

Different types of geothermal systems

4 Types Of Geothermal Systems

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The thermal energy contained in the interior of the earth is called geothermal energy. Volcanoes, geysers, and hot springs are visible evidence of a large amount of heat lying in Earth's interior. The geothermal is enormous and last for several millions of years. Hence, it is called renewable energy.

Energy presents as heat (i.e. thermal energy) in the earth's crust. The more readily accessible heat is in the uppermost part (10 km) or crust constitutes a potentially useful and almost the inexhaustible source of energy. This heat is apparent from the increase in temperature of the earth with an increase in depth below the surface. Although higher and lower temperatures or cross the average temperatures occur, the average temperature at the depth of 10 kilometers is 200 degrees celsius.

The molten rock within the earth is called magma. It is commonly presented at a depth of about 32 km on an average with a temperature of about 3000 degrees C. In some places, anomalous geologic conditions cause the magma to be pushed up towards the surface where the heat of the magma is being conducted upward through an overlying rock layer. The figure shows a typical geothermal field.

The hot magma near the surface (A) solidifies into igneous rock (D). The heat of the magma is conducted upward to this igneous rock. Ground water which finds its way down to this rock through cracks is heated by the heat of the rock or by mixing with hot gases and steam coming from magma. Then the heated water convectively rises upward and into a porous and permeable reservoir (C) above the igneous rock. The reservoir is capped by a layer of the impermeable solid rock (D) which traps the hot water in the reservoir. The solid rock has fissures (E) which act as vents of the giant underground boiler. The vents show up at the surface as geysers fumaroles (I) or hot spring (G). A well (H) traps steam from fissures for the use in a geothermal power plant.

At any place on the planet, there is a normal temperature gradient of 30 degrees C. per km dug into the earth. Therefore, if in one dig 20000 feet the temperature will be about 190-degree c above the surface temperature, this difference will be enough to produce electricity. However, no useful and economical technologies have been developed to extract this large source of energy.

The basic kinds of geothermal sources are as follows.

1. Hydrothermal (a) Vapour dominated or dry steam fields (b) Liquid dominated system (c) Hot -water fields

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2. Geopressured 3. Hot dry rock or Petrothermal 4. Magma resources 5. Volcanoes

Hydrothermal resources contain superheated water, steam, or both in fractures or porous rock but further trapped by a layer of impermeable rock.

Hot dry rock or petrothermal resources consist of high-temperature rocks ranging from 90°C to 650 degree C. The rocks can be fractured and water may be circulated through the rocks to extract thermal energy.

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