

Geothermal Power Plant

Star Energy Geothermal (Wayang Windu) Ltd., Indonesia
Wayang Windu Geothermal Power Plant
1×110MW and 1×117MW



Outline

Wayang Windu Geothermal Power Plant is located about 40km south from Bandung city, West Java in Indonesia.

The plant consists of 1 unit of 110MW and 1 unit of 117MW geothermal steam turbines and generators. All equipment and works within the plant boundary as well as the Steamfield Above Ground System (SAGS) were furnished and constructed by Fuji in collaboration with ReKayasa Industri under an EPC (Engineering Procurement Construction) contract including civil and architectural design and construction work. Unit 1 was completed in June 2000, and Unit 2 in February 2009. The plant is owned by Star Energy Geothermal (Wayang Windu)

Limited (SEG) who is an Independent Power Producer (IPP) and operates the plant and sell electricity to Perusahaan Listrik Negara (PLN) for 30 years.

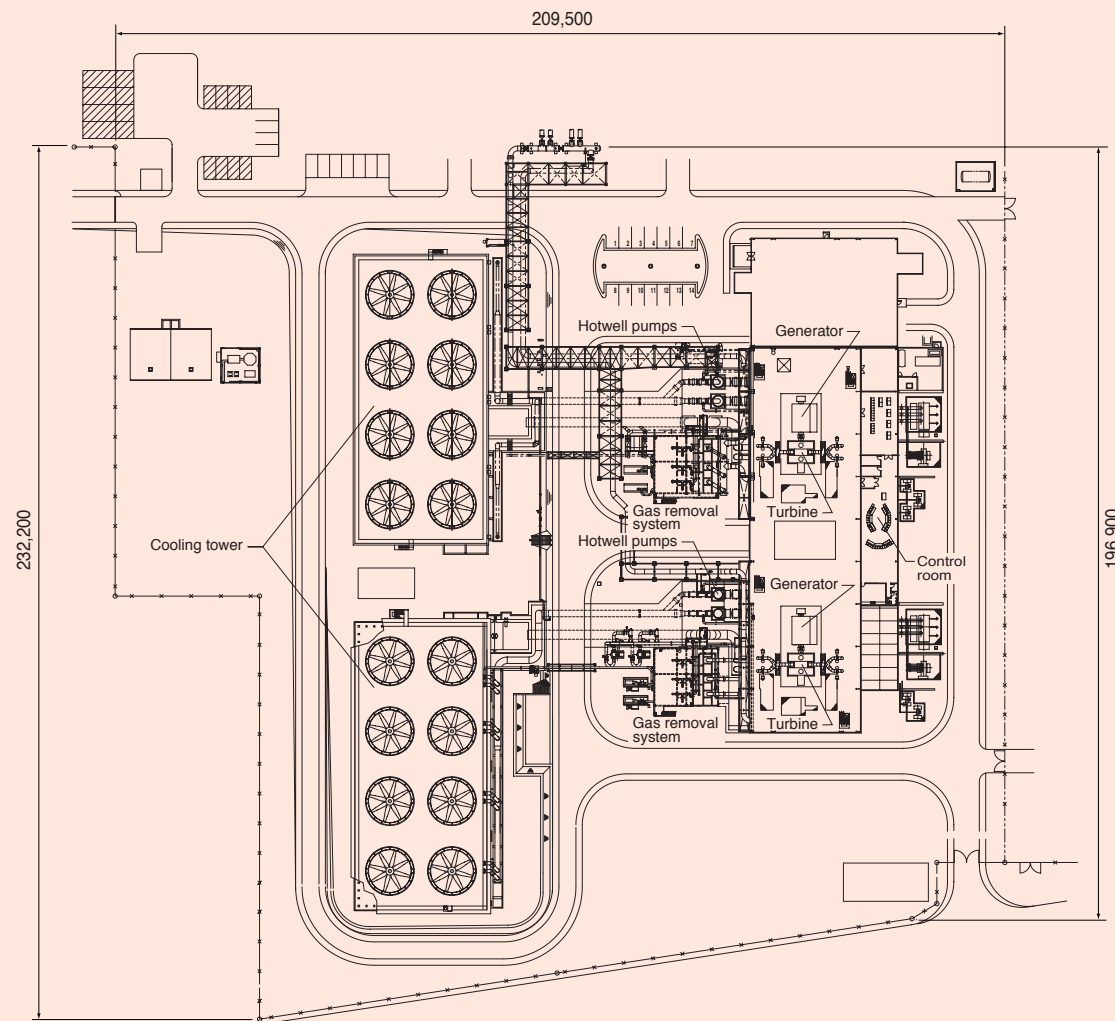
The two units utilize world-largest class single cylinder geothermal steam turbines employing the 27" (697mm) last stage blades.

SEG developed 6 production wellpads and 3 injection wellpads. Each wellpad has 1 to 5 wells of 2,000m to 3,000m deep for production and 1,500m deep for injection.

The geothermal brine from each wellpad is led to the separator station as two-phase flow through about 4km pipeline.

Overall layout

[Unit : mm]



Steam Turbines

The turbine is the single cylinder, double flow, condensing type. The lubrication oil system for the turbine and the generator is assembled at the shop and delivered to the site as one package.

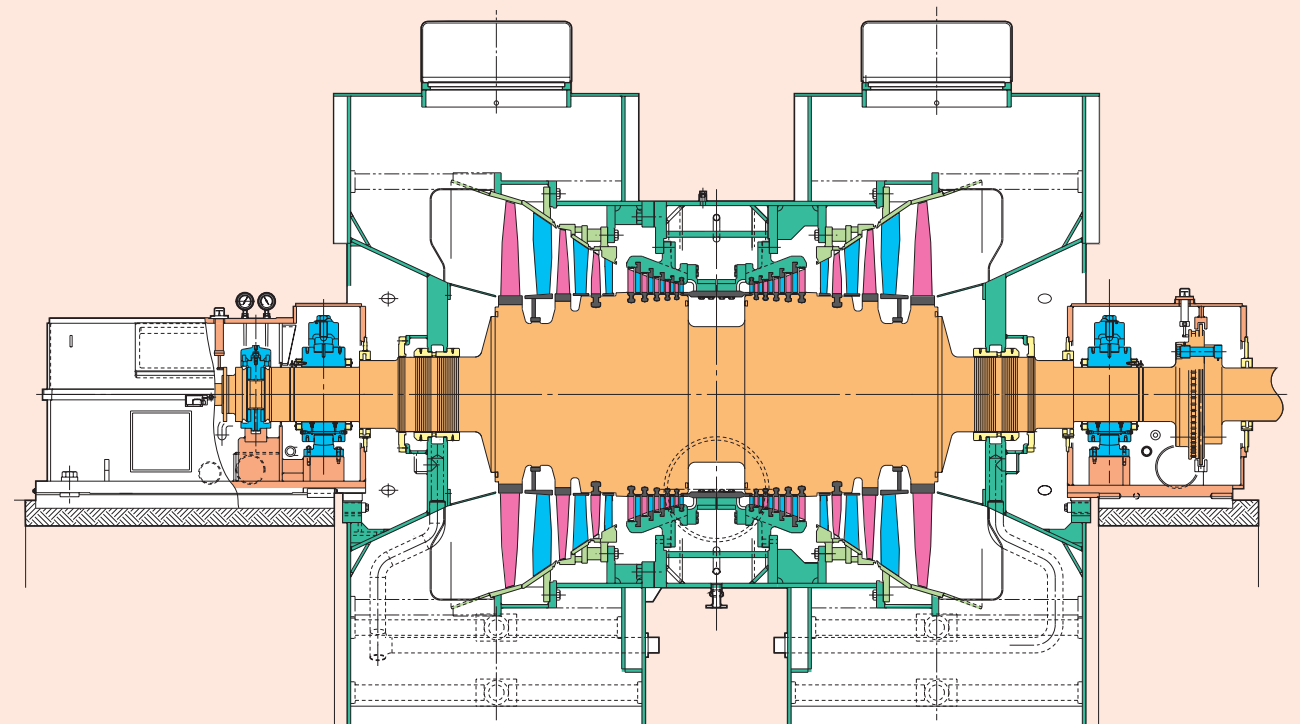
Turbine

Type	: Single cylinder, double flow, reaction, condensing
Rated output	: Unit 1; 110,000kW Unit 2; 117,000kW
Inlet steam pressure	: 10.7bar a (155psi a)
Inlet steam flow	: 768t/h (1,690klb/h)
NCG in steam	: 1.5%
Exhaust pressure	: Unit 1; 0.12bar a (3.54inHg a) Unit 2; 0.11bar a (3.25inHg a)
Speed	: 3,000r/min
No. of stages	: 8×2
Length of last stage	: 697mm (27")

Geothermal steam turbine



Turbine sectional view



Generators

Generator

Type : Cylindrical, 3-phase, synchronous, water-to-air cooled (TEWAC)
Output : 137,500kVA
Voltage : 13.8kV
Power factor : Unit 1; 0.8 (lagging)
Unit 2; 0.85 (lagging)
Excitation : Brushless

137.5MVA generator and turbine



Cooling Water System

Cooling tower

Mechanical draft counter flow type cooling tower is employed.

Type : Mechanical draft counter flow type
No. of cells : 8
Capacity : Unit 1; 18,500m³/h (81,500GPM)
Unit 2; 19,650m³/h (86,500GPM)

Design wet bulb temperature : Unit 1; 15.5°C (60°F)
Unit 2; 17.0°C (63°F)
Water temperature : Unit 1; 23.5/44.8°C (74.3/113°F)
Unit 2; 22.5/44.2°C (72.5/112°F)

Hotwell pumps

Vertical, centrifugal pumps are employed. 2 sets of 50% capacity pumps are installed.

Hotwell pumps



Cooling tower



Electrical and Control System

The electric power generated by the generator is delivered to the transmission line via generator transformer by which the voltage is stepped up to 230kV.

For the plant operation, control and supervising, the DCS system is provided. Self-standing type control cubicle is also provided for the operation of the electric system such as generator circuit breakers on-off and the automatic synchronization.

Generator transformer



Control room



Steamfield Above Ground System (SAGS)

Steamfield Above Ground System (SAGS) including the wellpad equipment, pipelines, separator station and the scrubber station is also constructed under the same contract.

There are 6 production wellpads and 3 brine/condensate injection wellpads for the two units.

Geothermal steam and fluid from the production wells is piped the separator station.

6 cyclone type separators are used to separate the steam from the two-phase liquid from the production wells.

4 scrubbers of corrugate type are provided just before the power station to eliminate further moisture.

Surplus steam will be released to the atmosphere through vent valves in emergency.

4 rock mufflers are provided near the separator station to reduce the noise level of the steam released.

Pipeline from wellpad to separator station



N68-441-82

Separator station



N68-441-38

Scrubber station



N68-441-31

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