indicate number	:	YES/NO

SIGNATURE OF THE TENDERER