AMBARLI NATURAL GAS COMBINED CYCLE POWER PLANT

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The Ambarlı Combined Cycle Power Plant is located at Marmara Coast of İstanbul. The plant is constructed as a Combined Cycle Gas Turbine plant and a total send-out capability of approximately 1350 MW. The plant is designed for base load operation at an expected efficiency of approximately 51%. The power plant comprises generating plant of six Siemens V94.2 gas turbine alternator sets each exhausting combustion turbine, gases to individual Heat Recovery Steam Boilers that in turn supply steam to a single Siemens Steam turbine

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The generation voltages of 10,5 kV(GT's) and 15,75kV(ST) are indivually transformed to supply 154 Kv to the TEIAŞ National Grid. The combustion turbine sets are supplied with fuel gas from the adjacent BOTAŞ terminal. In the absence of gas supplies there is tank storage for 15 days supply of diesel oil held at site.

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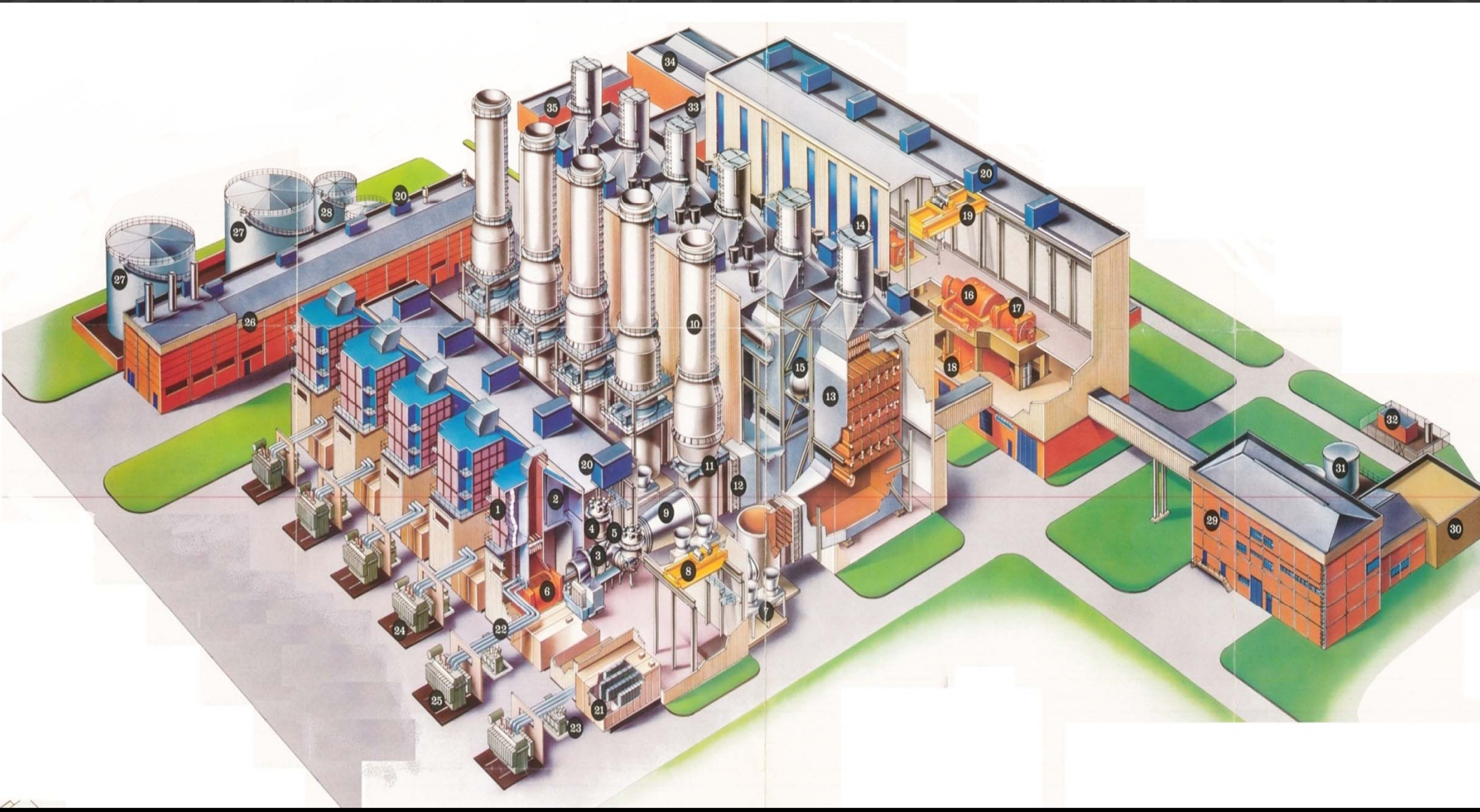

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6x GAS TURBINE GENERATOR

Siemens V94.2 gas turbine equipped with dry low NOx natural burners. Alternetive fuel is diesel oil. Comprises single shaft layout with 16 stage axial compressor and four stage combustion turbine. Output 138,8 MW at 3000 rpm.

Siemens air cooled generator directly coupled to compressor shaft 183 MVA output at 10,5kV. PF 0,85. Insulated class F. Power factor 0,85 Frequency 50 Hz. Output linked to generator step-up transformer through 10,5 Kv SF6 breaker.

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HEAT RECOVERY STEAM GENERATOR(HRSG)

One ducted behind each gas turbine exhaust outlet.

Horizantal tube modular type incorporating dual pressure without reheat. There are no supplementary fuel burners.

Module design details are:

HP Section steam output 462 t/hr at 76 bar and 524 deg C

LP Section steam output 93 t/hr at 6 bar and 197 deg C

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Each HRSG is fed from HP feed pumps.

LP feed is delivered through a preheater and a deaerator section. The HRSG pre-heaters are fed directly from two full capacity …. kw turbine condenser extraction pumps and by….Kw Ingersoll Rand recirculation pumps.

The HP section is equipped with feed water inlet economisers, the HP being two-stage.

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STEAM TURBINE AND GENERATOR

Siemens HP/LP dual pressure, double flow, self condensing, “single shaft” turbine unit with underslung seawater cooled titanium-tubed condenser.

Nominal turbine capacity 172,7 MW, Max. Capacity 199,9 MW at overload. Steam conditions at HP inlet 76 bar, 524 deg C.

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FUEL GAS SYSTEM

Natural gas via pipeline is supplied by BOTAŞ to a pressure reducing station which can reduce the gas pressure through 2x50 fuel gas regulators

FUEL OIL SYSTEM

Distillate oil is stored in two 1*5000m³, 2*500, 1*22500, 2*10000storage tanks which are filled from ship through ……jetty. The fuel oil supply system are include the following equipment for the supply fuel oil to the combustion turbines:

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WATER SUPPLIES-I

Demineralized water for the HRSG and Auxiliary Boiler described below is supplied from spring water. Raw water taken Azatlı spring is demineralized and polished through two mixed bed ion exchangers with polishing filters. System capacity is $50m^3/h$

Raw water is stored in a $200x3=600\ m^3$ storage tank for make up to the condensate feed system described above.

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WATER SUPPLIES-II

Acid and caustic soda systems are fitted to re-energise and clean the beds.

Boiler feed water treatment is by ammonia and hydrazine

dosing and the HRSG contents and turbine condensate are continuously monitored for Ph and conductivity.

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WATER SUPPLIES-III

Cooling water for the main condenser is drawn from the sea through underwater concrete section pipes by six Ingersoll Rand ……kW vertical, wet pit pumps.

Auxiliaries in the turbine hall are cooled with demineralized water, which is circulated in a loop by two 100% electrically driven cooling pumps. The demin. Circuit is cooled by two single shell 100% capacity heat exchangers which in turn are sea water cooled from a vertical auxiliary.

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PLANT AND INSTRUMENT AİR.

Supplied by two 100% capacity air-cooled oil free air compressors with associated air receivers.(Compressor: Kaiser, 10,5 m^3/h and 6,5 bar)

AUXILIARY STEAM BOILER

Manufacturer: Hoval, Gas and diesel fired,

The primary purpose is to provide steam the ……. when the main HRSG's are not in use. Steam output is 10 tons/h at 5-7 bar superheated. .

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Normal usage of the generating equipment is both gas and steam units exporting current to the TEIAŞ grid. Principal ST and GT generator breakers are SF6 insulated.

Protection arrangements have been specified as:

Circuit breaker failure/short zone protection.

Check synchronising relay, over-frequency protection, rotor earth fault protection, circulating current protection, neutral displacement- rotor earth fault protection, under voltage relays, over-current protection, reverse power protection, over-voltage protection, negative phase sequence protection and loss of excitation protection.

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TRANSFORMERS

Four GT unit Generating TX-10,5/154kV units of 180 MVA-Maker AEG

Two GT unit Generating TX-10,5/380kV units of 180 MVA-Maker AEG

Three Unit Generating TX- 15,75/380kV unit of 200 MVA-Maker AEG

Six 10,5 kV/6,3kV unit auxiliary TX of 2 MVA-Maker AEG

Three 15,75 kV/6,3kV unit auxiliary TX of 10 MVA-Maker AEG

Three ST excitation TX 1660 Kva

six GT excitation TX 747 Kva

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EMERGENCY DIESEL GENERATOR

16 cyclinder turbo-charged diesel engine with automatic electric battery start.
Capacity 1525 kW at 6,3kV delivered direct to 6,3kV essential services busbar system
This unit is supplied to maintain essential services for safe shut down of the plant in emergency. The unit does not provide black start facilities, these are accommodated by back feeding from the grid through the static frequency converter start system to start either GT set
Essential services and DCS are also backed up by 220 V DC battery banks at the 220V substation.

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SWITCH YARD/POWER STATION VOLTAGES

154 kV- output to grid

10,5 kV- GT generating

15,75 kV-ST generating

6,3 kV- station intermediate auxiliaries

400V- station auxiliaries and essential supplies

220V-station services

220V/DC- essential services backup battery supplies

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CONTROL-I

The control system has the capability operating under part load and changing load conditions. The proposed level of automation meets or exceeds that required by the operator staffing level of ……operators, ….. control operator and plus ….. supervisor per shift. Routine operations are all carried out from the central control room or the local control panels.

The Distributed Control System (DCS) provides a high level of automation for the plant

operations using modulating (analogue) control, digital (on/off) control, monitoring, alarming and indicating functions for the plant system and equipment.

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CONTROL-II

Devices which provide inputs to the DCS are connected to the process, not the instrument transmission system. Signals which provide inputs to control or tripping systems are connected directly (hard wired) They are not repeat contacts from alarm annunciators.

Sometimes, trip signals are generated within the DCS. The DCS provides redundant outputs which are hard wired into the associated tripping system. The Load Control System is capable of contributing to secondary frequency control requirements of TEIAŞ National Load Dispatch System.

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The Ambarlı Power Plant was designed and built to meet strick enviromental guidelines. As part of company's philosophy, top priority is given to building and operating the plant with minimal impact on the quality of air, water and land surrounding the plant. The Ambarlı Power Plant is an environmentally friendly power station with negligible sulfur emissions and very low nitrogen emissions because of ıts clean naturel gas fuel, new burning technologies and high efficiencies.

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This combinations means that there little greenhouse effect on earth's atmosphere, especially compared to coal-fired plants which have double the amount of carbon dioxide per kWh. The cooling water of plant is discharged to the sea in such a manner so as not to disturb the Environment, either with significant charge or decrease in quality of water. Finally, strict noise abatement measures have been incorporated

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GENERAL INFORMATION ON GAS TURBINE MAINTENANCE-I

Four types of inspection are described in the following that differ in terms of scope and interval

-The minor inspection, referred to in the following simply as inspection, comprises enter into the accessible regions of the machine and a largely visual inspection thereof. The scope of assembly work is limited to opening manholes on the combustion chamber, in the compressor inlet and in the exhaust duct

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GENERAL INFORMATION ON GAS TURBINE MAINTENANCE-II

The hot gas path inspection(HGPI) is essentially an inspection that is restricted to hot gas path items. Removing the outer casing in the turbine section, lifting off the upper sections of the turbine vane carriers and removing turbine blades/vanes for replecament. The compressor section is not opened and the rotor remains in the machine.

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GENERAL INFORMATION ON GAS TURBINE MAINTENANCE-III

The extended scope hot gas path inspection(ext.HGPI) comprises opening of the outer casing in the compressor section, lifting off the compressor vane carrier upper sections, and rolling out the lower sections of the compressor vane carriers in addition to the scope of an HGPI. Detailed visual inspections and extensive non-destructive evaluation work as well as scheduled and condition based repairs performed.

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GENERAL INFORMATION ON GAS TURBINE MAINTENANCE-IV

Life time extension(LTE); Measures are performed with the objective of preparing the machine for a further 100.000 EOH and/or 3000 starts or an additional major inspection interval. The main components of gas turbine are subjected to extensive non-destructive evaluation. As a general rule, this requires unstacking of the rotor.

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GENERAL INFORMATION ON GAS TURBINE MAINTENANCE-V

A major inspection is not called for as a general rule, but maybe performed on the basis of inspection findings.

- A Major inspection includes the measures performed in an ext. HGPI. In addition, the rotor is lifted out of the machine and unstacked.

ORGANIZATION&STAFFING

AMBARLI FUEL-OIL AND COMBINED CYCLE POWER PLANT

PERSONEL LİSTESİ

				01.12.2010
		Fuel Oil	**Doğal Gaz**	**TOPLAM**
Memur	Müdür	**1**		**1**
	Teknik Müdür Yardımcısı	**1**	**1**	**2**
	İdari Müdür Yardımcısı		**1**	**1**
	Baş Mühendis	**2**	**5**	**7**
	Mühendis	**9**	**9**	**18**
	TOPLAM	**12**	**17**	**29**
	BAŞUZMAN		**1**	**1**
	Uzman		**2**	**2**
	Teknik Uzman(A.)		**1**	**1**
	Teknik Uzman(B.)			
	Şef		**8**	**8**
	Sözleşmeli Memur	**2**	**24**	**26**
	Doktor ve Sağlık Memuru	**1**	**0**	**1**
	Hemşire	**1**		**1**
	Toplam	**5**	**36**	**40**
	Güvenlik Görevlisi		**34**	**34**
	TOPLAM	**5**	**70**	**74**
işçi işletme	Kazan İşletme	**36**	**22**	**58**
	Türbin İşletme	**23**	**27**	**50**
	Elektrik İşletme	**17**	**20**	**37**
	Su Tasfiye-Laboratuvar	**12**	**13**	**25**
	Yakıt Alma Tank Sahası	**9**	**0**	**9**
	İŞLETME TOPLAMI	**97**	**82**	**179**
İşçi Bakım	Kazan Bakım	**15**	**10**	**25**
	Türbin Bakım	**17**	**13**	**30**
	Elektrik Bakım	**10**	**9**	**19**
	Ölçü Kontrol	**14**	**13**	**27**
	Mekanik Atelye	**4**	**0**	**4**
	İnşaat Bakım	**0**	**0**	**0**
	Eğitim	**0**	**0**	**0**
	Teknik Büro	**2**	**3**	**5**
	Garaj	**0**	**9**	**9**
	BAKIM TOPLAM	**62**	**57**	**119**
İDARE	İdare	**0**	**11**	**11**
	İşçi Toplam	**159**	**150**	**309**
	SANTRAL TOPLAMI	**176**	**237**	**412**

THANK YOU FOR YOUR ATTENTION