A
Seminar report
on

Geothermal Energy

Submitted in partial fulfillment of the requirement for the award of degree
Of Mechanical

SUBMITTED TO: **SUBMITTED BY:**

www.studymafia.org www.studymafia.org

Preface

I have made this report file on the topic **Geothermal Energy;** I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Index

Introduction

Geothermal energy is the earth's natural heat available inside the earth. This thermal energy contained in the rock and fluid that filled up fractures and pores in the earth's crust can profitably be used for various purposes. Heat from the Earth, or geothermal — Geo (Earth) + thermal (heat) — energy can be and is accessed by drilling water or steam wells in a process similar to drilling for oil. Geothermal energy is an enormous, underused heat and power resource that is **clean** (emits little or no greenhouse gases), **reliable** (average system availability of 95%), and **homegrown** (making us less dependent on foreign oil).

Geothermal resources range from shallow ground to hot water and rock several miles below the Earth's surface, and even farther down to the extremely hot molten rock called magma. Mile-or-more-deep wells can be drilled into underground reservoirs to tap steam and very hot water that can be brought to the surface for use in a variety of applications.

What is geothermal energy?

Geothermal energy is defined as heat from the Earth. It is a clean, renewable resource that provides energy in the U.S. and around the world in a variety of applications and resources.

Costs of Geothermal Energy

Costs for geothermal electricity generation are 4.5-7 cents per kilowatt-hour. This is competitive with some fossil fuel facilities, but one must keep in mind the drastic reduction of pollution.

Delivered costs depend on ownership arrangements, financing, transmission, the quality of the resource, and the size of the project.

Geothermal plants are relatively capital-intensive, with low variable costs and no fuel costs.

Usually financing is structured so that the project pays back its capital costs in the first 15 years, delivering power at 5-10¢/kWh. Costs then fall by 50-70 percent, to cover just operations and maintenance for the remaining 15-30 years that the facility operates (World Bank Group, 2004).

History

- Paleo-American Indians used hot springs in this area
- Hot Springs, Arkansas had $1 hot baths in 1830
- First electricity (20kW) from geothermal produced from natural steam in Larderello, Italy in 1904 [Kruger, 1973]
- New Zealand's north island gets 6% of its electricity from geothermal energy
- 1920: test boring in Niland CA
- 1922: electricity generation in The Geysers
- 1950: 95°F, 220kW generating plant in Katanga
- The Geysers CA expanded to 600MW in 1975

Where Is Geothermal Energy Found?

What does geothermal energy look like? Some visible features of geothermal energy are volcanoes, hot springs, geysers, and fumaroles.

But you cannot see most geothermal energy. Usually geothermal energy is deep underground.

There may be no clues above ground to what exists below ground.

Applications

1. Space/District Heating: Schemes utilizing geothermal heat provide over 80% of the central heating needs of Reykjavik city in Iceland and are employed in many towns in USA, Poland and Hungary. The World Bank is currently supporting a program in Poland for using hot water from unsuccessful oil wells to displace the use of coal for district heating (World Bank Group, 2004).

2. Agriculture and Aquaculture: In temperate and colder climates, greatly improved plant and fish growth can be achieved by heating soils, greenhouses and fish ponds using geothermal heat. One example of this is the largely successful Osearian Farm, Kenya (World Flowers, 2005).

3. Power Generation: With over 8000 MW of installed capacity, geothermal electric power generation is a well-proven technology that has been especially successful in countries and islands that have a high reliance on imported fossil fuels (World Bank Group, 2004).

Types

Liquid-dominated plants

Liquid-dominated reservoirs (LDRs) are more common with temperatures greater than 200 °C (392 °F) and are found near young volcanoes surrounding the Pacific Ocean and in rift zones and hot spots.

Thermal energy

Lower temperature sources produce the energy equivalent of 100M BBL per year. Sources with temperatures from 30-150 C are used without conversion to electricity for as district heating, greenhouses, fisheries, mineral recovery, industrial process heating and bathing in 75 countries.

Enhanced geothermal

Enhanced geothermal systems (EGS) actively inject water into wells to be heated and pumped back out.

The water is injected under high pressure to expand existing rock fissures to enable the water to freely flow in and out.

CLASSIFICATION OF GEOTHERMAL RESOURCES

The Geothermal Resources can be classified into three categories, viz

a) hydrothermal ,

b) geopressure

c) Hot dry rocks.

Hydrothermal resources

Hydrothermal resources are those that are associated with natural convection systems. Their thermal reservoirs consist of porous or fractured rocks, containing hot water or steam, which in the natural state, transported towards the surface by density-driven thermo-artesian flow. All the currently identified geothermal resources are hydrothermal in origin. Hydrothermal system may be further divided into liquid-dominated or vapour-dominated, depending on the ratio of water to steam in the reservoir.

Liquid dominated hydrothermal systems may be of low, moderate or high-temperature type and are the most common kind of geothermal system being exploited commercially today. Vapour dominated reservoir is much less common but includes Larderello in Italy and Geyser in USA.

Geopressure Resources

Geopressure Resources are an example of conduction dominated heat flow system. Their energy is confined in the porous spaces as hot water and sealed so that fluid convection is restricted and heat transfer is by conduction. Their main characteristic is that their pore pressure is considerably greater than the hydrostatic. Such reservoirs exist at depths >4 km in young sedimentary basins having only slightly greater than average thermal gradients. Tertiary basins along the Gulf Coast of Louisiana and Texas, USA are some examples.

Hot dry rock

Hot dry rock resources are another example of a sub-economic conduction dominated geothermal resources. They occur in areas of high heat flow but low permeability and heat is transferred by conduction. In these areas temperature exceeds 300°C at 2 to 3 km depth. To derive geothermal resources it is required to open a fracture system at depth using hydraulic fluid pressure by drilling and then penetrated by a secondary drill hole.

Heat is extracted by circulating treated water from the surface down the well, through the hot fracture network, and recovered up in the second well. The technique is in the preliminary stage and is being applied in England, France and USA.

Advantages

- It is a renewable source of energy.
- By far, it is non-polluting and environment friendly.
- There is no wastage or generation of by-products.
- Geothermal energy can be used directly. In ancient times, people used this source of energy for heating homes, cooking, etc.

Disadvantages

- Only few sites have the potential of Geothermal Energy.
- Most of the sites, where geothermal energy is produced, are far from markets or cities, where it needs to be consumed.
- Total generation potential of this source is too small.
- There is always a danger of eruption of volcano.

Conclusion

Geothermal energy is limited in extent as extracting the heat usually exceeds the replenishment rate Hot, dry rock (HDR) is widespread and offers new resources in areas where geyser activity is unknown Direct low-temperature heat transfer for home systems is practical as long as low maintenance is designed into the system Sources of high temperature water or steam are limited and the cost of extraction, maintenance, and operation will remain high in comparison with other sources of energy

Geothermal energy likely to remain at 1% of world energy [Kruger, 1973]

References

www.studymafia.org

www.google.com

www.wikipedia.com