Low hours pre-owned 400 MW CCGT Power Plant in excellent (as new) condition, fully erected and preserved

Ready for relocation/export with OEM support

CPP Power Plant appr. 400 MW

Asset Overview

- 100% owned by an independant Power Generation Company, depth free.
- Natural gas-fired combined cycle power plant with a site gross capacity of 388 MW located in India
- Gas turbine supplied by G.E. and steam turbine supplied by Alstom, Germany.
- COD- 16th September 2006.
- FFH Clocked -36736 Hours.
- Long Term Assured Parts Supply Agreement and a Long Term Maintenance Contract with GE for maintenance of the gas turbine.
- Transmission line connected to a 400 kV grid.
- Water supply from a River.

Operational Features

Plant Capacity	**ISO 410 MW (388.5 MW** at Site Conditions) With GT Evaporative Cooling, Duct Firing and Fuel Gas Heating ON.
Site Conditions	DBT- 29.2^{0}C, RH- 71% , Atm. Pressure – 1010.7 Mbar, Elevation – 24.5m Above MSL.
Plant Heat Rate	1730 kCal/Kwh (on HHV)
Auxiliary Power Consumption for Plant	10.450 MWh. (2.69 %)
Guaranteed Emission Limits	NOx -35 ppmv & Co – 15 ppmv @ 15% O2
Plant O&M	O&M by professional Co. LTMA and LTAPSA by GE lycensor for GT and Generator.
Power Evacuation	Through 2 quad moose feeders from 400 kV switch yard
Supplementary Duct Firing	27.3 MW. (47.3 m Kcal/hr)
Water Consumption	13392 m^3/Day.

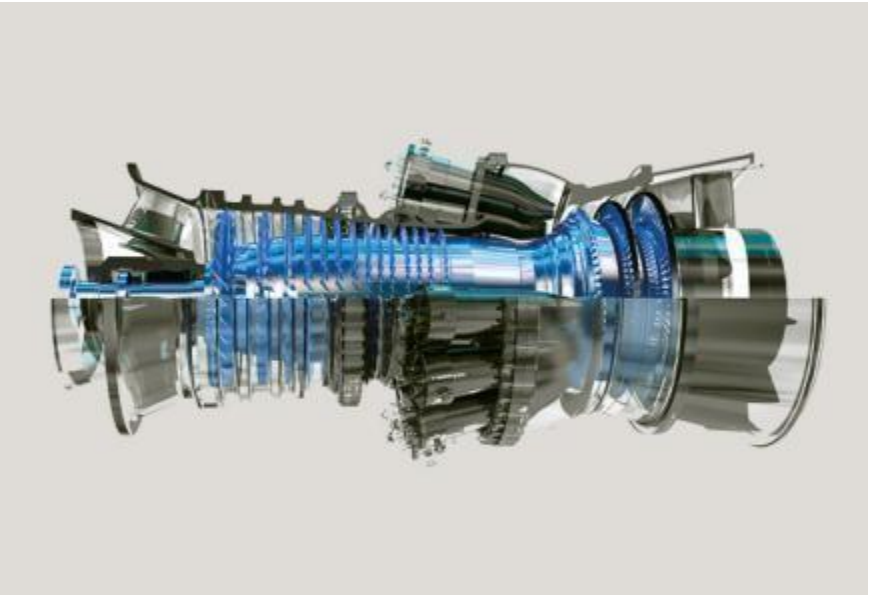
Plant Start Up time	Cold Start Up - 260 Min Warm Start Up- 120 Min Hot Start Up – 90 Min
Fuel	Natural Gas with HHV – 9832 kCal/m^3. At 35 Bar, 15^0C
Plant Area	26 Acres (built up area).

Major Equipment

Particulars	Make	Site Rating	Special Features
Gas Turbine	GE 9351 FA	232.54 MW	Indoor installation
HRSG	CMI, India	HP/ IP / LP F326/ 36/ 29 P 127 / 27 /4 T 568/ 329/258	Vertical , Triple Pressure , Reheat, Supplementary Firing
Steam Turbine	Alstom ST-F15.	156 MW	Reheat, Single Flow, Condensing type
Generators	GT – GE ST - Alstom	GT – 285 MVA ST – 190 MVA	GTG – H2 cooled STG – Air cooled
Supplementary Firing	Supplied by CMI	Approx. 20MW	In-line type with BMS
Power Transformer for GTG	CGL	290 MVA	
Power Transformer for STG	CGL	190 MVA	
Unit auxiliary transformer	VoltAmp	20 MVA	
EDG	Cummins	1.01 MVA	
Circulating water pump	WPIL	18000 M3/hr.	

Condensate Extraction pump	Sulzer	430 M3/hr.

MAJOR EQUIPMENT FEATURES



GE PG 9351 FA with DLN2.0+

Heavy duty 9FA gas turbines from the experienced F class fleet with over **25 million hours of operation**.

Features

- Enhanced 24K hardware for increased reliability and availability.
- Mark VI Control System controls the gas turbine using real-time physics based modeling, increasing the overall performance, operability, and reliability of the gas turbine.

Gas Turbine	
Capacity	233* MW (at site conditions).
Fuel	Natural Gas
Starting Means	Load Commutated Inverter (LCI)
Air Filtration	Self-Cleaning
Inlet Air Cooling	Evaporative Cooler
Compressor Cleaning	On-line and Off–line Water Wash
Exhaust System	Exhaust Diffuser with Expansion Joint for Axial Exit
Emissions Control	Dry Low NOx 2.0+

Gas Turbine Generator	
Rating	285MVA hydrogen cooled
Frequency	50 Hz
Cooling	Hydrogen
Power Factor (pf)	0.80 Lagging, Capability to 0.95 Leading
Terminal Voltage	15.75KV
Generator Excitation	Digital Static Bus Fed

MAJOR EQUIPMENT FEATURES

Alstom – Steam Turbine ST-F15 and Generator

Features

- Turbine:- 2 casing , condensing steam turbine
- Sliding pressure operation.
- Triple pressure single reheat.
- Manufactured by Alstom Germany.
- 100% bypass capability for HRH /LP.

Steam Turbine

Make	ALSTOM
Capacity	156.15 MW
Main Steam Parameters	▪ HP Steam: 324 T/hr. @ 127 Bar, 568 Deg C ▪ IP Steam: 361 T/hr. @ 26 Bar, 568 Deg C ▪ LP Steam: 32 T/hr. @ 5 Bar, 320 Deg C

Steam Turbine Generator

Rating	183.7 MVA
Frequency	50 Hz
Power Factor (PF)	0.85 Lagging
Terminal Voltage	15.75KV
Cooling	Air Cooled

Heat Recovery Steam Generator (HRSG)

Supplier – L&T , Design - CMI

Vertical, Triple pressure , Reheat type HRSG with supplementary duct firing.

Water Circulation:-

HP :- Forced circulation – Pump capacity – 1041 M^3/hr.

IP :- Natural Circulation

LP :- Forced Circulation – Pump Capacity – 153 M^3/hr.

Make		CMI Design		
Type	Triple Pressure HRSG installed at the exhaust of the Gas Turbines			
Steam Parameters	Unit	HP	IP	LP
- Steam generation	tph	326	36	29
- Pressure	Bar (a)	127	27	4
- Temp.	°C	568	329	258

Major Equipment Features

Power Transformer GTG –CGL	
Rating	3 phase/ 290 MVA, 0.85 P.F lag
Voltage	15.75/420 KV
Cooling	ONAN/ ONAF/OFAF
Frequency	50 Hz

Unit Auxiliary Transformer – VoltAmp	
Rating	3 phase/ 20 MVA
Voltage	15.75/6.9 KV
Cooling	ONAN/ ONAF
Frequency	50 Hz.

Power Transformer STG-CGL	
Rating	3 phase/ 190 MVA, 0.85 P.F lag
Voltage	15.75/420 KV
Cooling	ONAN/ ONAF/OFAF
Frequency	50 Hz

Major Equipments

BALANCE OF PLANT:

DM PLANT	2x15 m3/hr. capacity. Doshi-Ion Exchange Ind. Ltd.
Induced Draft Cooling Tower	L&T - 11 cells (10 Working + 1 Satndby). Circulation Flow – 31,185 M^3/hr.,
Gas Conditioning System	Manufacturer - Gastech Process Engineering.
HP/IP BFP	Electric driven pump , variable speed hydraulic coupling. Manufacturer – KSB Pumps. HP/IP flow – 330/80 M^3/hr at 163.36/46.18 Bar.
CW Pumps	Vertical mixed flow pumps. Manufacturer – WPIL , 3 X 18,000M^3/hr. at 2.32 bar
400 KV Switchyard	Conventional 1 ½ breaker scheme,
DCS	Centum 3000, Yokogawa India Ltd.

FUEL SPECIFICATIONS

Modified Wobbe Index (MWI)

Absolute Limits	54	40
Range Within Limits	5%	-5%

Constituent Limits, Mole %	**MAX**	**MIN**
Methane	100	85
Ethane	15	0
Propane	15	0
Butane + higher paraffin's (C4+)	5	0
Hydrogen	Trace	0
Carbon Monoxide	Trace	0
Oxygen Trace	Trace	0
Total Inert (N2+CO2+Ar)	15	0

Fuel requirement at Full Load

- Natural Gas requirement at full load – **1.72 MMSCMD @ 8991 GC**

WATER SPECIFICATIONS

Raw Water Specification

S.No	Description	Unit	Value
1	pH		8.49
2	Conductivity	Micro siemens/cm	287
3	Total dissolved solids	ppm	175
4	Turbidity	NTU	175
5	Total suspended solids	ppm	250
6	Calcium	ppm as CaCO3	48
7	Magnesium	ppm as CaCO3	30
8	Sodium	ppm as CaCO3	68.1
9	Potassium	ppm as CaCO3	2.43
10	Chloride	ppm as CaCO3	33.86
11	Sulphates	ppm as CaCO3	20.38
12	Nitrate	ppm as CaCO3	1.74

13	Fluoride	ppm as CaCO3	0.45
14	Phosphate	ppm as CaCO3	0.11
15	Silica	ppm as SiO2	14.2
16	Iron	ppm aws Fe	0.09
17	Organic matter	ppm as KMno4	2.8