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Geothermal Power Plants

Mayank Kumar*[1], Gautam Tayal*[2] Dr J.P. Kesari*[3]
[1,2] Student, Department of Information Technology, Delhi Technological University, Delhi, India
[3]Associate Professor, Department of Mechanical Engineering, Delhi Technological University, Delhi,India

ABSTRACT
Geothermal energy is available day and night every day of the year and thus can serve as a supplement to energy sources that are only available intermittently. Renewable energy sources can play a significant role in mitigating climate change by cooperating rather than competing. Geothermal power plants use hydro-thermal resources that contain both water (hydro) and heat (thermal). Geothermal power plants require very high temperature hydrothermal resources that are obtained from dry steam wells or hot water wells. People use these riches to dig wells in the ground and then apply steam to the surface. Hot water or the steam produced further helps to power a turbine that generates electricity. Some geothermal wells are up to two miles deep. Geothermal power is generated in 24 countries, five of which derive 15-22% of their national electricity generation from geothermal energy. Direct use of geothermal energy (for direct heating, bathing, etc.) has been reported by 72 countries.

KEYWORDS: *Geothermal energy, Thermal power plants, Electricity,*

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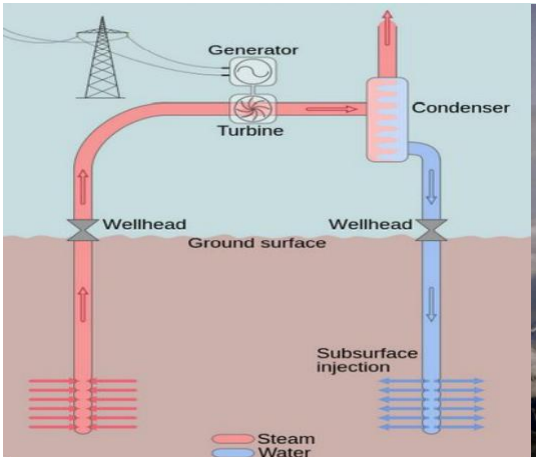
I. INTRODUCTION

Geothermal power plants are used for the purpose of generating electricity using geothermal energy (the earth's internal thermal energy). They operate primarily in a similar way as coal or nuclear power plants, the real difference being the source of heat. With geothermal, ground heat replaces coal plant boilers or nuclear plant reactors. Hot water or steam is extracted from the ground through a series of wells and feeds the power plant. Mostly, Geothermal plants draw water from the ground and return it to the surface. The rate of water used is often much higher than the rate of return of water, so a make-up water supply is usually required. There are 3 main types of geothermal power plants, of which flash cycle is the most common. The choice of plants depends on how much geothermal energy is available, and how hot the resources are. The hotter the resource, the less flow it will need to take advantage of it. Geothermal power is the force generated by geothermal energy. Technologies in use include dry steam power plants, flash steam power stations and binary cycle power stations. 26 countries are already using geothermal power for electricity production and 70 countries are using it for heating purposes

II. TYPES OF GEOTHERMAL POWER PLANTS

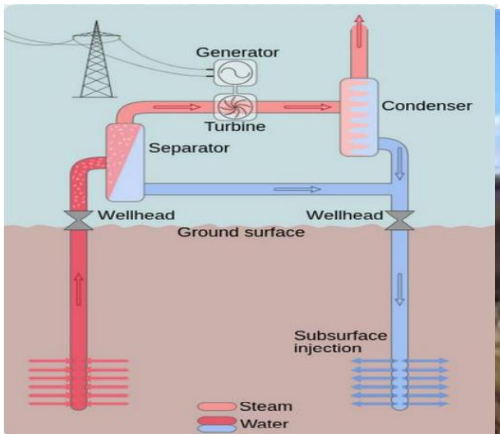
2.1 DRY STEAM POWER PLANT

The dry steam power plants use dry steam, which is produced naturally in the ground. This steam travels through a production well to the surface and through the turbine, and after its energy is transferred to the turbine, it condenses and is injected again into the ground. These are the oldest types of geothermal power plants, first built in Italy in 1904. Because such power plants require the highest temperatures, they can only be used if the underground temperature is high enough, but this type requires minimal fluid flow. The dry steam plant at Geysers in Northern California, first operated in 1924, is the largest geothermal source of electricity. In their high output in the late 1980s, they generated 2 gigawatts of electricity, equivalent to two large coal or nuclear power plants.



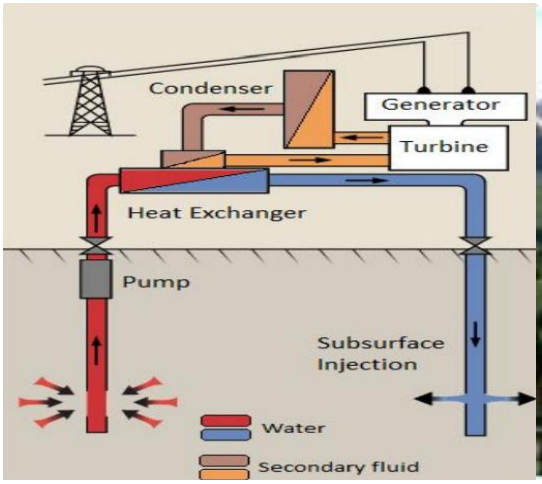
2.2 FLASH CYCLE POWER PLANT

These types are most commonly used due to the lack of naturally occurring high quality steam. In this method, the water temperature must be above 180 ° C, and under its own pressure it flows upwards from the well. It operates on a lower temperature than dry steam plants. As its pressure decreases, some of the water "flashes" into steam, which passes through the turbine section. The rest of the water, which did not evaporate, circulates in the well below, and can also be used for heating purposes. More complex parts have increased the cost of these systems, but they can still compete with conventional power sources.



2.3 BINARY CYCLE POWER PLANT

These are different from dry steam or flash steam power plants because the hydrothermal liquid from the subsoil reservoir never comes in contact with the turbine / generator units. In this dual process, a hydrothermal liquid that is not hot enough to be used in a flash steam plant is fed into the heat exchanger. Here, heat is transferred from the hydrothermal fluid to a "working liquid" with a lower boiling point (usually isobutane or isopentane) than water. The working liquid evaporates as much as it evaporates in a flash power plant and powers the turbine / generator unit. Both hydrothermal fluids and working liquids are present in "closed loops" and never come into contact with each other. The vapor condenses from the working liquid and the hydrothermal liquid returns to the ground. This cycle can be repeated in coherence with the reheating of Earth. An example of an area that uses the binary cycle power generation systems is the binary geothermal power plants of Mammoth Pacific in Casa Diablo. Because hot hydrothermal fluids are a much wider resource than hot fluids or pressure brains, binary systems have the potential to contribute significantly to the overall production of geothermal generated electricity.



III. DIRECT USE

Hot water from geothermal sources can be used directly to provide heat for industrial processes, crop drying, or heating buildings. In this method, hot water is pumped directly into the building's hot water-based heating system, under sidewalks, or into pools. The city of Klamath Falls, Oregon, located in the southern part of the Cascade Range is an area of much near-surface hydrothermal fluid. The Oregon Institute of Technology is practically heated by this direct-use system. The sidewalks in the area are covered with tubes to prevent snow and ice formation in the winter. Other examples of direct use of geothermal resources exist throughout the western United States, including Capitol Mall in Boise, Idaho. There, the city's geothermal district heating system even heats the Idaho State Capitol Building. Geothermal water also finds its application in local industries in greenhouses, fish farms and dairies.

IV. FUTURE OF GEOTHERMAL POWER IN INDIA: CHALLENGES AND BARRIERS

No geothermal generating capacity is available yet and only direct use (e.g. drying) has been reported. There is a need to consider the potential of geothermal resources in India and utilize these resources for power generation, space heating, greenhouse cultivation and cooking. All of the 400 thermal springs that have been found in India are available for use and if these springs are harnessed, they can provide significant energy compared to the current meager utilization of 200 MW. Out of 400 thermal springs, 150 are inside the Himalayan Geothermal Belt (HGB) with temperatures varying from 47o C to 87 ° C. Unlike conventional fuel powered plants that must be purchased over the life of the plant, geothermal power plants use a renewable resource that is unlikely to fluctuate in price. The new geothermal plants are currently generating 0.05$ to 0.08 $ per kWh (kWh) of electricity. Most of the expenses related to geothermal power plants are related to resource exploration and plant construction. Like oil and gas exploration, it is also expensive because only one in five wells has a suitable reservoir for development. Geothermal developers have to prove that they have reliable resources before providing the millions of dollars needed to develop geothermal resources.

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