Geothermal Energy

Geothermal energy is the natural heat generated within the earth.

- the potential too vast

India has a potential of 40.9×10^{18} cal with more than 300 hot springs

* 20 hot springs located in J&K
* 30 " " " " H.P.
* 62 " " " " U.P.

Worldwide present installed capacity of geothermal power plants is 5915 MW.

* GSI has explored 113 geothermal areas in India and estimated a potential of 40.9×10^{18} cal in the upper 3 km depth - which is equivalent to 5.73 billion tonnes of coal.

Geothermal energy can be exploited/used in 2 ways: depending on the temp. of the hot fluid.

1) Electric power generation when temp very high
2) Used for thermal application when fluid luke warm.

Thermal fluids having temp $60-120°C$ have following advantages over power generation:

i) many more lower temp reservoirs can be used
ii) lower capital cost
(iii) efficiency of use is higher than conversion to electric power.
- (a) no. of stages ↑↑
- (b) temp low, insufficient for Rankine cycle.

How Geothermal Energy Generated

Geothermal energy is generated & stored within the earth because of two reasons.
(i) Due to collision betn continental crust plates

For example.
by the collision betn (continental plate).
generated got trapped These becomes rich

other than H
or occurs between southern & western active volcanoes in H heat.

Important Paran

1) surface temp
2) reservoir "
3) depth of exploral
4) thermal gradient
5) heat & conduct

* Important Geotherma
1) Puga (J&K) - Acido
2) Chhimathang (J&K)
3) Manikaran (HP)

Utilization of Geot

1) space heating
processing 4) ho

Utilization Abroad.

Russia - green h
power
Iceland -
China power
Hungary fus
Others

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For example, the Himalayan mountain came into existence by the collision betn the asian plate & European plate (continental plate). Due to collision huge amt. of heat generated got trapped betn in the water & rocks beneath. These becomes rich sources of geothermal energy.

Other than these heat & its generated when collision occurs between oceanic plate & continental plate as in southern & western India. & There are numerous active volcanoes in the ocean sea bed. giving rise to enormous heat.

Important Parameters of Geothermal reservoirs

1) surface temp
2) reservoir
3) depth of exploration   (5) heat flow (6) max. bore hole temp recorded.
4) thermal gradient
5)   (7) condition of flow (8) thickness of fracture zone

Important Geothermal areas in India

1) Puga (J & K) - temp upto 84°C   with discharge 51 ft/sec.
2) Chhimathang (J & K) - 87°C, depth 20-221m, max temp 109°
3) Manikaran (HP)   4) Tapoban (UP)

Utilization of Geothermal Energy

1) space heating   2) power generation 3) Food processing 4) refrigeration 5) cold storage etc.

Utilization Abroad

Russia - green house cultivation, processing, space heat, power generation.

Iceland -   same

China - power generation, green-house cultivation

Hungary - Energy equivalent to 80,000 tonnes saw

Others - USA, France, Japan, Italy, Mexico.

Utilization in India

(1) Power generation — 5kW pilot plant operating at Manikaran.

(2) space heating — Expt. carried out at Puga have proved successful.

(3) Green house cultivation — Geothermal water was successfully used at Chhumathang (Ladakh). A tempof 20-25°C. maintained inside the green house

(4) Refrigeration. — A 7.5 tonne cold storage installed at Manikaran utilising water at 90°C

Difficulties using GT water

— decrease in discharge of thermal fluid.
— surface pipeline scaling
— mechanical damage in borewell.
— entrance of cooler fluids in the reservoir
— well pipeline scaling.