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ROLE OF GEOTHERMAL ENERGY: A PRESENT SCENARIO

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Abstract: - This research gives brief introduction about types of renewable Energy Sources mainly Solar and Wind energy. Renewable Energy Sources are of paramount importance as conventional Energy Sources are not in a position to cater the needs of changing demand scenario. Various Renewable Energy Technologies are not conversant with Conventional Energy Sources Technologies. Thus, to synchronize both past and present Energy Sources, advanced technologies need to address. This paper addresses the technologies used for Renewable Energy Source (geothermal energy) and their prominent role in present scenario.
Keywords: - paramount, conversant, efficient, synchronize, prominent.

I. INTRODUCTION

Energy is basic need of human beings of current society. The primary resources available are used since past to convert them into useful forms of the energy. In ancient times the society was based on various forms for example: -wind, Hydro, bio and other energy. There was Continuous improvement in the technology for harnessing the energy from these resources and brought an industrial revolution. the fossil fuel such as coal, natural gas have been used in industrial world to produce needed for the society.

II. LITERATURE SURVEY

Wendy M et al [1] explained that Hydrothermal alteration mineralogy in geothermal systems is commonly used to infer system temperature and past fluid flow patterns. Infrared spectroscopy is particularly good at identifying a wide variety of hydrothermal alteration minerals. The technique requires little sample preparation, and is especially helpful in discrimination among a wide range of phyllosilicate minerals that may be difficult to distin-guish in hand sample or require lengthy preparation for XRD analysis. We have performed several pilot studies of geothermal drill core and chips to prototype rapid alteration characterization over large depths. These preliminary studies have established reliable methods for core/chip surveys that can quickly mea-sure samples with high depth resolution and show the efficiency of the technique to sample frequently and provide alteration logs similar to geophysical logs. We have successfully identified a wide variety of phyllosilicates, zeolites, opal, calcite, iron oxides, and hydroxides, and note depth-associated changes inalteration minerals, patterns, or zones. Alteration mineralogy identified using these techniques shows good correlation with traditional petrographic microscope and XRD methods.

Mihaela Coroiu [2] described that Now-a days the environmental pollution is one of the main concerns worldwide going next to the preoccupation to ensure the energy consumption of the modern world continuously increasing. One solution to this issue is the energy generation using renewable sources, especially considering the classic energy sources being limited and the unfavorable availability forecast for coal, natural gas and oil. The paper is structured to addresses a topic related to the exploitation of renewable energy sources to generate heat and power using modern and sustainable solutions in order to reduce the environmental impact by facilitating greenhouse emissions savings

.Robert Caulk et al. [3] in this paper they described the calibration and parameterization of a numerical model for conductive heat transfer from a group of geothermal energy piles into the soil surrounding the piles. Calibration was performed using Thermal Response Test (TRT) data collected from a group of full-scale in-situ geothermal energy piles in Colorado Springs, CO. The calibration of the three dimensional model incorporated field data to represent boundary conditions including inlet temperature, atmospheric temperature, and subsurface temperatures at different locations within the pile group. Following calibration, the model was parameterized to understand the role of heat exchanger configuration with a given energy pile as well as the role of pile spacing in an energy pile group. Parametric combinations were compared using heat transfer per unit length of the energy pile (W/m). The results of the parametric study indicate that heat transfer increases by up to 8% for an even heat exchanger layout compared to an uneven layout when considering a 15.2 m long, 0.61 m energy pile configured with a W-shape heat exchanger. These results also provide useful insight into the cross-sectional temperature distribution of the aforementioned energy pile configuration. Energy pile temperature was observed to vary by up to 20% across the core of the pile during heating for various heat exchanger layouts. This uneven temperature distribution may have implications on the estimation of in-situ thermal axial stresses in energy piles. Specifically, using measurements at strain gage locations may underestimate thermal axial stress during heating.

P. Bingham et al.[4] Enhanced geothermal systems seek to expand the potential for geothermal energy by engineering heat exchange systems within the earth. A neutron radiography imaging method has been developed for the study of fluid flow through rock under environmental conditions found in enhanced geothermal energy systems. For this method, a pressure vessel suitable for neutron radiography was designed and fabricated, modifications to imaging instrument setups were tested, multiple contrast agents were tested, and algorithms developed for tracking of flow. The method has shown success for tracking of single phase flow through a manufactured crack in a 3.81 cm (1.5 inch) diameter core within a pressure vessel capable of confinement up to 69 MPa (10,000 psi) using a particle tracking approach with bubbles of fluorocarbon-based fluid as the "particles" and imaging with 10 ms exposures.

III. RENEWABLE ENERGY

Renewable energy is energy generated from natural resources present on earth's surface —such as sunlight, wind, rain, tides and geothermal heat—which are renewable (naturally replenished). Renewable energy technologies range from solar power, wind power, hydroelectricity/micro hydro, biomass and biofuels[5].

A. Geothermal energy

Geothermal energy is defined as heat from the Earth. It is a tidy, renewable resource that provides energy in the U.S and around the world in a variety of applications and resources. Although areas with history signs like hot springs are more obvious and are often the first and foremost places where geothermal resources are used, the heat of the earth is available everywhere, and we are learning to put in service it in a broader possibilities of circumstances. It is considered a renewable resource because the heat emanating from the interior core of the Earth is fundamentally limitless. The heat continuously flowing from the Earth's inside, which travels chiefly by conductibility is estimated to be equivalent to 44 million megawatts (MW) of power, and is expected to remain so for coming billions of years, ensuring an unlimited supply of energy.

B. Conventional geothermal reservoir

A geothermal system requires heat, permeability, and water. The heat inside Earth's core continuously flows outward. Sometimes the heat, as magma, reaches the surface as lava, but it usually remains below the Earth's crust, temperature nearby rock and water — sometimes reaches to levels as hot as 700°F. When water is heated by the earth's heat, hot water or steam can be trapped in leaky and porous rocks under a layer of impermeable rock and a geothermal reservoir can be formed[4-6]. This hot geothermal water can demonstrate itself on the surface as in form of hot springs (geysers) , but most of it stays deep underground, trapped in cracks and porous rock. This natural collection of hot water is called a geothermal reservoir.

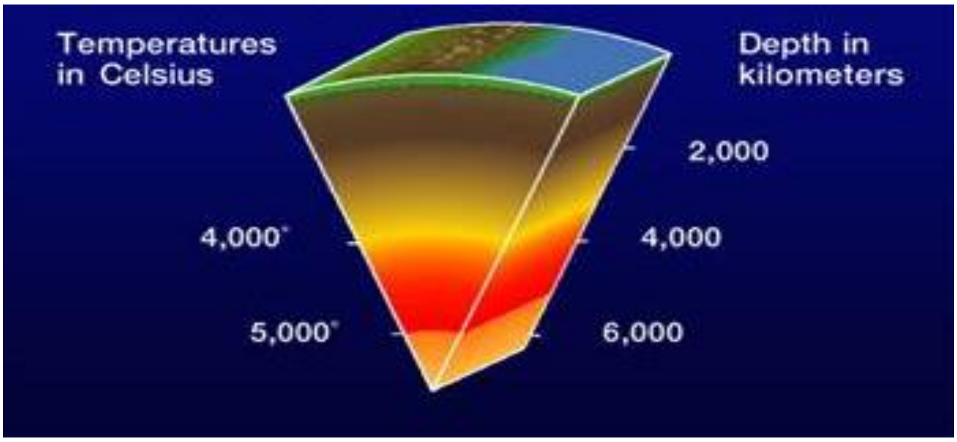

Fig 1.Temperature in different parts of core of Earth.(source- 9)

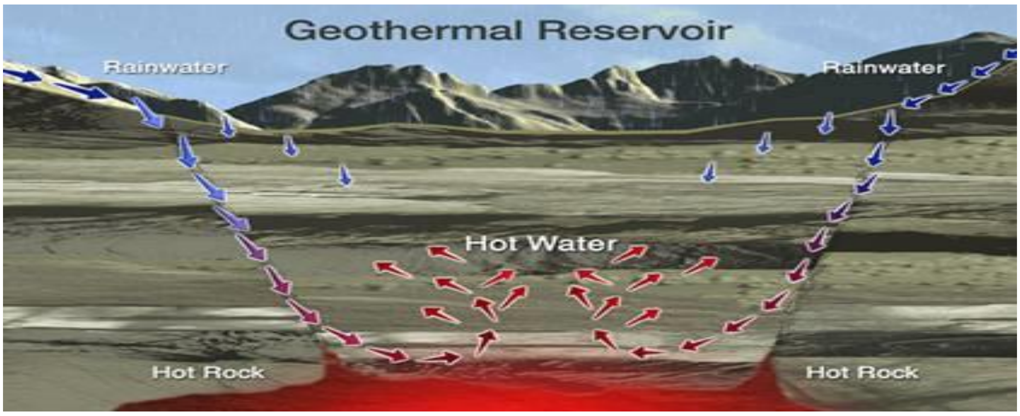

Figure 2: The Formation of a Geothermal Reservoir.(source- 9)

IV. GEOTHERMAL ENERGY INTO ELECTRICITY

Geothermal energy working principle is used for building, heating and generating electricity (simplified version). First step, we need to extract the geothermal energy from steam, hot water and hot rocks from Earth's surface. The success of the process depends on how hot the water is, and water temperature depends on how hot rocks are to start with, and how much water is pumped down to these rocks. The water is pumped down through an "injection well", it passes through the cracks in these rocks and then comes back up again through a "recovery well" towards the surface, and because of the great pressure water is transformed into a steam when getting on the surface[7-8].

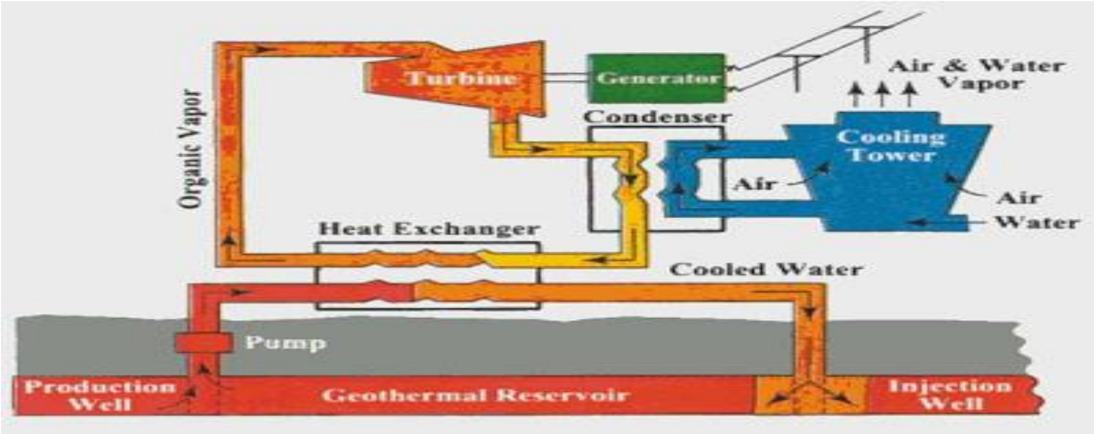

Fig 3.Geothermal energy working principle used for generating electricity.(source- 9).

Created steam then needs to be separated from salts which is usually done in central separation chamber. After this process of separation is over, complete steam is transferred to heat exchangers which are present inside the power plant[8]. After steam is sent to heat exchangers it is possible to transfer it even further to the steam turbines from where it can be turned into electricity, and at the same time through the exhaust pipes unused energy is being released.

In heat exchangers steam is cooled under the pressure in condensate and after that heat is transferred into cold water in condensate heat exchangers. This cold water is gained on this way gets pumped from wells to storage tanks from which is transferred to heat exchangers from where water's temperature gets increased and then passes through deaerators where it boils and where oxygen is released and other gases that could cause corrosion (when being heated) are removed by final water cooling[7]. Simply, it's all in the process of water heating and it's transfer to steam which can be then be used to drive a turbo-generator that generates electricity or this steam passes through heat exchangers and heats water thus creating necessary heat for central heating of households and industrial facilities.

A. Geothermal power plant

The basic components used for generation of electricity in geothermal power plants are given below:-

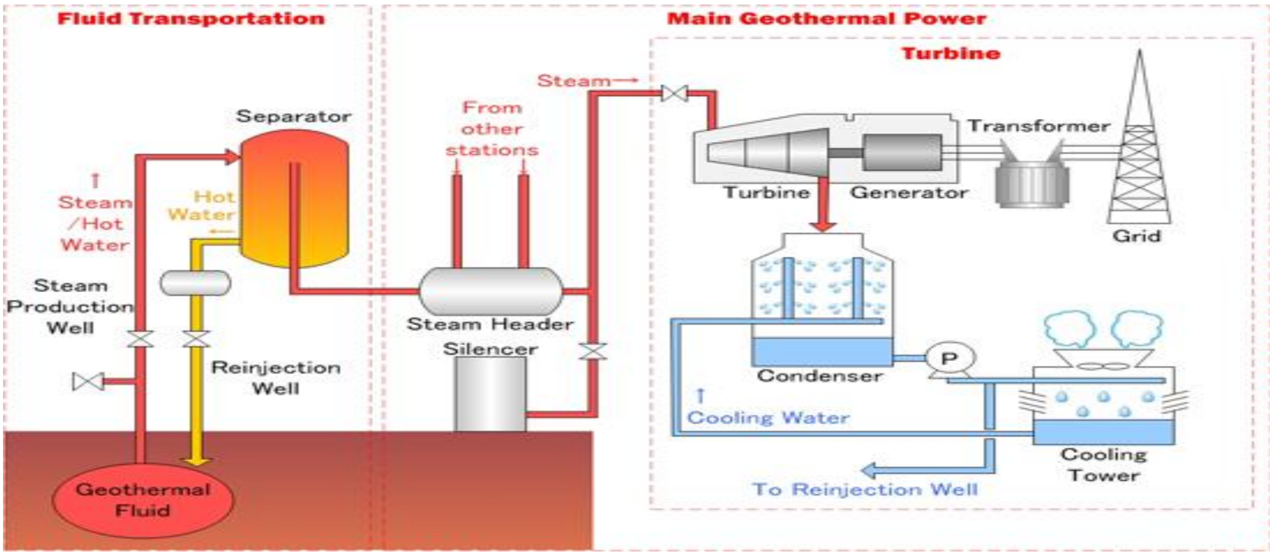

Fig 4 Geothermal Plant .(source- 9)

1. Geothermal Vents

The first component of a geothermal plant is geothermal vent. A geothermal vent is a deep well drilled into the Earth that the power plant uses to tap into the Earth's heat[6-7]. A geothermal plant may have two goals for its vent; most current geothermal plants draw superheated, pressurized water upward; these are called flash steam plants. Geothermal plants may also simply dig far enough underground, as many as three kilometers, to reach a point where the Earth is warm enough to boil water, these are called dry steam vents.

2. Steam Generator

Another key component of a geothermal plant is the steam production unit, which can take multiple forms. In a flash steam vent, superheated pressurized water is drawn from its place underground to low-pressure tanks[7]. The pressure of the Earth kept the water in liquid form despite its high temperature, and by removing that pressure the hot water instantly turns to steam, hence the term flash steam. In a dry steam plant, the plant technicians pump water to the bottom of the vent where the Earth's heat boils the water and turns it into steam.

3. Turbine

Regardless of the plant type, both flash steam and dry steam plants pump the steam from the geothermal vent to a large turbine. The steam passes this turbine, turning it in the process. This turbine is attached to an electric generator, and as the turbine turns the generator turns the mechanical energy into electric energy, thus converting the heat from the Earth into usable electricity[8-9].

4. Condenser

After the steam passes through the turbine, it continues to a condenser chamber. This chamber condenses the steam back into liquid water by cooling it. The excess heat lost as the steam turns to liquid water may be used for other applications, such as heating or greenhouse farming[8-9]. The cooled liquid water is then typically pumped back into the ground to either restart the boiling process for dry steam or to replenish the natural heated aquifer for flash steam plants.

V. USAGE

- Geothermal energy is also used to heat buildings through district heating systems. Hot water near the earth's surface can be piped directly into buildings and industries for heat[6-9]. A district heating system provides heat for most of the buildings in Reykjavik, Iceland.
- Industrial applications of geothermal energy include food dehydration, gold mining, and milk pasteurizing.
- For the treatment of skin diseases
- Dehydration (drying of vegetables and fruits)
- Used for pasteurizing milk, paper manufacturing, in swimming pools, drying timber and wool, animal husbandry etc.
- Geothermal waters are used for heating greenhouses on a small scale.
- Little to No Global Warming Emissions present

VI. ADVANTAGES

- Improved Public Health and Environmental Quality.
- A Vast and never-ending Energy Supply.

- Jobs created and Other Economic Benefits.
- Constant and minimal Energy Prices.
- A More Reliable and elastic Energy System.

VII. CONCLUSION

A geothermal heating system can completely be substitute to natural gas or oil heating system. In combination with a photovoltaic system, we can reduce the annual costs by more than 60 percent and also reduce CO2 emissions. Investing in a geothermal system is profitable from and economical and an environmental perspective.

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