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**1 x Frame 6B combined cycle Power Plant Available for sale**



**History**

Power plant was erected in 1994 and had the first commercial operation in February 1995.

Power plant will remain in stand by operation up to end of October 2010 (available to the local grid only for peaking expected during summer 2010), date when the plant should go out of operation, be de-commissioned and available for sale.

### **Equipment List & main specs**

Combined Cycle Power Plant based on the following equipment list:

<b>Equipment</b>	<b>Model</b>	<b>Make</b>	<b>Running hours (updated 1st May, 2010)</b>
Gas Turbine	Frame 6B Steam I (Ext) G.E.	GE Licensee	110538
Steam Turbine	CDI 635 R	Ansaldo	108906
GT Generator	45 Mva T190 - 240	Alstom	110538
ST Generator	23 Mva GSCR - 1000 Z4	Ansaldo	108906
Gas Compressors	2HM/1 - Nuovo Pignone	Nuovo Pignone	110538
Heat Recovery Steam Generator	GVR	(Ansaldo)	110538
Step-up transformer 11 - 11 - 220 KV	3H6132 - TP	ABB	duty since 1994
Transformer 6 - 0,4 KV x auxiliaries	G30121/1 - TD1		duty since 1994
Transformer 6 - 0,4 KV x auxiliaries	G30121/2 - TD2		duty since 1994
Transformer 22 - 04 KV x emergency feeding	G30122/1 - TD3		duty since 1994
Transformer 11 - 6 KV x auxiliaries	G30123/1 - TA1		duty since 1994
Transformer 11 - 6 KV x auxiliaries	G30123/2 - TA2		duty since 1994

Major details are summarized in following table:

Typology	Power Plant Gross Output		[MW]	50,1	
	Arrangement			combined cycle (1 TG + 1 TV)	
	Main fuel TG			Natural gas	
	Back up fuel TG			no	
	Operation mode			Base load	
	Black start			no	
	By-pass stack			no	
	Auxiliary boiler			yes (not for sale)	
	Cogeneration mode (steam flow):		HP	[t/h]	8,5
			IP	[t/h]	13
			LP	[t/h]	6
	Steam pressure line:		HP	[bar]	24
			IP	[bar]	12
			LP	[bar]	6
Efficiency (thermal + electric)		[%]	60,0		
Gross Electric Efficiency (without cogeneration)		[%]	45,3		
Weather	Average, min, max Temperature		[°C]	12; -8; 35	
	Average Humidity		[%]	60,0	
Gas Turbine	Name			TG1	
	Manufacturer			G.E.	
	Gas turbine type			MS 6541 B	
	TG Power - ISO conditions		Preselected load	[MWe]	-
			Base load	[MWe]	39
	1 <sup>st</sup> synchronizing			Aug 1994	
	Operating Hours fuel gas		Fire Hours:		110538 at 01/05/2010
			Equivalent Operating Hours:		not used
	Anti-icing			steam	
	Filters		Coalescer+prefilters+high eff.		yes
			Self cleaning (pulse jet)		no
	Aspiration system conditioner			no	
	Gas compressor			yes	
	Gas heating			no	
	NOx reduction system			steam injection	
	TG start device			electric motor + torque converter	
	O2		[%]	15	
	NOx limit value		[mg/Nm3]	200	
CO limit value		[mg/Nm3]	100		
Particulate Matter limit value		[mg/Nm3]	-		
SOx limit value		[mg/Nm3]	-		
Number of unit			1		
HRSG	Name			GVR	
	Manufacturer			ANSALDO	
	Post firing			no	
	Fresh air			no	
	Pressure level and Temperature		HP	[bar ; °C]	70 ; 500
			IP	[bar ; °C]	-
			LP	[bar ; °C]	6 ; 285
	RH			no	
HP Feedwater Pump		Manufacturer		KSB	
		Q; H; T	[m3/h ; m ; °C]	69,7 ; ΔP max 75,5 ; 164 °C	
Steam Turbine	Name			TV	
	Manufacturer			ANSALDO	
	Serial Number				
	Power		[MWe]	15 (full condensing); 11 (cogenerative condition)	
	1 <sup>st</sup> synchronizing			Aug 1994	
	Operating Hours			108906 at 011/05/2010	
Condenser fluid			air		

Cooling system	for Steam Turbine	Type		air condenser
		Manufacturer		
	for Auxiliaries	Thermal Power	[MWt]	44
		Type		evaporative tower
electrical	TG Generator	Manufacturer		ALSTOM
		Power of TG Generator	[kVA]	46.000
	Cooling system of TG Generator			air / water
	TV Generator	Manufacturer		ANSALDO
		Power of TV Generator	[kVA]	23.000
	Cooling system of TV Generator			air / water
	Main Transformer	TG		ABB
		TV		
	Type of transformer	TG		75.000 kVA ONAN
		TV		
Staff	Total staff of Power Plant			15
	Production department			11
	Nb. of staff per shift			1
	Maintenance department			3

### **Brief description of main features**

- 1 x GE Gas Turbine model Frame 6B

Frame 6B already incorporates latest GE upgrading packages like: upgraded brush seals for better efficiency, higher firing temperature for increased power output, upgraded IGV, Extendor Kit on combustion components to optimize maintenance and extend inspection intervals.

Gas Turbine Combustion system is Dual Fuel (Natural Gas + Distillate Oil). Starting System is based on Electric Motor.

At date Frame 6B Gas Turbine accumulated 110.538 Firing Hours. Second major Inspection to the Gas Turbine was completed last year.

45 MVA Alstom Generator (for GT), model T190 – 240. Spare stator for this generator is available at stock.

Mark V Control System.

Emission control by Steam injection on gas turbine: at 15°C ambient temperature, with GT full power output around 40 MW and about 2 Kilogram / sec of steam injection, emission levels are roughly:

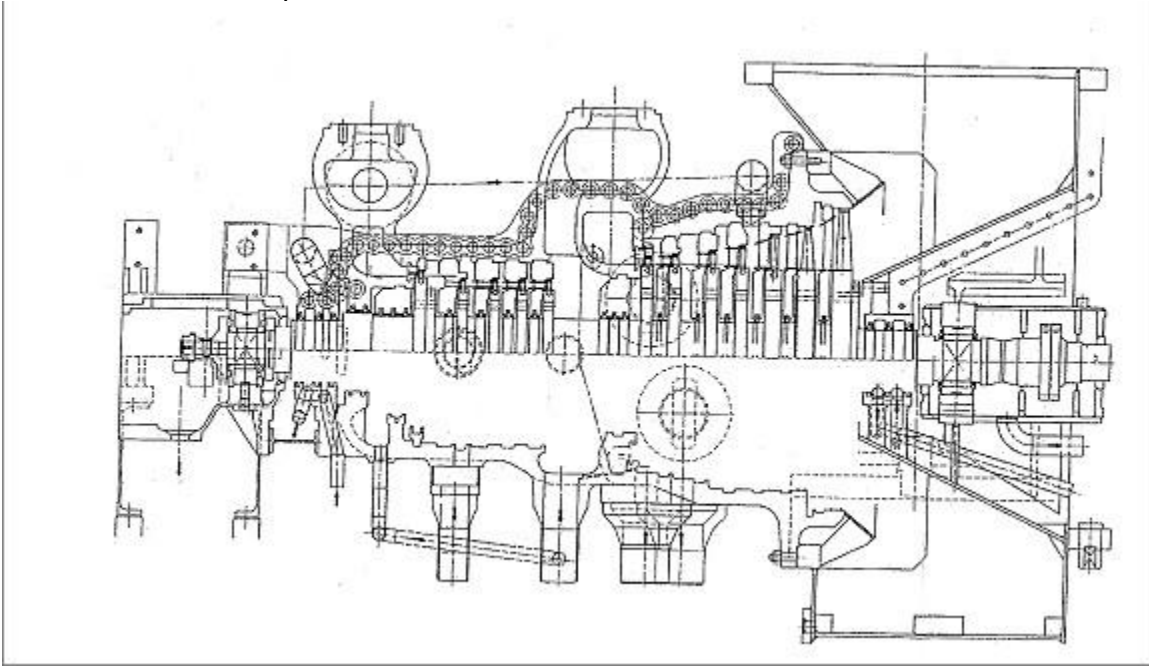
- 80 to 90 ppm of Nox
- 1 to 1,5 of CO

Present owner confirms that the gas turbine already completed the second major overhaul before the end of commercial operation.

- 1 x 23 MW Ansaldo Steam Turbine, model CDI 635 R

1 x 23 MVA Alstom Generator (for ST), model GSCR – 1000 Z4  
Steam turbine accumulated 108.906 firing Hours.

DCS Control System for thermal plant (boiler and steam turbine)  
ST cross section is reported below:



- **2 x Gas Compressors**

Power Plant is also equipped with two alternative compressors model 2HM/1, for natural gas: one compressor able to boost the pressure from the 11 - 12 bars of the pipeline up to 19,5 Bars required for the correct operation of the gas turbine.

Second compressor works in stand by mode, to replace the first in case of failure or maintenance. If both compressors work simultaneously, they are able to boost gas pressure from 5 bars up to 19,5 Bars. Below pipeline pressure of 5 Bars, the two compressors trip.

Both Compressors are powered by electrical motors.



PLANT PHOTOGRAPIC DOCUMENTATION



Img 1. Compressors room



Img 2. Steam Pipeline



*Img 3. External view of the plant*



*Img 4. External view of the plant*





*Img 5. Gas turbine air filter chamber*



*Img 6. Demi-water tanks*

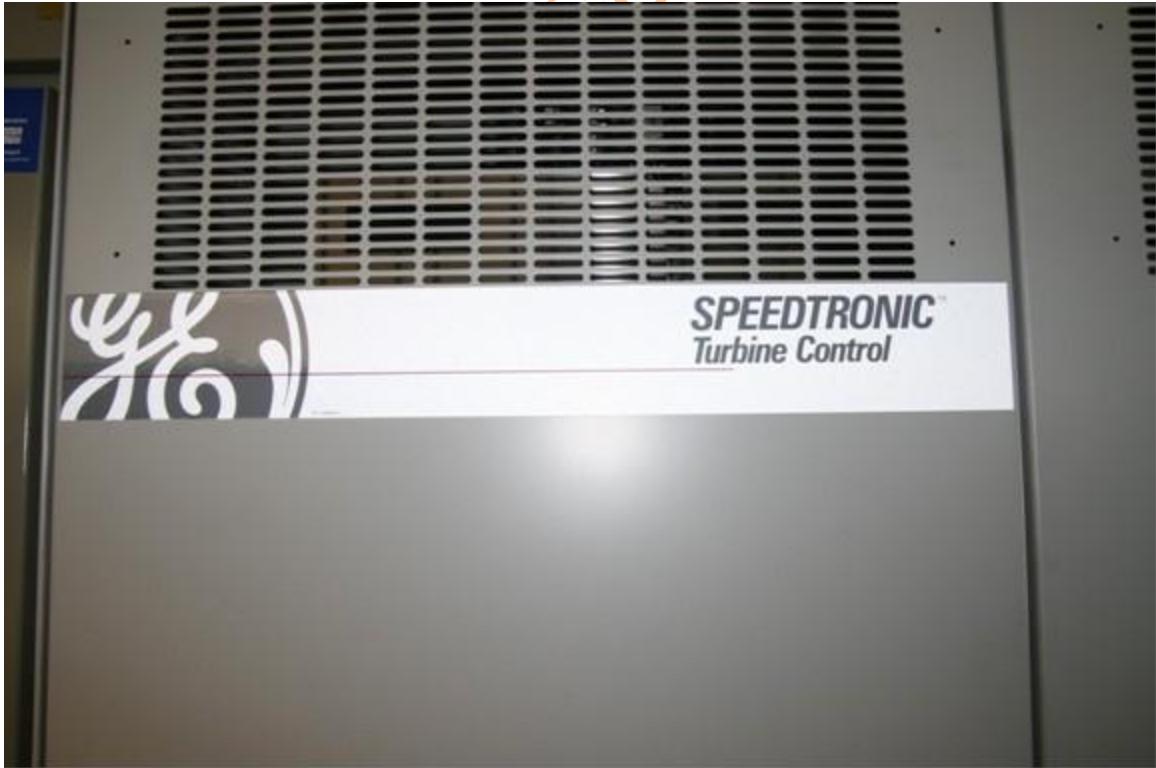
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*Img 7. External view of the transformers*



*Img 8. External view of the transformers*



*Img 9. Turbine control server*





Img 10. Control room



Img 11. Control room