01.	**Item**	**Gas to Gas heater with Accessories (Regenerative - Elements rotating type)**		
02.	Application	Used to transfer the heat from the Untreated gas to Treated gas in FGD plant of Coal fired Power plant.		
03.	**Sizing Parameters per GGH:**	**Units**	**Design**	**Max**
	a) Untreated gas flow Entering GGH	kg/hr	808690	808690
	b) Mass addition in FGD	%	3 Maximum	
	c) Untreated gas entering temp.	Deg C	135	155
	d) Treated gas entering temp.	Deg C	30	46.4
	e) Treated gas leaving temp.	Deg C	**More than 85**	
	f) Untreated gas entering pressure	mmWC	+ 310	
	g) Untreated gas leaving pressure	mmWC	+ 235	
	h) Treated gas entering pressure	mmWC	+ 100	
	i) Treated gas leaving pressure	mmWC	+ 25	
	j) SO_2 in Untreated gas entering GGH	Kg/hr	435 @ 135 Deg C	
	k) Particulates in flue gas	mg/Nm3	< 200	

04. **Design Criteria:**

a) VI type heater to be offered i.e. Untreated Flue gas flow direction shall be vertically downwards. GGH is located at an elevation of approximately 12 meters.

b) Refer Annexure - I for Untreated / treated gas compositions.

c) Booster Fan is located in A position (hot fan) i.e. before Untreated flue gas entry in to GGH.

d) GGH shall be designed such that it can be operated continuously at lower loads up to 50%.

e) The GGH shall with stand the maximum untreated flue gas temperature of 155 deg C.

f) Plant is located on seashore at an elevation of 6 meter above main sea level.

g) FGD is designed for 67% gas flow of 250MW Boiler and Seawater is used in FGD scrubber.

05. **Scope of supply & Exclusions:**

Supplier's scope shall cover **Complete GGH** flange to flange including sub-systems, Start-up Spares and Special tools as given below.

a) Complete GGH including Rotor, Heating elements, Housing, Connecting plates, Rotor drive including Air motor, Guide bearing, Support Bearing (Spherical roller thrust bearing), oil circulation systems, wash pipes, retractable combination of water and steam Cleaning devices with local control panel, leakage control system (if required), rotor stoppage alarm, Installation and O&M manuals etc.

b) Air sealing system including fan with motor, Mounting skid, electric heater and piping.
c) Purge / Scavenging system including fan with motor, duct work, dampers etc.
d) High-pressure water pump with motor etc for Multi media cleaning device.
e) Motor starters, controls, instruments, cables, conduits etc.
f) Flake glass/ Hast alloy lining including application at site.
g) Special tools.
h) Erection and start-up spares.
i) Supervision of both Erection and commissioning. (No of days required and per-diem rate to be indicated).
j) Any other items required for completeness of the GGH equipment except the items covered in the exclusions.

Exclusions:

a) Insulation and lagging material.
b) Walkways, platforms and ladders.
c) Support steel.
d) Hydraulic Jacks and Element handling hoists.

06. **The following documents shall be submitted along with the offer.**

a) Performance data sheet for GGH.
b) Filled in guarantee values as per Annexure-II.
c) Scope of supply / Deviations.
d) Equipment data sheet for GGH indicating the materials of construction for various parts like rotor, post, elements, various seals, housing, connecting plates, sector plates etc and size of equipment, rotor rpm, element details, cleaning device details, leakage control equipment detail, type of lining, lining material, area & thickness of lining, area & thickness of insulation etc.
e) Equipment data sheets for sub-systems including i) High pressure pump and motor, ii) Seal air system fan, motor and electric heater, iii) Purge system fan, motor and dampers etc. Vendor shall indicate type/model, make, quantity, Kw, rpm, weight, pressure etc.
f) Equipment drawing with overall dimensions and the inlet and outlet flange connection details.
g) Utility requirements i.e. consumption of power, compressed air, instrument air, water, steam, etc as per Annexure-III.
h) Complete P & I diagram showing all the components / instruments with necessary write-up and control logic and electrical drive list.
i) Loading details (static and dynamic) indicating the loading points for GGH and all auxiliary equipment of GGH for carrying out the civil works.
j) Complete weight schedule of the GGH equipment and auxiliaries.
k) List of special tools and Start-up spares.
l) List of essential spares for 3 years operation.
m) Manufacturing quality plan.
n) Painting scheme indicating items to be painted, type of paint, no of coats, coating thickness etc.
o) List of lubricants with quantity for initial filling.
p) Any other details pertaining to GGH.

07. **Qualifying Requirement for the Bidder:**

The bidder should have Designed, Engineered, Manufactured, Erected / Supervised erection, Commissioned / Supervised commissioning of at least TWO numbers of Gas to Gas heaters for Flue gas Desulphurization plants with **Sea water** scrubbing for utility boilers of 250 MW and above rating and shall be in successful operation for a period of not less than two years as on the date of bid opening. Vendor shall provide supply list for the above requirement along with the offer.

08. **GENERAL**

a) Supplier shall use the MKS units in their offer documents.

b) The motors shall be suitable for the power supply of 415V, 3phase, 50Hz and other equipments to suit 230V, 1phase, 50Hz.

c) Erection manuals and O&M manuals shall be submitted after the award of the contract.

d) Filled-in data sheets for LT Motors, Pump, and Blowers/fans etc shall be submitted after the award of the contract.

e) Painting shall be suitable for seawater environment. Paint color will be informed during contract stage.

f) The minimum material requirement for the following components shall be as given below:

- Rotor & Baskets: Corten or high grade material.
- Rotor casing: Carbon steel + lining.
- Untreated side inlet duct: Carbon steel
- Other three ducts: Carbon steel + lining.
- Heating element: Enameled de-carburized steel.

g) Seal air fan skid shall be suitable for mounting at GGH elevation on steel structures.

h) All the drawings required for the erection and maintenance of the equipments supplied shall be furnished after the award of the contract.

i) All the drawings and documents shall be supplied both in hard and soft copies.

j) All the bought-out items supplied shall be of reputed make and shall confirm to applicable international standards.

k) Despatchable units/ Shipping component details indicating quantity, weight and size shall be submitted after the award of the contract.

09. **Guarantee Parameters**

Vendor shall guarantee the equipments performance, auxiliary power consumption and utility consumption as per Annexure II.

10. **INSPECTION**

a) By BHEL / Customer at Vendor's works.

b) Necessary Material, Test & Guarantee Certificates shall be furnished.

Annexure – I

Flue Gas Composition

Inlet Condition (Untreated gas)

Component	Dry Volume (%)	Wet Volume (%)
O_2	4.885	4.498
CO_2	14.853	13.676
CO	-	-
N_2	80.241	73.882
NOx	-	-
SO_2	0.02	0.019
SO_3	-	-
Moisture	-	7.925
Dust (mg/Nm^3)	-	<200

Outlet Condition (Treated gas)

Component	Wet Volume (%)
O_2	4.4
CO_2	13.4
CO	-
N_2	Balance
NOx	-
SO_2	0.004
SO_3	-
Moisture	10.25
Dust (mg/Nm^3)	<200
Mist concentration (mg/Nm^3 dry)	<100
Component, $CaSO_4.2H_2O$ (by weight)	0.14

Annexure - II

Schedule of Guarantees

Sl No	Parameters	Guaranteed Value per GGH
01	Outlet temperature of treated gas, °C	:
02	Outlet temperature of untreated gas, °C	:
03	Leakage from Untreated to treated side in Kg/hr.	:
04	a) GGH Power Consumption for Main drive motor (at the inlet of motor), OCU Motor, Cleaning device motors etc in Kw (list to be furnished in Utility requirements)	
	b) Power consumption for other equipments like Seal air fan motor, electric heater for seal air, purge system fan motor, high pressure pump motor etc in Kw (list to be furnished in Utility requirements)	:
	c) Total power in KW	:
05	Steam consumption in kg/hr at pressure in ata and temp in deg C.	
06	Compressed Air consumption, Nm^3/hr @ pr	:
07	Instrument Air consumption, Nm^3/hr @ pr	:
08	Water Consumption, m^3/hr @ pr a) On Line b) Off Line	
09	Duration of Guarantee for the complete FGD system	: 12 months from Commissioning

Annexure-III

Schedule of Utilities required for GGH

Sl No	Requirements	No / GGH	
	Equipment		**Qty / GGH**
Cooling water at 5 kg / cm^2 (g)			**m^3 / hr**
01	Guide & Support Bearing Oil Coolers		
Service water at low Pressure 5 kg / cm^2 (g)			**m^3 / hr**
02	Water Washing - Hot & Cold End		
Service water at high Pressure ____ kg/cm^2(g)			**m^3 / hr**
03	Water Washing - Hot & Cold End		
Service air at 6.33 kg / cm^2 (g)			**N m^3 / min**
04	Auxiliary drive - Air Motor		
05	Cleaning device – Gas out (During Start-up When steam is not available)		
Steam at ___ kg/cm^2 (g) & 150 °C superheat			**kg / hr**
06	Cleaning devices - Hot & Cold End		
	(Cleaning Duration : ___ minutes per pass)		
	Electrical		**Rating**
L T Motors : 415 V, 3 Ph, 50 Hz, AC			**KW**
07	Main Drive Motor		
08	Oil Circulation Motors –Support & Guide Brg		
09	Cleaning device Motors – Hot & cold end		
10	Seal Air Fan Motor		
11	Purge System Fan Motor		
12	High Pressure Pump Motor		
Other Equipment : 230 V, 1 Ph, 50 Hz, AC			**KW**
13	Light Assembly		
14	Rotor Stoppage Alarm		
15	Solenoid Valve		
16	Seal air electric heater		