

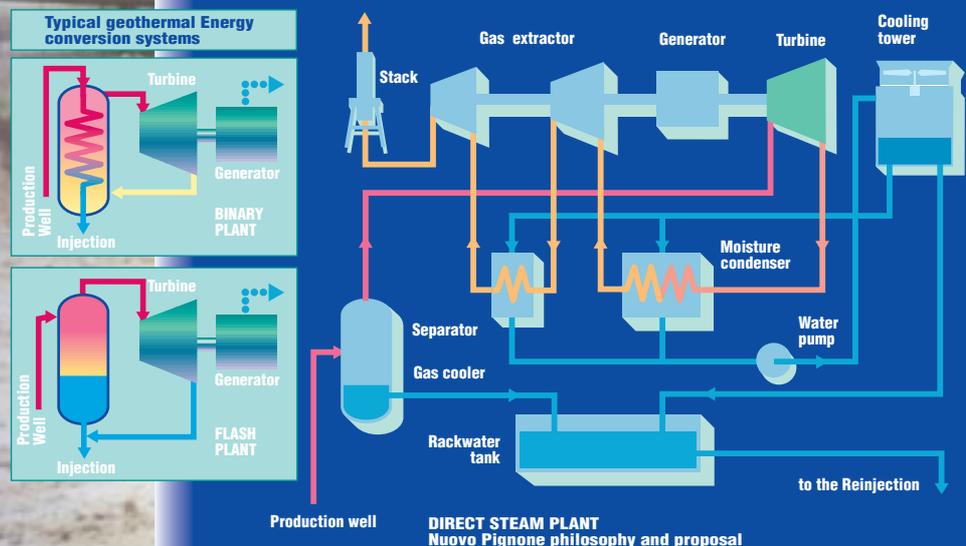
# GEO THERMAL POWER GENERATION

Well known as a natural phenomenon and exploited as energy resource since ancient times, geothermal steam became a source of energy for power generation purposes during early 1900.

Nowadays, electric power from geothermal source is generated in 27 countries, passing from 12MW in the 30's to about 8000 MW world wide in the year 2000.

Geothermal steam provides clean energy, and it is well considered as a naturally renewable and highly attractive source of power. Only small traces of non condensable gases ( $\text{CO}_2$ ,  $\text{CO}$ ,  $\text{CH}_4$  and  $\text{H}_2\text{S}$ ) are released in the atmosphere (released  $\text{CO}_2$  is to  $1/6$  of the emission of a conventional thermoelectric power plant).

## GEO THERMAL POWER PLANT TYPICAL SCHEMATICS



# Main Features

Experience matured in Italy since the earliest period, due to the high geological activity, gave Nuovo Pignone the proper know-how to develop a steam turbine series explicitly designed for geothermal power generation.

Proper steam turbine design minimizes erosion and corrosion:

- Stainless steel steam path
- Accurate performance prediction considering non condensable gas content in the geothermal steam
- Blade design to prevent salt deposits and erosion



# Casing

I2CrMo High Pressure Casing are provided with stainless steel coating and Inconel inlay at critical surfaces. Axial exhaust reduce installation elevation of the unit and minimizes civil works.

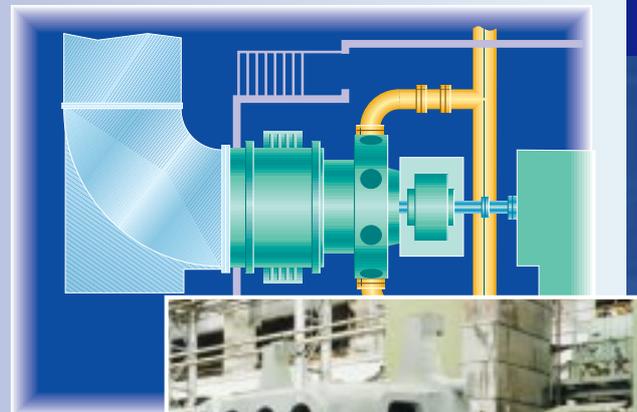
# Shaft & Blading

The shaft is made of Nickel Chrome Molybdenum high alloy steel. Standard low pressure stages have Stellite coating on the inlet edge for erosion protection. Blade materials are specially treated for best performance with geothermal fluid.



# Valves

Stop and control valves are butterfly type and flanged on the casing. Valve design is single-piece cast body, double flanged, triple eccentric, quarter-turn. Torque-generated resilient metal seal and stellite hard faced integral seal ensure continuous bi-directional zero leakage and full protection from aggressive fluid. Best operation flexibility and efficiency are also achieved by an additional series of manual valves, radially distributed over the first turbine stage; such valves allow a choking of steam flow redundant to the action of inlet butterfly valves.

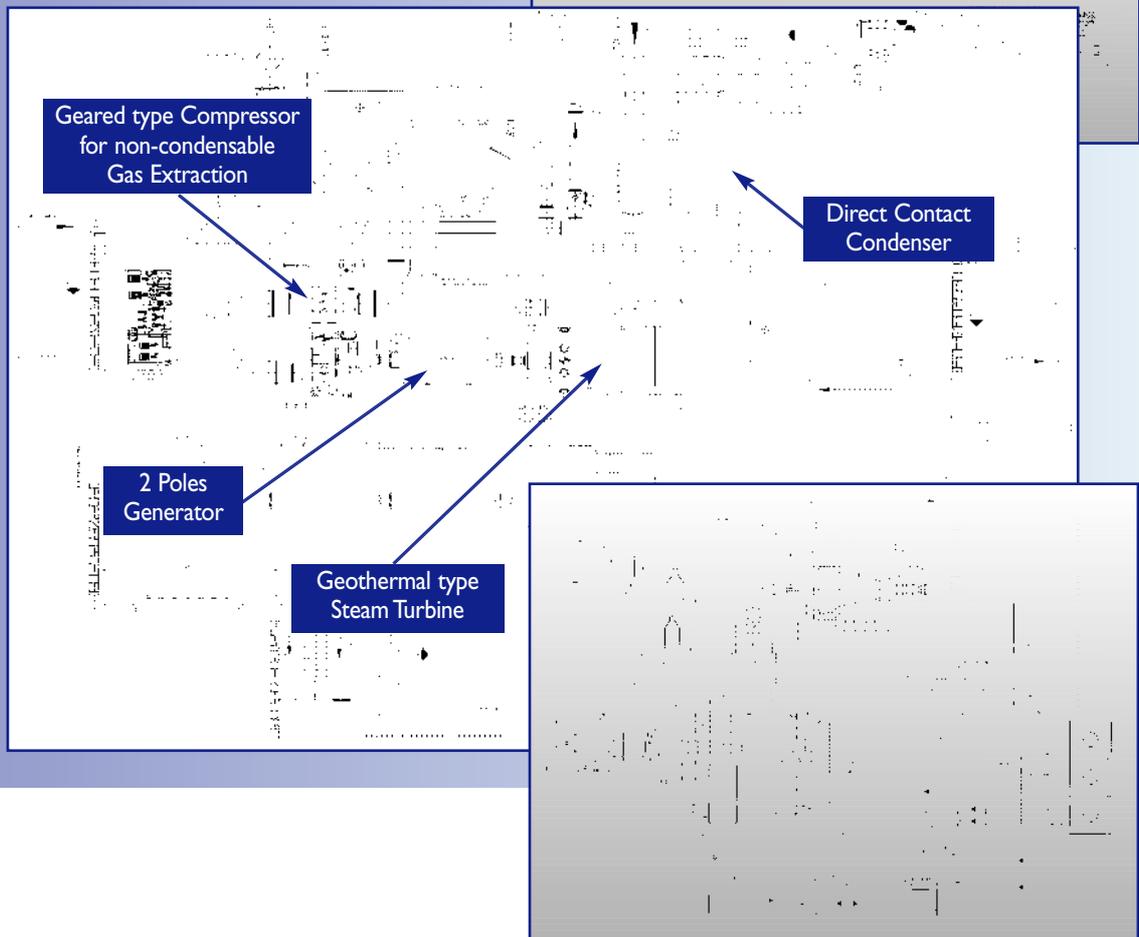


# Extended Scope

Over 35 years of experience as a system supplier, gave Nuovo Pignone the best capability to provide extended scope supplies.

Nuovo Pignone, with its vast experience in rotating machinery, reactors and condensers for refinery and petrochemical applications, has the unique capability of designing and manufacturing the complete equipment of the geothermal station like steam turbines, centrifugal compressors for non-condensable gas extraction, centrifugal pumps for condensate extraction, condensers and controls. The single source of most of the products in the scope of supply, and a full integration of equipment design and manufacturing provide the customers with optimized design and performances, minimum costs, and best project execution.

Typical arrangement  
of Geothermal Power Plant



## GE Power Systems Oil & Gas

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