

**810 MW ISO rated  
combined cycle power  
plant complete,  
consisting of 2 x 405 MW modules**

**1 GE Frame 9FA (ISO rated @ 257 MW) HRSG,  
and 1 Steam turbine  
(148 MW)**





# Facts about

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## Facts about

### **810 MW (2 x 405 MW, ISO), combined cycle power plant.**

One 810 MW (iso) complete power plant, 50 Hz, natural gas fuel, consisting of two 405.5 MW (iso) combined cycle power modules, setup in a highly efficient 1x1x1 arrangement.

Each 405.5 MW (iso) module consists of one General Electric GT-9FA.03, one Alstom steam turbine, and a CME designed heat recovery boiler system, equipped with supplemental firing. Electricity is generated at 15.75 kV, and elevated to 400 kV for transmission via Areva step up transformers.

The plant was commissioned at the end of 2015, under a Service and Supply contract with General Electric (GE). However, due to a lack of natural gas, the plant was put in preservation mode only a few months after starting operations. Actual operating hours for each module are: 2,790 and 1,547 hours since new.

With theoretical efficiency of close to 60%, the combined cycle modules reach a documented efficiency of 56.85% (at site). The added flexibility of supplemental firing allows each module to generate about 14 MW of additional power.

The plant has been maintained under the manufacturer's (GE) preservation program, conducted by a team of qualified professionals. The program includes annual borescope inspections, turbines and generators scheduled rotation, scheduled maintenance, steam and gas turbines recirculating heat, generators heat, and nitrogen blankets for all fluid lines and equipment sections requiring preservation.

The Service and Supply contract with GE is in place until 2028.

The metal building housing the two modules (included in this offering) was designed to withstand high winds (coastal locations) and includes a heavy lifting overhead crane, suitable for carrying out all maintenance and repair operations of the gas and steam turbines.

All of the original design and construction documentation (civil, mechanical and electrical engineering) are included in this offer. However, the buyer shall assess all engineering and design conditions applicable to the new site.

The plant control room features Yokokawa's complete operations systems integration, 170 kV of UPS back power, and "Remote Monitoring" with GE (part of the service and supply contract). Emergency power to the turbine systems is provided by two 1 MW ea. emergency generators.

Black start capability will require a 15 MW generator (optional)..



## Equipment Overview

810 MW (2 x 405 MW, ISO), combined cycle power plant.

The project comprises of 2 identical setups (1+1+1 configuration) one GE9FA Gas turbine, one steam turbine generator from Alstom, and one HRS Galong with associated auxiliaries and balance of plant. The plant is designed to operate on Natural Gas.

The plant generates at 15.75 KV with step up to 400 KV for synchronization to the grid.

The plant was commissioned in Oct 2015 and has not been in operation for lack of natural gas supply. Currently under preservation as per OEM norms ( GE, Alstom , L&T).

Long Term Service and Parts Supply Agreement with GE is available as well as maintenance and spare parts supply for the steam turbines.

All plant and equipment will get warranties and performance assurances from the OEM.

**Combined Cycle GTPP for immediate delivery with full OEM Warranty.**

**Unique offer, complete Power Plant, fully erected but unused 810 (2 x 405) MW, full preservation and maintenance as per OEM instructions**



## ASSET OVERVIEW

Sl. No.	Equipment	Capacity
1	Gas Turbine	2 x 240 MW
2	Gas Turbine Generator	2 x 214 MVA, 0.80 P.F lag
3	Steam Turbine	2 x 144 MW
4	Steam Turbine Generator	2 x 169.65 MVA, 0.85 P.F lag
5	HRSB	2 No. Vertical, Triple pressure , Reheat type
6	Power Transformer for GTG	2 x 277 MVA
7	Power Transformer for STG	2 x 170 MVA
8	Unit auxiliary transformer	2 x 28 MVA
9	EDG	2 X 1.01 MVA
10	CW pump	4 X 14260 m <sup>3</sup> /hr.
11	Condensate Extraction pump	4 X 570m <sup>3</sup> /hr.
12	HP/IP Boiler Feed Pump	4 X 410 m <sup>3</sup> /hr.

## Major Equipment Features



### 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 – 1030 M<sup>3</sup>/hr.

IP :- Natural Circulation

LP :- Forced Circulation – Pump Capacity – 60 M<sup>3</sup>/hr.

Make	CMI Design			
Type	Triple Pressure HRSG installed at the exhaust of the Gas Turbines			
Steam Parameters	Unit	HP	IP	LP
- Steam generation	kg/sec	82.377	94.25	9.18
- Pressure	Bar (a)	141.01	33.95	4.37
- Temp.	°C	567.5	568	287.4

# Major Equipment - Electrical



## Power Transformer GTG

Rating 3 phase/ 277 MVA, 0.85 P.F lag

Voltage 15.75/420 KV

Cooling ONAN/ ONAF/OFAF

Frequency 50 Hz

## Unit Auxiliary Transformer -

Rating 3 phase/ 28 MVA

Voltage 15.75/6.9 KV

Cooling ONAN/ ONAF

Frequency 50 Hz.

## Power Transformer STG-

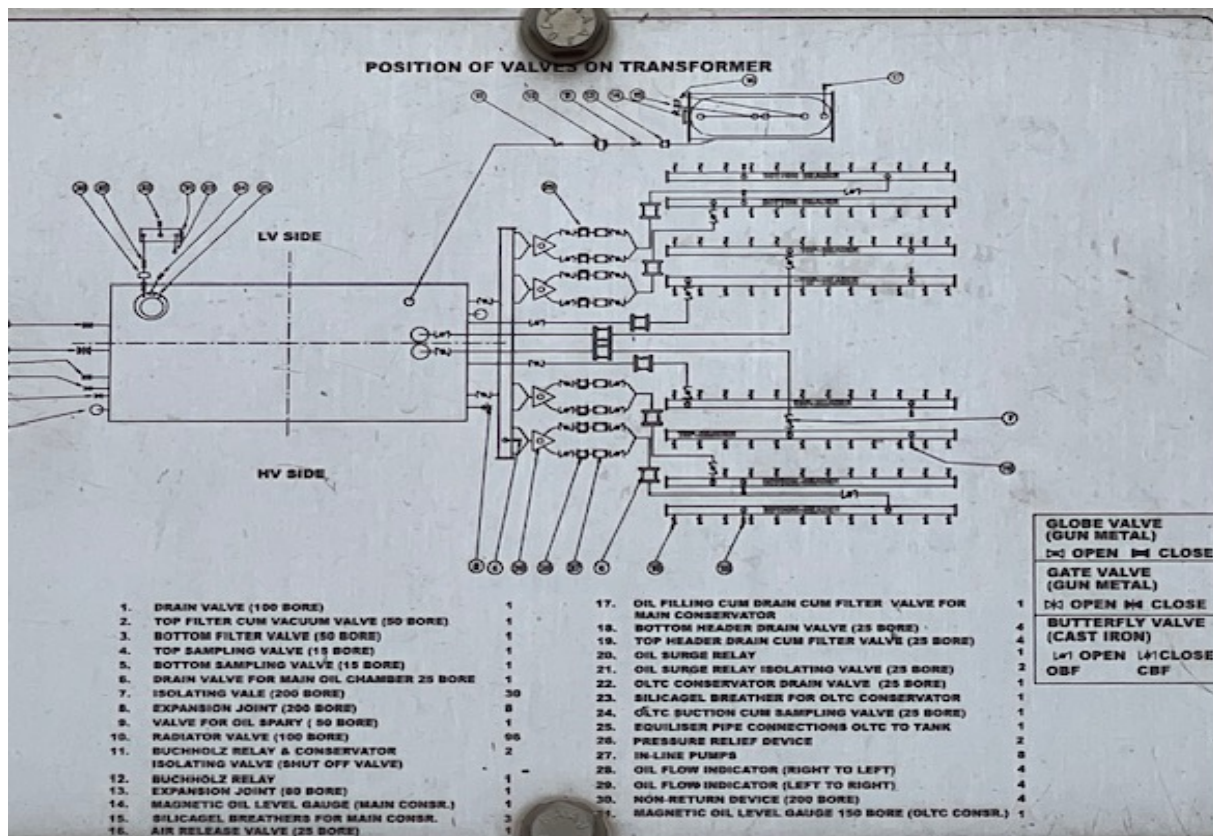
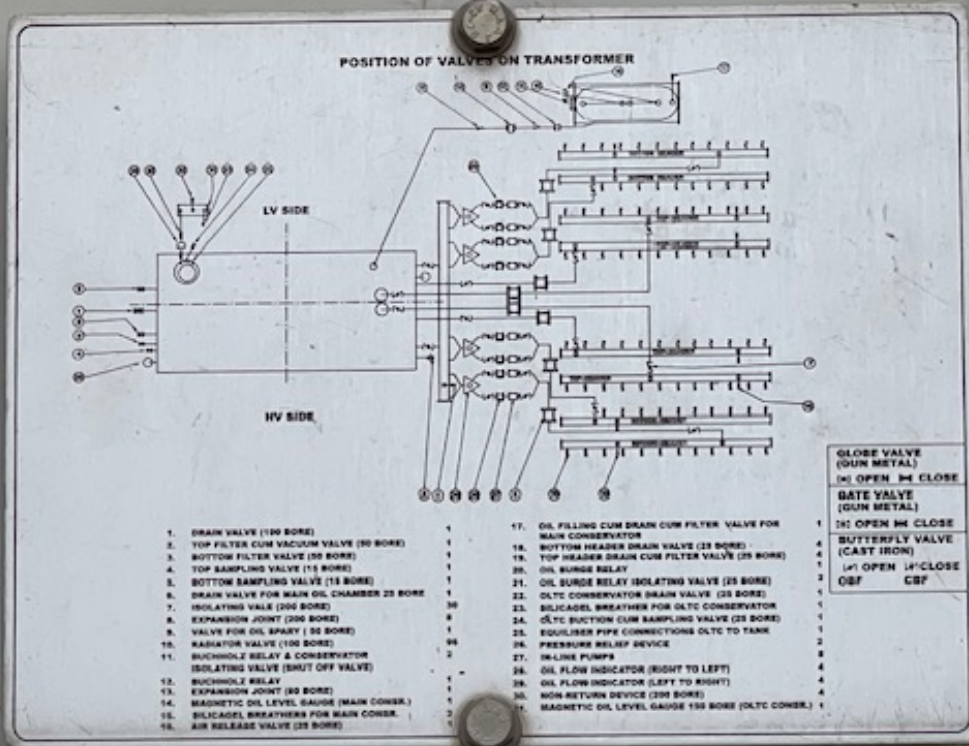
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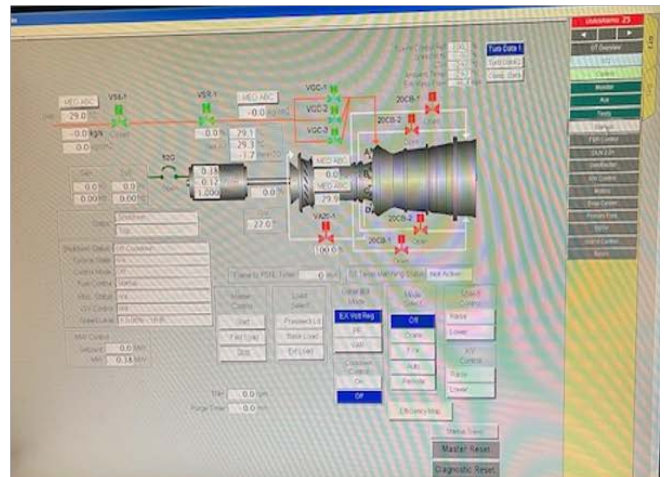
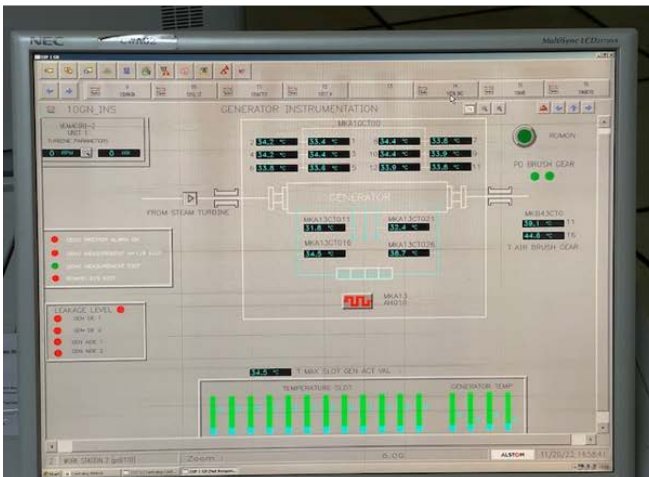
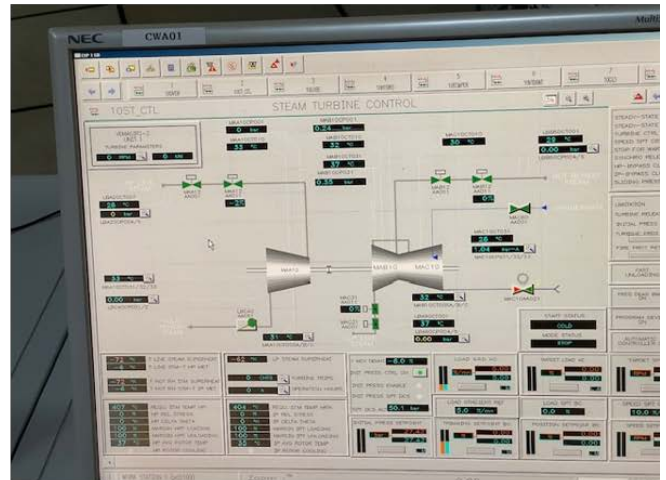
# Major Equipment - BoP

## BALANCE OF PLANT:

DM PLANT	2x20 m <sup>3</sup> /hr. capacity. Triveni Engineering Ind. Ltd.
Induce Draft Cooling Tower	L&T Double row multi cell with total 20 cells serving both units. Circulation Flow – 57040 M <sup>3</sup> /hr.,
Gas Conditioning System	Manufacturer - Gastech Process Engineering. Design flow- 109.17 TPH, Max. Supply press- 45 bar
HP/IP BFP	Electric driven pump with a variable speed hydraulic coupling. Manufacturer – KSB Pumps. HP/IP flow – 330/80 M <sup>3</sup> /hr at 163.36/46.18 Bar.
CW Pumps	Vertical mix flow pumps., Manufacturer – Kirloskar Brothers Ltd. 4 X 14260 M <sup>3</sup> /hr. at 2.2 bar
400 KV Switchyard	SAS with Energy Management system. Conventional 1 ½ breaker scheme, 80 MVar Bus Reactor, SCADA system.
DCS	Centum VP, Yokogawa.



# The Control Room



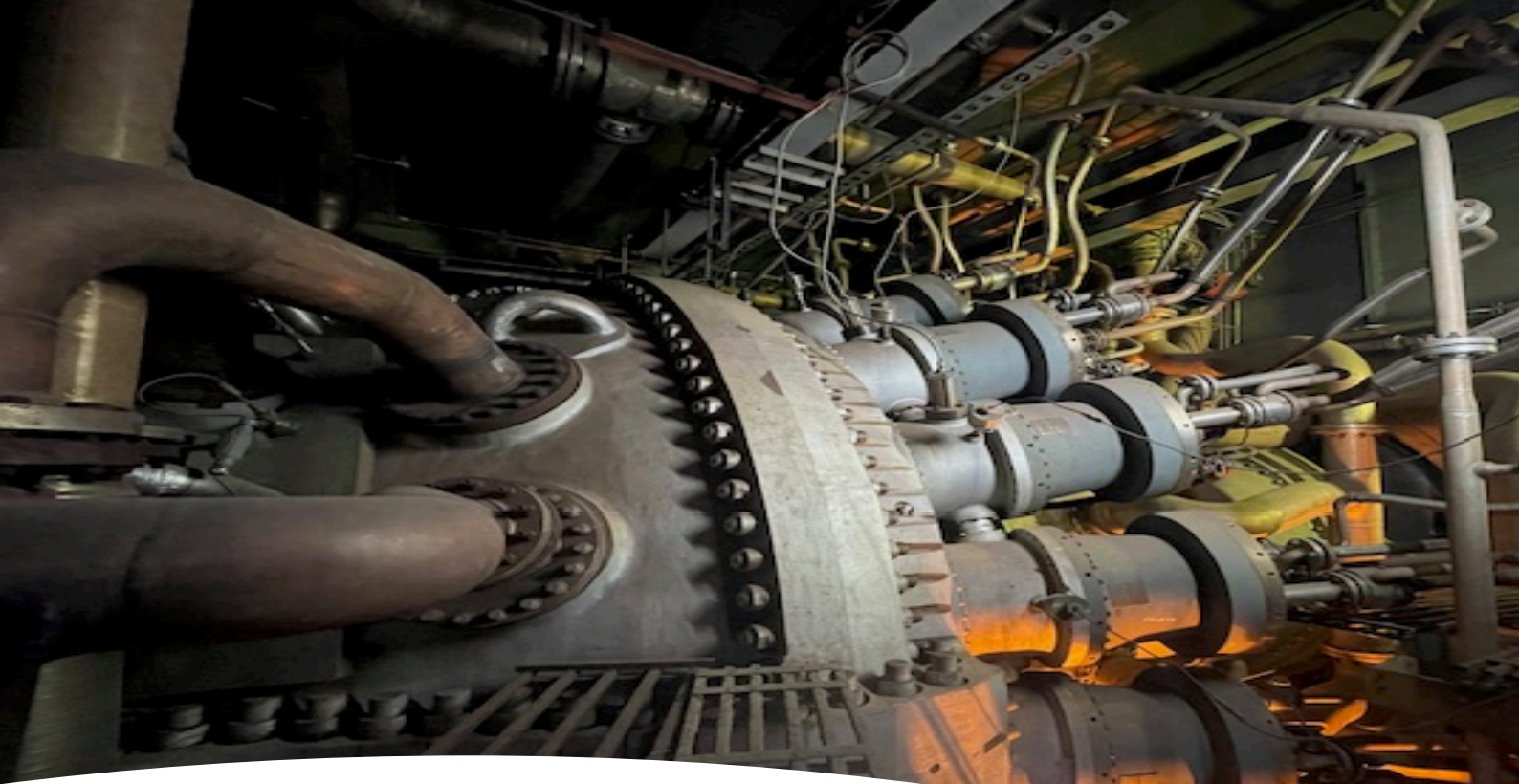
GE PG 9351 FA with DLN2.0+

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

## Features

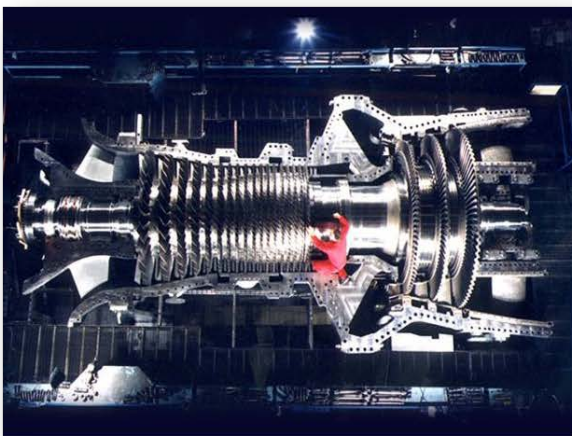
- Enhanced 24K hardware for increased reliability and availability.
- Cooling Optimization for improved power output and base load efficiency through better management of turbine section clearances and cooling air flows.
- Mark VIe Control System controls the gas turbine using real-time physics based modeling, increasing the overall performance, operability, and reliability of the gas turbine.





Factsheet for

# The gas turbine



## Gas Turbine

Capacity	240 * MW (at site conditions). <b>257 MW at ISO conditions</b>
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+

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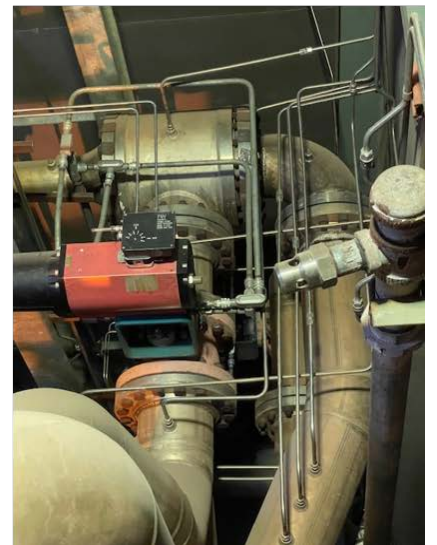
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## Gas Turbine Generator

Rating	314 MVA 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

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# The gas turbine





## Major Equipment Features



Alstom – Steam Turbine and Generator

### Features

- Turbine:- 2 casing , condensing steam turbine model - HD1CK+MDG160/NE37AA
- Sliding pressure operation.
- Manufactured at Alstom Germany
- 100% bypass capability for HRH /LP.
- Max. inlet temp.= 566 ° C .

### Steam Turbine

Make	ALSTOM
Capacity	144 * MW
Main Steam Parameters	<ul style="list-style-type: none"> <li>▪ HP Steam: 296.5 T/hr. @ 141 Bar, 568 Deg C</li> <li>▪ IP Steam: 339.3 T/hr. @ 34 Bar, 568 Deg C</li> <li>▪ LP Steam: 33 T/hr. @ 4.4 Bar, 287.4 Deg C</li> </ul>

### Steam Turbine Generator

Rating	169.65 MVA
Frequency	50 Hz
Power Factor (PF)	0.85 Lagging
Terminal Voltage	15.75KV
Cooling	Air Cooled

# Further plant Images



# Further plant Images

