

**THE FOLLOWING COMPLETE COMBINED CYCLE POWER PLANTS ARE AVAILABLE FOR SALE WITH US WITH IMMEDIATE DELIVERY:**

**2 Nos. – 750 MW each, UNUSED Gas Based Complete Combined Cycle Power Plants, having the Following Technical Specifications:**

**The Project Details:**

1. EACH module has two Gas turbines GE 9FA.03 (DLN2+) and one Steam turbine GE D11. Each GT exhaust is directed to the triple pressure unfired, natural circulation horizontal, type CMI USA HRSG. This configuration helps turndown operation of station up to 45%.
2. The Station is based on robust design of GE Gas Turbine with high efficiency DLN2+ Dry low Nox system, each GT is site rated for an output of 235 MW and the triple pressure reheat GE D11 Steam Turbine with downstream Exhaust, is site rated at 266 MW. The HRSG is a Triple pressure, Natural circulation, Horizontal design type with Deaerator atop the LP drum. Thus Net Combined cycle efficiency at Site condition is approx 57% on LHV basis. The inherent design of the gas turbine reduced the NOx emissions < 25 ppmvd. Noise level of the station is below 85 db. The machines operating frequency is 50 HZ and the power factor 0.85.
3. The ambient conditions are :

Site elevation above MSL	meter	27
Ambient temperature	Deg C	29
Relative humidity	%	70

4. The Major operation parameters are
  - a. Base load gas requirement per GT is 1.5 million standard cubic meter per day (mmscmd).
  - b. Base Load Gross heat Rate on GCV basis 1780 Kcal/kwh
  - c. Nominal Station Auxiliary power Consumption is < 3 %.
5. Station Water Requirements For 3 modules :
  - a. Total Water requirement = 2544 cum/hr.
  - b. Cooling tower make up = 2394 cum/hr
  - c. Power cycle make up = 37 cum/hr
  - d. Service water & other = 113 cum/hr
6. Technical Data Sheet of Equipment: **Attachment A.**
7. Major Equipment: Run Hours: NIL (Designed maintenance cycle Hot Gas Path Inspection (HGPI) 24000 Hrs and major Inspection (MI) 48000 hrs.)

8. Installed and Uninstalled Packages: Some part of the equipment is installed and some equipment are in un erected condition. For details please refer to the Attachment B

### Attachment A

#### **GAS TURBINE DETAILS:**

Make	:	General Electric, USA
Model	:	PG 9351 FA.03
Fuel	:	Natural Gas
Combustion	:	Dry Low NOx DLN 2.0+
Compressor Stage	:	18
Turbine Stage	:	3
Operating Speed	:	3000 RPM
Trip Speed	:	3300 RPM
Starting Means	:	Static Start
Air Filtration	:	Self Cleaning
Inlet Air Cooling	:	Evaporative Cooler On/Off condition
Compressor Cleaning	:	Offline / Online
Enclosure	:	Indoor
Cooling	:	Closed Loop
Nox Emissions	:	Gas Fuel , 25 ppm ref 15% O <sub>2</sub>

#### **GENERATOR DETAILS:**

Manufacturer	:	GE
Type	:	324 LU
Prime Mover	:	GT 9FA
Cooling Method	:	Hydrogen cooled.
Rated Capacity	:	310.725 MVA
Rated Terminal Voltage	:	15.75 kV
Rated stator current	:	11390 A
Rated power factor	:	0.85(lag), capability to 0.95 (lead)
Rated Speed	:	3000 rpm
Rated Frequency	:	50Hz
No. of phase / Connection	:	3 / Wye
Short Circuit Ratio (SCR)	:	0.53
Excitation	:	Static Bus Fed EX2100
Terminal Enclosure	:	On Top
Seal Oil System	:	Scavenging Design

#### **HEAT RECOVERY STEAM GENERATOR DETAILS:**

Make	:	CMI EPTI, USA
Type	:	Horizontal, Natural Circulation, Triple-Pressure

Parameters	HP	Reheater	IP	IP is ola table Economizer	IP	LP is ola table Economizer

Max. Allowable Working Pressure (Kg/cm <sup>2</sup> )	149.8	32.8	38.2	76.6	10.2	43.2
Heating Surface Area (m <sup>2</sup> )	153446	21122	33444	153446	38609	153446
Max Steaming Capacity (Kg/h)	292500	326500	50000	7853	38700	82580

#### **HP/IP BOILER FEED PUMP & MOTOR DETAILS:**

Make	:	Torishima
Type & Size	:	MHB 5/11
Speed	:	Variable Speed (nominal 2979 rpm)
Capacity	:	352.9 m <sup>3</sup> /h
Design Pressure (bar A)	:	Extraction: 88.4; Discharge: 247.6
Hydraulic Balancing	:	Piston
Casing Type / Mount	:	Diffuser / Centerline
External Casing	:	Barrel
Coupling	:	Voith

#### **Motor:**

Make	:	TECO Taiwan
Type	:	AEZW, 6.6KV, 50Hz, 3 Ph
Method of Starting	:	DOL
Frame Size	:	450E
Driver	:	2700 kW
Degree of Protection of Enclosure	:	IP55
Stator	:	Wye

#### **CONDENSER EXTRACTION PUMP & MOTOR DETAILS:**

Make	:	Torishima
Type & Size	:	MMTV 250/5
Total Head	:	295.6 m
Speed	:	1485 rpm
Capacity	:	949.3 m <sup>3</sup> /h

#### **MOTOR:**

Make	:	TECO Taiwan
Type	:	AEHC, 6.6KV, 50Hz, 3 Ph
Method of Starting	:	DOL
Frame Size	:	500 C
Driver	:	1060 kW
Degree of Protection of Enclosure	:	IP55
Stator	:	Wye

#### **CW PUMP & MOTOR DETAILS:**

Make	:	WPIL
Type	:	Mixed flow non pull out
Model	:	VT 49-72
Total Head	:	24 MWC

Speed	:	424 rpm
Capacity	:	23500 m3/h

**Motor:**

Make	:	CGL
Type	:	Squirrel Cage , 6.6KV , 50Hz, 3 Ph
Method of Starting	:	DOL
Frame Size	:	VTPC 1700
Driver	:	2100 kW
Degree of Protection of Enclosure	:	IP55
Stator	:	Wye

**STEAM TURBINE DETAILS:**

Make	:	GE
Model	:	D11
Type	:	TC-Down flow
Rated Speed	:	3000 rpm
HP Steam Inlet	:	127 Kg/ Cm <sup>2</sup> , 566 deg C
LP Stage Bucket Length	:	850.9 mm (33.5 inch)
Exhaust flow	:	Down
Total no of stages:		
High Pressure	10	
Intermediate Pressure	8	
Low Pressure	5	
Number of Casings	2	

**GENERATOR DETAILS:**

Manufacturer	:	GE
Type	:	324H
Prime Mover	:	D11
Cooling Method	:	Hydrogen cooled
Rated Capacity	:	324.760 MVA
Rated Terminal Voltage	:	15.75 kV
Rated stator current	:	11904 A
Rated power factor	:	0.85(lag), capability to 0.95 (lead)
Rated Speed	:	3000 rpm
Rated Frequency	:	50Hz
No. of phase / Connection	:	3 / Wye
Excitation	:	Static
Terminal Enclosure	:	Bottom

**EXCITATION – GTG & STG DETAILS:**

Type	:	Static Excitation System
Model	:	EX2100

**Static Excitation Transformer**

Type	:	Oil filled
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Power Rating	:	2500 kVA
No-Load Voltage (HV/LV)	:	6600/900 V
Rated Current (HV/LV)	:	219/1604 Amps
No of Phases	:	3
Frequency	:	50 Hz

#### **STATIC STARTING SYSTEM FOR GT UNITS DETAILS:**

##### **Load Commutated Inverter (LCI)**

Make / Model No.	:	LS2100
Power Rating	:	14MVA
Input Voltage	:	2080 Vrms
Input Frequency	:	50Hz

##### **Isolation Transformer (LCI Transformer)**

Type	:	Oil filled
Power Rating (HV/LV1/LV2)	:	7/3.5/3.5 MVA
No-Load Voltage (HV/LV1/LV2)	:	6600/2080/2080 V
Rated Current (HV/LV1/LV2)	:	612/972/972 Amps
No of Phases	:	3
Frequency	:	50 Hz

#### **GENERATOR CIRCUIT BREAKER DETAILS:**

Make	:	ABB
Type	:	SF6
Model No.	:	HECS-1OOL Plus
Quantity	:	2 No's
Service	:	Indoor
Rated Voltage	:	25.3 KV
Rated Frequency	:	50 Hz
Rated Continuous current	:	13,000 A
Rated Duty Cycle	:	CO-30Min-CO
Number of trip coils	:	2
Interrupting medium	:	SF6

#### **GENERATOR BUS DUCT DETAILS:**

Type	:	Isolated phase, continuous
Service	:	Indoor / Outdoor
Rated Voltage	:	17.5 KV
Current rating		
Main run	:	13000 A
Tap off run	:	1300 A
Conductor	:	Aluminum alloy
Enclosure	:	Aluminum
Type of cooling	:	Air natural

#### **GENERATOR STEP UP TRANSFORMER DETAILS:**

Make	:	Hyundai
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Type	:	Oil Filled
Type of Cooling	:	ODAF/ONAF/ONAN
Rated Output	:	335/268/201 MVA
Rated Voltage-HV/LV	:	420 / 15.75 kV
No of Phases	:	3
Frequency	:	50Hz

#### **UNIT AUXILIARY TRANSFORMER DETAILS:**

Make	:	Areva
Type	:	Oil Filled
Type of Cooling	:	ONAF/ONAN
Rated Output	:	31.5/25 MVA
Rated Voltage-HV/LV	:	15.75 / 6.9 KV
Rated Current HV/LV	:	1154.7A /2635.7A
No of Phases	:	3
Frequency	:	50Hz

#### **CONDENSER DETAILS:**

Manufacturer	:	HBG
Type	:	Non Deaerating surface- two pass
No. of passes on tube side	:	2
Size	:	23800 m2
Source of Water	:	Cooling Water
Cooling Water Flow Rate	:	42849 m3/h
Shell material	:	SA 516 Gr. 71
Tube material	:	SA249 TP 304
Tube size	:	25.4 mm OD ( 0.7 mm thick)
No. of Tubes	:	11600
Condensate Flow	:	732 tph

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Shell material	:	SA 516 Gr. 71
Tube material	:	SA249 TP 304
Tube size	:	25.4 mm OD ( 0.7 mm thick)
No. of Tubes	:	11600
Condensate Flow	:	732 tph

#### **COOLING TOWER DETAILS:**

Make	:	Hamon
Type of Fill	:	Splash type
Nos. of Cells per tower	:	18

Cell Dimensions : 15.75 m x 15.75 m  
Fill Height : 5.6 m  
Fan Diameter : 9144mm

## Cooling Tower Gear Box

Make : SUMITMO Heavy Industries  
Model No. : YVD050R2-RRFB-11.375  
No of Gear Box : 18 No's  
High Rotation Speed : 1480 RPM  
Low Rotation Speed : 130.1 RPM

## **Drive Motor:**

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Make	:	WEG Industria SA
Type	:	Sq. Cage Induction
Model	:	280 S/M
Rated output, KW	:	75
Voltage/Phase/Freq	:	415V/3Ph/50 Hz/ 125 A
Insulation Class	:	Class F
Speed, RPM	:	1480

## **FIRE PROTECTION & DETECTION SYSTEM**

S.NO	Parameter	Hydrant Pump	Spray Pump	Jockey Pump
1	Number of pumps	3	2	2
2	Number of pumps Working / standby	2W + 1S	1W + 1S	1W + 1S
3	Type of drives			
3.1	Motor driven	2	1	2
3.2	Diesel engine driven	1	1	NA

## **RESERVE AUXILIARY TRANSFORMER (RAT OR SUT) DETAILS:**

Make	:	Areva
Type	:	Oil Filled
Type of Cooling	:	ONAF/ONAN
Rated Output MVA	:	31.5/ 25
Rated Voltage-HV/LV KV	:	400 / 6.9
Rated Current HV/LV A	:	45.52A / 2638.85 (ONAF)
	:	36.13 / 2094.33 (ONAN)
No of Phases	:	3
Frequency	:	50Hz

## **6.6KV SWITCHGEAR DETAILS:**

Make	:	L&T
Type	:	Vacuum, draw out
Service	:	Indoor
Rated voltage	:	6600V, 3 phase, 3 wire

Lightning impulse withstand voltage	:	60 KV (peak)
Power frequencywithstands voltage	:	20 KV (rms)
Short time rating	:	31.5 KA (Sym) for 1 sec

### **Circuit Breaker**

Type	:	Vacuum
Number of poles	:	Three

### **EMERGENCY DIESEL GENSET DETAILS:**

DG set manufacturers name	:	M/s SterIing Wilson Power gen Pvt. Ltd.
DG set model no. offered	:	SGP 1250 P
DG set output at 0.8 pf	:	1250 KVA
DG set output voltage	:	415V, 3 phase & neutral
DG set output frequency	:	50Hz
Diesel engine & alternator shaft speed	:	1500 rpm
Make of Diesel Engine	:	PERKINS
Model No. of Diesel Engine	:	4012 PERKINS
Number of Cylinders	:	12 No's vee, 60 Deg
Starting system	:	24 V DC Electric Starting System
Rotation direction	:	Anticlockwise
Excitation Voltage	:	40 V

### **400KV GIS**

Supplier	:	Xian , China
Quantity	:	23 Bays
Rated voltage	:	420 kV
Rated Frequency	:	50 Hz
Rated current	:	5000A (Outlet & Inlet)
Rated power frequency 1 min withstand	:	680 KV
Voltage phase to earth		
Rated lighting impulse withstand volt	:	1550KV
Peak 1.250 $\mu$ s (Phase to earth)		
Power supply (control Circuit)	:	220V DC
SF6 Pressure	:	0.5 MPa

### **CONTROL SYSTEM FOR GAS TURBINE GENERATOR AND STEAM TURBINE GENERATOR DETAILS:**

Make	:	General Electric
Model	:	Mark VIe
Type	:	Triple Modular Redundant (TMR)
Control Network	:	Dual Redundant 10/ 100MB Ethernet Network
System Details	:	Mark VIe Panels for each GTG located in Local container (PEECC) and Mark VIe Panels for each STG are located in Central Electrical Room.

### **CONTROL SYSTEM FOR STATION BALANCE OF PLANT DETAILS:**

Make : Honey well DCS  
 System Details : Control hardware located in the CER. HMI  
 Located in CCR

### Attachment B

#### Installed and Not Installed packages

2 x 750 MW CCPP Package Wise Details						
SL	DESCRIPTION	Original Supplier	UOM	Module 2	Module 3	Installed
1	Gas Turbines and Auxiliaries	M/s General Electric, USA	Set	2	2	4 Installed
2	HRSG and Auxiliaries	M/s CMI, USA	Set	2	2	2 Partial Installed
3	Steam Turbine &Auxiliaries	M/s General Electric, USA	Set	1	1	Not Installed
4	Condenser & Auxiliaries	M/s Hangzhou Boiler Group	Set	1	1	Not Installed
5	Gas insulated Switchyard	M/s Xian, China	Set	1		Installed
6	Generator Circuit Breaker & Fittings	M/s ABB Schweiz AG	nos	2	2	4 Installed
7	Generator Transformer	M/s Hyundai, Korea	nos	3	3	6 Installed
8	Dry Type transformers	M/s QRE,China	nos	6	8	12 Installed
9	400kV EHV cables	M/s SFC,Japan	km	2	2	3.67 Installed
10	Pre-Fabricated Power House Building Structures	M/s HXSS ,China	Lot	1	1	80% Installed
11	Gas Turbines Spareparts	M/s General Electric, USA	Set	1		Not Installed
12	HRSG Spare Parts	M/s CMI, USA	Set	1		Not Installed
13	Air conditioning	Blue Star	Set	1		Not Installed
14	Ventilation	Blue Star	Set	1		Not Installed
15	Fire Protection System	Minimax	Set	1		40% Installed
16	Compressed Air System	Atlas Copco	Sets	3		2 Installed
17	Induced Draft Cooling Tower	Hamon	Set	1	1	2 Installed

18	CW Piping	PSL	Set	1	1	1 Set Installed
19	Circulating Water	WPIL	nos	3	3	Not Installed
	Pumps					
20	Pre-treatment Plant	Thermax	Set	1		Not Installed
21	Chlorination Plant	Airox Nigen	Set	1		Not Installed
22	Cooling Water Treatment Plant	Thermax	Set	1	1	Not Installed
23	Effluent Treatment Plant	Thermax	Set	1		Not Installed
24	Plate Heat Exchanger	GEA	Set	3	3	3 Installed
25	Horizontal Pumps	WPIL	Set	6	6	4 Installed
26	Vertical Pumps	Flowmore	Sets	1 3		Not Installed
27	Low Pressure Piping	Raunaq	Set	1	1	Partial Installed
28	Butterfly Valves	Fouress	Set	1	1	Not Installed
29	Rubber Expansion Joints	SRM Exoflex	Set	1	1	Not Installed
30	Stop Log Gates	Mechsol	Set	1	1	Partially Installed
31	Electric Overhead Travelling (EOT) Cranes	Anupam	no	2	2	4 Installed
32	Misc Cranes & Hoists	Reva	Set	1		Not Installed
33	Fuel Gas Conditioning	Multitex	Set	1	1	1.5 Installed
34	Service Elevator	Hyundai	no.	1		Not Installed
35	Inter-Connecting Piping (GTG & STG)	PowerMech	Set	1	1	Partial Installed
36	HRSG Piping	Dee Development	Set	1	1	Not Installed
37	Instrument Transformer	Alstom T&D India Ltd.	nos	4	4	Partial Installed
38	Reactor	Alstom T&D India Ltd.	Set	1		Installed
39	Start Up Transformer	Alstom T&D India Ltd.	Set	1		Installed
40	Unit Auxiliary Transformer	Alstom T&D India Ltd.	nos	2	2	4 Installed
41	Wave Trap	Alstom T&D India Ltd.	nos.	6		Partial Installed
42	Lab Instruments	Basil Powertek pvt. Ltd	Set	1		
43	Switchyard Equipments	BLUE STAR LIMITED	Set	1		Partial Installed

44	Isolated Phase Bus Duct	C & S ELECTRIC LIMITED	Set	3	3	4 Installed
45	Transmission line Conductors 400 kV	Kadevi Industries	Set	1		Partial Installed
46	Electrical BOP Supply	L&T	Set	1	1	Partial Installed
47	HT SWGR	L&T	lot	2	2	Installed
48	Control & Relay Panel	SIEMENS LIMITED	lot	1		Installed
49	LT Cables	TERACOM	lot	1	1	Partial Installed
50	Aux Transformer(Oil Type)	VICTORY ELECTRICA LS LTD	lot	6		Not Installed
51	DCS	Honeywell	lot	1	1	Not Installed
52	Station C&I	Honeywell	lot	1	1	Partial Installed

#### **SCOPE OF SUPPLY FOR EACH MODULE:**

SL	DESCRIPTION	Unit of Measure	Common	Remarks	Original Equipment Supplier
<b>A</b>	<b>Power Block</b>				
1	Gas Turbines and Auxiliaries	sets	2	Complete Supply	General Electric, USA
2	HRSG and Auxiliaries	sets	2	Complete Supply	CMI, USA
3	Steam Turbine & Auxiliaries	sets	1	Complete Supply	General Electric, USA
4	Condenser & Auxiliaries	set	1	Complete Supply	Hangzhou Boiler Group
5	Pre-Fabricated Power House Building Structures (Wind speed 57.5 m/s)	MT	4076	Partial Supply	HXSS ,China
6	Gas Turbines Spare parts	set	1		General Electric, USA
<b>B</b>	<b>Mechanical</b>				
1	Induced Draft Cooling Tower	set	1	Complete Supply	Hamon
2	Circulating Water Pumps	nos	2	Complete Supply	WPIL
3	Plate Heat Exchanger	set	1	Complete Supply	GEA
4	Horizontal Pumps	set	1	Partial Supply	WPIL
5	Butterfly Valves	lot	1	Complete Supply	Fouress
6	Electric Overhead Travelling Cranes	nos	2	Complete Supply	Anupam

7	Misc Cranes & Hoists	set	1	Complete Supply	Reva
<b>C</b>	<b>Electrical</b>				
1	Gas insulated Switchyard	set	1	Partial Supply	Xian, China
2	Generator Circuit Breaker & Fittings	nos	2	Complete Supply	ABB Schweiz AG
3	Generator Transformer	nos	3	Complete Supply	Hyundai, Korea
4	Dry Type transformers	nos	8	Complete Supply	QRE, China
5	400kV EHV cables	km	1.7	Complete Supply	SFC, Japan
6	Instrument Transformer	sets	4	Partial Supply	Alstom T & D Limited
7	Reactor-1 & 2	sets	1	Complete Supply	Alstom T & D Limited
8	Unit Auxiliary Transformer	sets	2	Complete Supply	Alstom T & D Limited
9	Wave Trap	nos.	4	Complete Supply	Alstom T & D Limited
10	Switchyard Control Panel	set	1	Complete Supply	Blue Star Limited
11	Isolated Phase Bus Duct	set	1	Complete Supply	C & S Electric Limited
12	Electrical BOP Supply	set	1	Partial Supply	L&T
13	HT SWGR	lot	2	Complete Supply	L&T
14	Control & Relay Panel	set	1	Complete Supply	Siemens
15	Aux Transformer(Oil Type)	nos	2	Complete Supply	Victory Electricals Limited
16	LT Cables	Lot	1	Partial Supply	TERACOM

Notes:

1. The above list does not consider any consumables and spare parts for Balance of Plant equipment.
2. Following are exclusions from the scope:
  1. Air Conditioning
  2. Ventilation System
  3. Gas Turbine interconnecting piping
  4. Fire Protection System
  5. Fire Tender
  6. Compressed Air System

7. Hydrogen and Carbon di-oxide Cylinders
8. DM-RO Plant
9. Pre-treatment Plant
10. Chlorination Plant
11. Cooling Water Treatment Plant
12. Water intake System including raw water pipeline
13. Effluent Treatment Plant
14. Vertical Pumps
15. Low Pressure Piping
16. Rubber Expansion Joints
17. Stop Log Gates
18. Fuel Gas Conditioning
19. Service Elevator
20. PLCC (Power Line Carrier Communication)
21. Transmission Line
22. Gas pipe line
23. Lab Instruments
24. DCS
25. Station C&I
26. All and any Service not limited to erection, supervision for any equipment/Plant.

**PHOTOS:**





