

**Details of Equipment available for  
Sale of 165 MW Naphtha Based  
Combined Cycle Power Plant**



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## 1. INTRODUCTION

We have equipments readily available of a 165 MW Naphtha based state of the art Combined Cycle Power Project in excellent operating condition for direct sale. The combined cycle plant comprises of three LM6000PC aero derivative gas turbines, three Heat Recovery Steam Generators (HRSG) and a Steam turbine common to all the HRSGs. The plant has an excellent and proven track record of maintaining availability in excess of 95% for the last 15 Years. Gas turbines manufactured by GE, USA were packaged and commissioned by erstwhile Stewart and Stevenson, USA. Steam Turbine was supplied by BHEL, India and the Babcock and Wilcox design HRSGs were supplied by Thermax, India.

### 1.1. PROJECT STATUS

The first gas turbine entered commercial operation in October, 2000 followed by other two gas turbines. Commercial Operation of the Power Plant in Combined Cycle mode started in November, 2001.

## 2. PROJECT REQUIREMENTS

### 2.1. PLANT EQUIPMENT

The plant comprises of state of the art LM6000PC Aero Derivative Gas Turbine, Steam Turbine, Dual Pressure Heat Recovery Steam Generators, Electrical Generators and associated auxiliary equipments. *(Please refer Annexure I for detailed list of equipment for the Project and their respective suppliers.)*

The Station has got an Integrated Management System (IMS) certified for Quality, Health, Safety Environment and Energy Management.

### 2.2. LAND, WATER & FUEL REQUIREMENTS

Land required for the project including power block, open switchyard, Fuel storage tanks and Balance of Plant facilities is approximately 20 acres. The area required on gas (excluding liquid fuel storage and treatment facility) will be about 15 acres.

Daily sweetwater requirement for the Project is  $4000\text{m}^3/\text{day}$  with closed cooling water system, of which de-mineralized water requirement is about  $500\text{m}^3/\text{day}$ . De-mineralized water is required for injection into gas turbine for control of NOX emission and as make up to the boilers.

Daily Naphtha requirement at full load - 650 MT

Once switched over to gas, daily gas requirement for the project at full load is about 0.85 MMSCMD.

### 3. ADVANTAGE

The equipments are in a state of ready to operate. Since there is no dispatch instruction to operate the plant, the equipments are being appropriately preserved with periodic trials scheduled for all rotary equipments including monthly FSNL (Full Speed No Load) operation of gas turbines.

The average fired hours clocked by the gas turbines/steam turbine since new is only 35000 Hours. Gas turbines are maintained as per OEM (GE) recommendation and with the help of OEM.

Gas turbines are designed to use liquid fuel (Naphtha) as the fuel but the gas turbines can be retrofitted to fire gas within a short span.

**Following Table shows Gas turbine, Steam Turbine and Plant COD Details**

Unit No	Date Of Commissioning	COD
GTG-1	06/06/1999	30/03/2001
GTG-2	02/08/1999	31/03/2001
GTG-3	04/12/1999	31/10/2000
STG(Combined Cycle)	20/11/2000	23/11/2001

**Overhauling of Machines and Running Hours**

Unit No:	Dates of Hotsection replacements/Overhauling	Running Hours after Hotsection replacements/Overhauling	Running Hours TSN
GTG-1	04/07/2004,19/05/2010	5167	30747
GTG-2	01/06/2004,28/07/2009	7648	34878
GTG-3	11/07/2007,23-06/2011	4397	31444
STG	16/10/2009	7794	35293

## ANNEXURE I–LIST OF KEY EQUIPMENT

SN	Name of the Equipment	Nos	Details
1	Gas Turbines with mandatory spares parts	3 No.	GE Make Aero derivative Gas Turbines (Model - 7LM6000-PC NLW -C02, liquid fuel). Rated capacity-45.449 MW
1.1	Hydraulic starter pumps & motors	3 No.	Motor make: MARATHON ELECTRIC, Rating-200HP, Pump make: Brueninghaus Hydromatik, Germany, Hydraulic Transmission Pump, Variable Displacement, rated 56gpm at 5200 psig
1.2	Naphtha booster pumps & motors	6 No.	Motor make: Marathon Electric, Rating-125 HP, Pump make: EnviroTech, Roto Jet Pumps, Model: ROHA 3x2, 65 gpm capacity
1.3	Diesel booster pumps & motors	6 No.	Motor make: Marathon Electric, Rating-100 HP Pump make: IMO, multistage centrifugal pump of capacity-66 gpm @ 1200 Psig
1.4	Turbine vent fans & motors	6 No	Motor make: Marathon Electric, USA. Rating-125 HP. Fan make: TCF Aerovent, USA. Vane axial Fan of 60,000 scfm capacity
1.5	Generator Vent fans & motors	6 No.	Motor make: Marathon Electric, USA. Rating-100 HP, TCFAerovent, USA. Vane axial Fan of 39,000 scfm capacity
1.6	Centrifugal Chillers with Vane control	6 No.	Make: Trane, USA. Capacity-chillers-985 Tons and motor rating-656 KW(3 nos) Chillers-840 Tons and motor rating-582 KW (3 nos)
1.7	Chilled Water pumps	3 No.	Motor Make-Kirloskar, Rating-100KW, Pump make-Kirloskar, centrifugal pump capacity-208.35 Liters/sec.
1.8	GTG Reduction Gear box	3 No.	Make: Lufkin, Power-7000HP and Gear ratio- 1.209 to 1
1.9	DM Injection pumps & motors	2 No.	Motor make-Kirloskar, Rating-160KW, Pump make-Kirloskar Ebara, Multistage centrifugal pump capacity-30 M3/Hr
2	Steam Turbine & auxiliaries	1 No.	BHEL Make Steam Turbine (Model HNK-71/3.2-4, Condensing), Year of manufacturing 1998
2.1	High pressure boiler feed	2 No.	Motor Make-BHEL, Rating-525 KW,

	pumps & motors		Pump make-KSB, Multi stage centrifugal pump capacity-164.99 M3/hr.
2.2	Low pressure boiler feed pumps & motors	2No.	Motor Make-Kirloskar, Rating-55KW, Pump make-Sulzer, India. Multi stage centrifugal pump capacity-50.65 M3/hr.
2.3	Steam turbine oil pumps & motors	2 No.	Motor Make-cromptongreaves, Rating-75KW, Pump make-KSB, India .Centrifugal pump capacity-150 M3/hr.
2.4	Condensate extraction pumps & motors	2 No.	Motor Make-BHEL, Rating-180 KW, Pump make-BHEL, Vertical centrifugal pump capacity-195 Liters/min.
2.5	Vacuum Pump	1 No:	Make: Nash, Model: At-1006E, Motor Rating-45 KW
3	Heat Recovery Steam Generators & Auxiliaries System	3 No.	Thermax Babcock Wilcox Limited ,Pune . type:Natural circulation , Bi drum , Twin pressure , Unfired ,Horizontal Gas path , Vertical Water tube Boiler. Capacity -High pressure-46.5 kg/cm <sup>2</sup> /427 Deg C/44.5 TPH, Low pressure-4.5 kg/cm <sup>2</sup> /200 degC/13.45 TPH.
4	Condenser and Auxiliaries	1 No.	Make - BHEL Year of manufacturing 1997
5	<b>Fuel System</b>		
5.1	Naphtha centrifuges	4 No.	Make: Westfalia Separator USA
5.2	Diesel Centrifuges	2 Nos	Make: Alfa Lavel, India
6.	DM Plant	2 No.	Capacity : 35 m <sup>3</sup> / Hr. each, Make- Ion Exchange
7	<b>Cooling water system</b>		
7.1	Main cooling water pumps & motors	2 No.	Motor Make-BHEL, Rating-875 KW, Pump make-Kirloskar, Vertical centrifugal pump capacity-7000 M3/hr.
7.2	Auxiliary cooling water pumps & motors	3 No.	Motor Make: Kirloskar, Rating-160KW, Pump make-Kirloskar, Vertical centrifugal pump capacity-1650 M3/hr.

7.3	Cooling tower Fans	7 No.	MotorMake:CromptonGreaves,Rating-75KW,Fans-Axial adjustable FRP blades
8	Black Start DG Set	2 No.	Engine Make: Detroit USA.Generator make: Leroy Somer,Capacity- 1325 KVA
9	<b>Control Systems</b>		
9.1	GT control system	3 No.	Woodward make, NetCon 5000.
9.2	STG & HRSG control system	1 No:	ABB make, Procontrol model P30
9.3	BOP Control system		GE Fanuc make,model-9030/9070
10	<b>Electrical Equipment &amp; Systems</b>		
10.1	Gas Turbine Generator	3No.	Rating : 55230 KVA Make : GE,USA ,Type: Air cooled
10.2	Gas Turbine Transformer	3 No.	Rating : 60 MVA (11/110KV) Make : TELK ,India. Type:ONAF Year of manufacturing 1998
10.3	Steam Turbine Generator	1 No.	Rating :37.00 MW Make : BHEL, India (TARI 800-24P) Year of manufacturing 1998
10.4	Steam Turbine Transformer	1No.	Rating : 55 MVA (11/110KV) Make : TELK, India.Type :ONAF Year of manufacturing 1998
10.5	Station Transformer -20 MVA	2 Nos	Make : EMCO Trans Ltd Thane Rating : 110/ 6.6 kv, Type-ONAF Year of manufacturing 1998
10.6	Unit Auxiliary Transformers -2.5 MVA	3 Nos	Make :Kirloskar Rating : 11/ 0.415 KV, Type: Dry Type Cast Resin Transformer Year of manufacturing 1999

10.7	Unit Auxiliary Transformers -2.5 MVA	1 No.	Make :Kirloskar Rating : 11/ 0.415 KV, Type: Oil filled Year of manufacturing 1998
10.8	Unit Auxiliary Transformers -250KVA	1 No.	Make :Kirloskar Rating : 11/ 0.415 KV, Type: Oil filled Year of manufacturing 1998
10.9	Lighting Transformer-250 KVA	2 No.	Make :Kirloskar Rating : 0.455/ 0.418 kv, Type: Oil filled Year of manufacturing 1998
11	<b>Fire Water &amp; Raw water System</b>		
11.1	Electrical Fire hydrant Pump & Motor	1 No:	MotorMake:Kirloskar,Rating-110KW, Pump make-Voltas,Vertical centrifugal pump capaci- 273 M3/hr.
11.2	Medium velocity water spry pumps & motor	4 No.	MotorMake:Kirloskar,Rating-150KW, Pump make-Voltas,Vertical centrifugal pump capaci- 550 M3/hr.
11.3	Diesel fire hydrant	1 No.	Engine:Cummins,India. Pump make-Voltas,Vertical centrifugal pump capaci- 273 M3/hr.
11.4	River Water pumps & motors	3 No.	MotorMake:Kirloskar,Rating-45KW, Pump make-Kirloskar,Vertical centrifugal pump capacity 400 M3/hr.
11.5	Clarifier water pumps(soft water stream)	3 No	MotorMake:Kirloskar,Rating-45KW,Pump make- Kirloskar,centrifugal pump capacity 250 M3/hr.
11.6	Clarifier water pumps(Dm stream)	2 No.	MotorMake:Kirloskar,Rating-9.3KW,Pump make- Kirloskar,centrifugal pump capacity 40 M3/hr.
12	<b>Instrument air system</b>		
12.1	Reciprocating Air compressors	3 No.	Make:Khosla Crepelle,India.Capacity-6 M3/Min
12.2	Screw compressor	1 No.	Make:AtlasCopco,India.
13	<b>Switchyard 110 KV</b>		
13.1	Circuit breakers –SF6	11 No.	Make: Crompton Greaves,Type: (i) 120-SFM-32A



			Gang operated for bay no 1,2,5,6,9,10,11 (ii) 120-SFM-32A(SPR) Single pole execution for bay no 3,4,7,8
13.2	CURRENT TRANSFORMERS	33 No.	Make: ABB,India.
13.3	CAPACITIVE VOLTAGE TRANSFORMERS	18 No.	Make:Crompton Greaves,India.
14	<b>6.6 KV switchgear</b>		
14.1	6.6 KV SF6 circuit breakers	26 No.	Make-Voltas SG,India. Type: 2500A - 3 Nos , 1250 A - 23 Nos