A Thesis on

"GEOTHERMAL ENERGY AND THE PROSPECT OF BANGLADESH"

This thesis paper has been submitted to the Daffodil International University, of Bangladesh in partial fulfillment of the requirements of the degree of "Bachelor of Science in Electrical and Electronics Engineering."

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APPROVAL

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Dedicated to

MY PARENTS
TEACHERS
&
MY FRIENDS

With Love & Respect

ABSTRACTS

This thesis is Geothermal energy and the prospect of Bangladesh.We can not believe that electricity is central to our modern life without electricity.There is a wide gap between electricity generation an d demand in this country.With required statistical data,various sources of power such as gas,coal, wind,solar,hydro,biomass etc studied in this study.There has been comprehensive study onexisting p ower plants.Gas, coal, oil, power plant related, primarily power generation capability used fuels, present generation status have been considered.Geothermal powerplant technical characteristicsalong with protection, risks, radiation effects etc have been addressed.Geothermal powerplant feasibility in Bangladesh has also been studied by comparing power generation at different plant.I'm addressing various Bangladesh scenarios and the demand capacity generation of different powerplants in this re search paper.One of the essential sources of our power production could geothermal power plants. T he electricity demand be met by geothermal power plants.Most incidents oftenoccur in geothermal p ower plants,so ensuring safety and security is very necessary.

Bangladesh is a developing country and she has to meet the huge energy demand for her massive population giving only 63% of total population the access to electricity. Due to her limited non-renewable energy resources like coal, oil, and others, she needs to face the challenge looking forward to the scope for the renewable energy resources where geothermal energy can be a good choice. It has the potential to run long term and can provide base-load energy, at the same time it helps to reduce the greenhouse gas emissions. It is found almost everywhere on earth. The resources of geothermal energy range from shallow ground to hot water or hot rock, which can be found few kilometers below the surface and even deeper to magma where the temperature is extremely high. Since its discovery from the ancient times, many technologies have been developed to understand or use geothermal energy properly. In Bangladesh, by using low-temperature system with Organic Rankine Cycle method can be possible to generate electricity with a sufficient efficiency for a long term.

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1.1 Introduction:

Bangladesh could be a developing country with an enormous energy demand. Electricity could be a should for the recent development of Asian country. Electricity affiliation is obtainable among solely 100 percent of the agricultural households and it's expected that some components of Asian country which can not get the style of electricity from the national grid among next thirty years [1]. Presently, fifty three of the general public sectors and forty seventh of the personal sector organizations manufacture electricity in Asian country [2]. to satisfy the high demand, most 2087 MW generation in 1995-1996, that accumulated to 4037 MW in in next decade and will not take away power crisis within the country[3-4].

The power plants in operation at this moment in Asian country build environmental pollution. within the recent days, biogas could be a new technology associated as Asian country is an agro-based country, it produces large waste materials. A survey reports that three,054 ton of wastes per day area unit expected to be collected in 2015 and accumulative disposal is concerning nine million tones by the tip of that year [5-6]. Energy resources like star, wind etc. also are renewable however none of them provides abundant benefits. every of them has some limitations. for instance solar power depends on sunshine, wind energy depends on air flow, and electricity power causes lower rate of down rivers as we have a tendency to use dams, that is extremely harmful for our agriculture. thus we'd like a safer however powerful renewable energy supply wherever heat will play a very important role.

The word energy came from 2 Greek words Geo and Thermal which implies the world and also the Heat severally. Thus, heat suggests that the warmth among the world. This energy classified as a renewable energy, as a result of it obtained from sources that area unit inexhaustible fossil fuels. About 4,000 miles beneath the Earth's surface lays the earth-core (see, figure1.1), that is double-layered of extremely popular liquified iron close a cast-iron center. The temperature of this core is calculable 2800°C to 6000°C. This continuous heat production generate by the slow decay of hot particles.

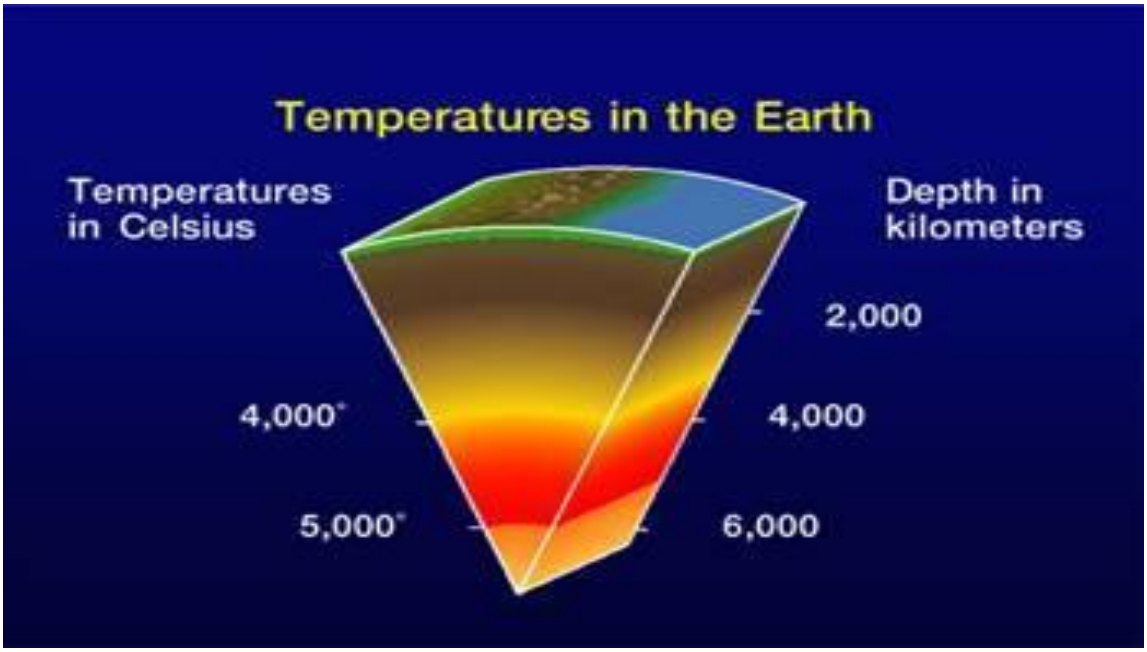


Figure1.1: Earth's temperatures depth in kilometers.

The earth's core is encircled by one,800 miles [3] thick mantle (see, figure1.2). it's partially rock and partially rock. The outmost layer of the planet is like Associate in Nursing egg shell, that is Associate in Nursing insulated crust and has some broken items. These broken items ar referred to as plates. These hot melted rock will identical to the weakened or broken (i.e. caused by morphology [3]) a part of the crust thanks to geological phenomenon (i.e. once the slabs of continents push against one another and sea bottom drift apart) and warmth will simply pop out to the surface through any of those broken plates. the warmth yet transfer to the underground water and a usable style of trapped-energy is formed. Later, this plight is pumped-up up to the surface, collect the warmth so come the water into the underground once more [3]. therefore re-usable heat is harvested from earth.

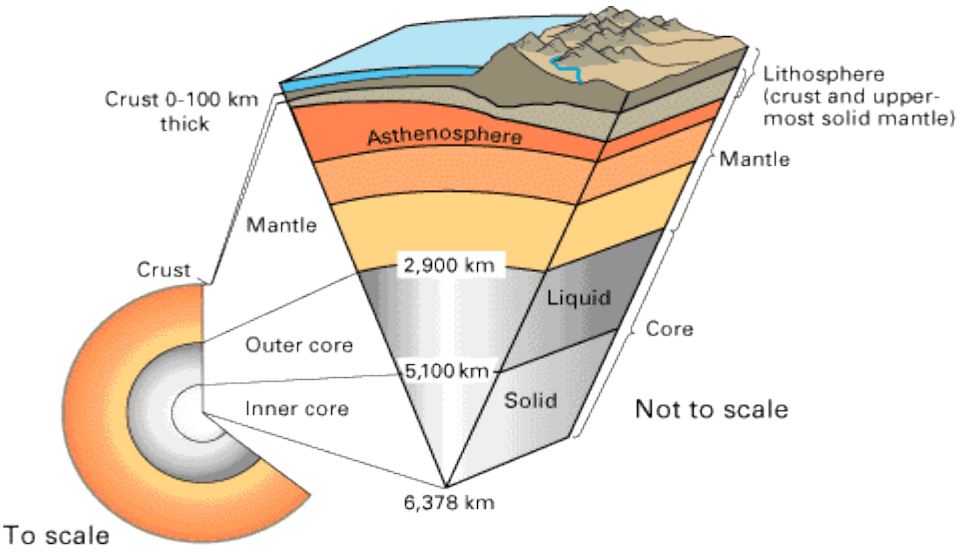


Figure1.2: Earth's surface lays the earth-coredepth in kilometers.

1.2 What Is Geothermal Energy

At the middle of Earth—about four,000 miles (6,400 kilometers) below the surface could be a extremely popular core. Some scientists estimate its temperature at concerning 7600º Fahrenheit (4200º Celsius). the middle of the core is solid. the warmth from this a part of the core is powerful enough to soften rock into a hot liquid known as rock. This liquid (melted) rock forms the outer core. the warmth from rock rises through Earth's mantle. The mantle is that the layer that surrounds the core. heat powers volcanoes, geysers, and natural hot springs. Erupting volcanoes square measure most likely the foremost noted geothermic events. once a volcano erupts, rock from underground square measure shoots through Earth's crust and flows into its surface as volcanic rock. Over time, folks have learned to use heat to heat homes and turn out electricity. Today, heat is additional necessary than ever. folks round the world use an excellent deal of energy to heat homes, to require hot showers, to fuel cars, and to get the electricality that powers everything from electric lights to factories to home computers. As additional countries of the globe develop, additional folks keep victimisation additional electricity. additional energy are required.

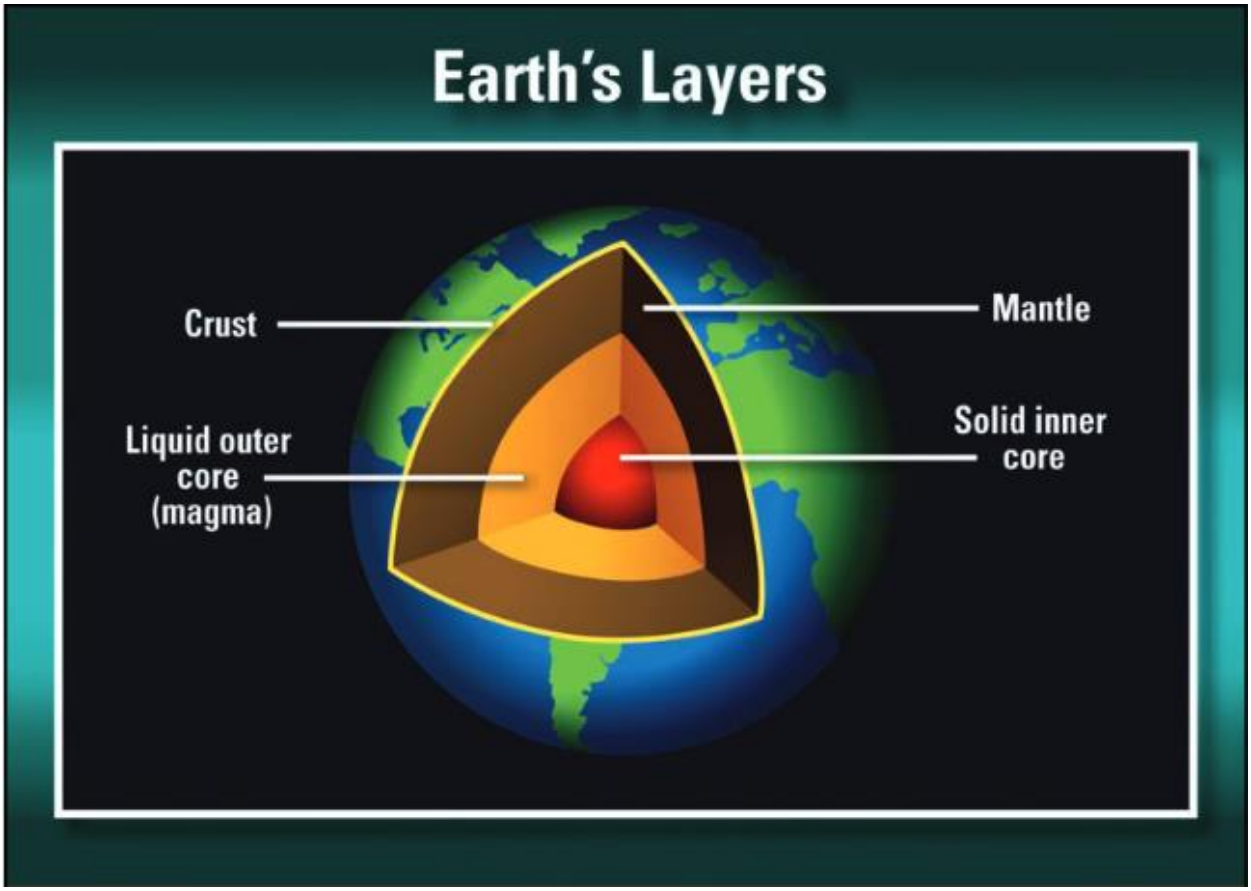


Figure1.3: Earth's layers

1.3 Geothermal Powers

According to the heat Association (2008), quite eight,900 megawatts of heat was created in twenty four countries round the world, and by manufacturing 3000 megawatts in eight states, the USA is that the largest heat manufacturing country [4]. Besides USA, these following nations [6] additionally generate the foremost energy power, supported their share of total power created (including fossil fuels and alternative renewable sources).

1. (30 percent) Iceland
2. (27 percent) Philippines
3. (25 percent) El Salvador
4. (14 percent) Costa Rica
5. (11 percent) of Kenya

1.4 Efficiency of geothermal energy

It has been found that mistreatment heat for residential heating and cooling is that the most effective. This potency is five hundredth to seventieth over the quality heating systems and 2 hundredth to four-hundredth over gift cooling systems. This high potency conjointly has terribly low utility bills [5] The thermal potency of geothermic electrical stations is low, around 7–10%,[15] as a result of Exhaust heat is wasted, unless it may be used directly and regionally, for instance in greenhouses, timber mills, and district heating. The potency of the system doesn't have an effect on operational prices because it would for a coal or alternative fuel plant, however it will issue into the viability of the station. so as to supply a lot of energy than the pumps consume, electricity generation needs extreme temperature geothermic fields and specialised heat cycles. as a result of geothermic power doesn't believe variable sources of energy, unlike, for example, wind or star, its capability issue may be quite massive – up to ninety six has been incontestable .[16] but the world average capability issue was seventy four.5% in 2008, in step with the IPCC.[17]

1.5 History:FW

In the twentieth century, demand for electricity light-emitting diode to the thought of geothermic power as a generating supply. aristocrat Piero Ginori Conti tested the primary geothermic power generator on four July 1904 in Larderello, Italy. It with success lit four light-weight bulbs.[7] Later, in 1911, the world's 1st industrial geothermic power plant was engineered there. Experimental generators were inbuilt Beppu, Japan and therefore the Geysers, California, within the Nineteen Twenties, however Italian Republic was the world's solely industrial producer of geothermic electricity till 1958. n 1958,

New island became the second major industrial producer of geothermic electricity once its Wairakei station was commissioned. Wairakei was the primary station to use flash steam technology.[9] Over the past sixty years, internet fluid production has been in more than
2.5 km3. Subsidence at Wairakei-Tauhara has been a difficulty in an exceedingly range of formal hearings associated with environmental consents for enlarged development of the system as a supply of renewable energy.[4]

In 1960, Pacific Gas and electrical began operation of the primary no-hit geothermic power station within the u. s. at The Geysers in Calif..[10] the first rotary engine lasted for quite thirty years and created eleven MW internet powers. [11]

The binary cycle power plant was 1st incontestable in 1967 in Russia and later introduced to the u. s. in 1981,[10] following the Seventies energy crisis and important changes in restrictive policies. This technology permits the employment of a lot of lower temperature resources than were antecedently recoverable . In 2006, a binary cycle station in Chena Hot Springs, Alaska, came on-line, manufacturing electricity from a record low fluid temperature of fifty seven °C (135 °F).[12]

1.6 Advantage:

1.6.1 Available Anywhere, Anytime

Geothermal heat pumps may be used virtually anyplace. The temperature a number of feet below Earth's surface is concerning an equivalent everywhere: 50°F to 60°F (10°C to 15°C). These temperatures ar heat enough to assist with heating in cold months. they'll conjointly facilitate with cooling in hot months. Some individuals suppose that increased geothermic systems can also be used virtually anyplace that wells may be trained deeply and safely enough. Not solely is a few reasonably heat energy on the market virtually anyplace, it's on the market virtually anytime. in contrast to different energy sources, like star or wind generation, heat energy is obtainable whether or not or not the Sun is shining or the wind is processing. every kind of energy systems need some maintenance to stay them operating well, however geothermic systems don't need a great deal. Direct heat energy and heat-pump systems would like very little maintenance and no further fuel. geothermic power plants ar ready to work and turn out electricity ninety p.c or a lot of of the time. In distinction, coal-fueled power plants work solely seventy five p.c of the time.

1.6.2 Sustainable and Renewable

Geothermal heat pumps will be used virtually any place. The temperature some feet below Earth's surface is concerning an equivalent everywhere: 50°F to 60°F (10°C to 15°C). These temperatures ar heat enough to assist with heating in cold months. they will additionally facilitate with cooling in hot months. Some folks suppose that increased energy systems can also be used virtually anyplace that wells will be trained deeply and safely enough. Not solely is a few quite heat out there virtually anyplace, it's out there virtually anytime. not like alternative energy sources, like star or alternative energy, heat is out there whether or not or not the Sun is shining or the wind is processing. all kinds of energy systems need some maintenance to stay them operating well, however energy systems don't need significantly. Direct heat and heat-pump systems want very little maintenance and no further fuel. energy power plants ar ready to work and manufacture electricity ninety p.c or additional of the time. In distinction, coal-fueled power plants work solely seventy five p.c of the time.

1.6.3 Economic Advantages:

Once individuals have put in the mandatory instrumentality to use heat to heat their homes, they'll save a great deal of cash. they are doing not have to be compelled to pay money for oil or fossil fuel to fuel their heating systems. employing a geothermic apparatus, it's attainable within the u. s. to heat a three,000-square-foot (280-square-meter) house for concerning $60 per month. this could be a lot of but the price of heating a house of constant size with typical energy. several users of geothermic heat pumps save thirty to sixty % on their energy bills every year, compared to the price of warmth from a fuel supply. A geothermic apparatus will be fairly expensive to shop for and install, however the savings on energy prices area unit nice enough that the pump pays for itself in five to ten years. the utilization of heat by cities can even save a great deal of cash. the town of Lincoln, Nebraska, put in geothermic heat pumps in four elementary colleges in 1995, victimization the warmth pumps for each heating and cooling. The city's energy bills for were fifty seven per. less than the prices for 2 different schools that had ancient heating and cooling systems put in at constant time. Another economic advantage of heat is that it creates jobs. A 2007 report aforementioned that if the u. s. additional five 635 megawatts of geothermally generated electricity, it might have to be compelled to add nearly thirty 30,000 regular jobs in constructing and in operation the ability plants. as a result of most of the geothermic resources within the u. s. area unit in rural areas, growth in heat may bring nice profit to places wherever there area unit few jobs. On prime of this, the taxes collected from firms manufacturing heat may additionally facilitate rural communities. .

1.7 Disadvantages:

There are many advantages to geothermal energy but there are inconveniences. The cost involved is one of the most noteworthy concerns.

1.7.1 Environment considerations:

Geothermal energy guarantees to be less damaging to the atmosphere than energy derived from alternative sources; but, it's not environmentally benign and special thought should run to bound distinctive sets of attainable issues. quantity of environmental management necessary can vary from country to country and region to region, reckoning on native air and water quality standards, on the characteristics of every energy reservoir, and to some extent on the ability conversion method, whether or not it's flashed steam or some variety of closed-loop system with reinjection. presently manufacturing energy fields were developed with solely the foremost rudimentary environmental controls and a number of other areas of concern are known as society has grownup a lot of environmentally aware. Not all fields can create an equivalent issues. some of the a lot of vital ar as follow:

1.7.2 Waste Brine Disposal:

If the energy fluid is partly or whole brine, the waste brine should be disposed of in a very manner which will defend groundwater provides required for agricultural, domestic, or industrial uses. The ways of disposal so far have consisted of surface streams, ponding and evaporation, and reinjection of the brine back to the reservoir. Some cases reinjection could also be the well-liked technique, if there's a necessity to reduce ground subsidence or to exchange the water within the reservoir to boost production.

1.7.3 Noncondensible Gases:

Hydrogen sulfide and alternative noncondensible gases might have an effect on air quality if the concentrations ar sufficiently high and if they're ventilated to the atmosphere. sulfide seems to be the key off ender and gift analysis is that specialize in an answer to the present downside. In some cases, the sulfide concentration is thus low that special controls might not be necessary. In others, stack disposal might suffice; and in some, subtle technology could also be required, reckoning on native factors.

1.7.4 Waste Heat Rejection:

Geothermal power plants ar less economical than fuel plants; roughly 2 to 3 times a lot of heat should be rejected per unit of power. wherever water is in torrential offer, this could not be a haul, however in arid regions cooling water could also be at a premium and will slow energy development unless appropriate alternatives ar obtainable. One answer, if the plant is operated as a flashed steam facility, is solely to use the energy steam atmospheric phenomenon as makeup water within the cooling system. This approach might create issues if the temperature of the resource is low and if binary cycles ar utilized in that no steam is created. It might conjointly create a haul wherever reinjection of all the fluids is desired. Some combination of other approaches might sway be the simplest answer within the long haul.

1.7.5 Noise:

Systems could also be required in noise-sensitive areas. ventilated wells or steam lines will produce excessive noise. Muffler systems could also be required in noise-sensitive areas.

1.7.6 Threat of Earthquakes:

EGS needs terribly deep drilling into Earth. this kind of drilling has the potential to disturb the balance of rock among Earth. most likely the best threat from this drilling is that the risk of earthquakes. On December 8, 2006, a series of earthquakes began in Basel, European country, wherever drilling for a replacement energy powerhouse was happening. First, there was a series of tiny tremors. Then, a bigger quake hit. It measured three.4 on the scale of measurement. Earthquakes continued in Basel for a few year. 3 of the later quakes conjointly measured on top of three on the scale of measurement. In total, over three,500 earthquakes were recorded within the space. These earthquakes were terribly fearful as a result of they were caused by humans. an organization referred to as energy Explorers was prospecting for geothermal energy in Basel. the corporate was drilling a well that was three miles (5 kilometers) deep. As before long because the tremors started, company officers stopped the drilling. fortuitously, nobody was hurt by the quakes. The quakes did, however, injury thousands of homes in European country and close Federal Republic of Germany and France. To obtain the injury, the company's insurer paid over $8 million. In Gregorian calendar month 2009, land government for good clean up the project.

1.7.7 troublesome and Expensive:

One of the most important drawbacks committed heat is that it's high-priced to induce started. as an example, drilling a well for a energy powerhouse will price $1 million to $4 million. Even finding a website for a energy powerhouse takes careful study and investigation. Often, this method conjointly involves deep drilling to create certain there's associate degree adequate offer of heat within the space. putting in a energy apparatus is additionally high-priced concerning $7,500 for a standard home system. putting in a energy apparatus in a very home that's already designed needs an excellent

CHAPTER 2. GEOTHERMAL RESOURCES

2.1 Geothermal Resources:

Temperatures of the Earth's crust increase with depth at variable rates, betting on location the traditional gradient is regarding 25"C/km depth. Thus, in an exceedingly region wherever the close surface temperature (mean annual temperature) is 15"C, it's expected that a random hole trained to a depth of one metric linear unit can encounter a temperature of 40°C (the close temperature and the temperature increase because of the traditional gradient within the region). However, in some regions of the globe the gradient is far larger than traditional, increasing in places to a gradient as high as 1"C/m. In those areas related to recent geological phenomenon, comparatively high temperatures could also be encountered at shallow depth.

2.2 heat Resource Types:

Geothermal resources square measure divided into varies basic types: hydrothermal geothermic, Liquid- Dominated Systems, vapor-dominated systems; hot dry rock systems; and geo pressured systems. These sorts square measure characterised by their thermodynamical and hydrologic properties, as mentioned below.

2.2.1 Model of a Hydrothermal geothermic Resource:

There seem to be 5 options that square measure essential to creating a hydrothermal (i.e., hot water) geothermic resource commercially viable. They are:

(a) A giant heat supply

(b) A semipermeable reservoir

(c) An offer of water

(d) A superimposed layer of acid-fast rock

(e) A reliable recharge mechanism.

A extremely schematic depiction of such a system is shown in Fig. 1.4, 1st bestowed by D.E. White [21]. Cold recharge water is seen inward as rain (point A) and percolating through faults and fractures deep into the formation wherever it comes in reality with heated rocks. The semipermeable layer offers a path of lower resistance (point B) and because the liquid heats it becomes less dense and tends to rise among the formation. If it encounters a significant fault (point C) it'll ascend toward the surface losing pressure because it rises till it reaches the boiling purpose for its temperature (point D). There it flashes

into steam that emerges as a fumarole, a fountain, a mud pot, or a steam-heated pool (point E). The boiling curve is that the locus of saturation temperatures that correspond to the native fluid hydrostatic pressure. The intent of a geothermic development project is to find such systems and manufacture them by suggests that of strategically trained wells. As can be probable , most (but not all) hydrothermal systems reveal their general location through surface thermal manifestations like those delineated on top of. If anybody of the 5 options listed PRN for a viable hydrothermal resource is lacking, the sector usually won't be value exploiting. as an example, while not an oversized heat supply geofluid temperatures are going to be comparatively low, i.e., the thermal energy of the system can be skimpy to support exploitation long enough to create it economic. while not sufficient permeableness within the formation, the fluid won't be able to move pronto through it, i.e., it'll not be able to take away abundant of the hold on thermal energy within the rock. moreover, low permeableness can cause poor well flow or, even worse, could forestall any production from the reservoir. while not fluid within the system there's no heat transfer medium and also the thermal energy of the formation can stay within the reservoir. while not Associate in Nursing water-repellent cap rock, the geofluids can simply escape to the surface showing as various thermal manifestations and also the pressure within the formation can quickly dissipate. And lastly, while not a reliable and ample recharge to the reservoir, the geofluid can eventually become depleted once it provides an influence plant. With the exception of needs (a) and (d), deficiencies within the others are addressed through analysis and field follow. skimpy permeableness will generally be remedied by artificial suggests that like hydraulic fracturing (called "hydrofracing") during which aggressive liquid is injected from the surface through wells to open fractures by suggests that of stress cracking. However, unless the fresh created widened fractures square measure command open with "proppants" they'll re-close once the injection ceases. If very little water is gift within the formation or recharge is meager, all unused geofluid from the plant will be reinjected. moreover, external fluids will be delivered to the positioning by some suggests that and injected into the formation. In Chapter twelve we tend to discuss such a method at The Geysers field in northern American state within the u. s. during which treated municipal waste water from near communities is distributed to the sector via pipeline to help within the maintenance of a listing of fluid within the reservoir.

2.2.2 Liquid-Dominated Systems:

Liquid-dominated geothermic resources square measure those controlled by the presence of current liquids (water or brine) which will transport the thermal energy of the rock from deep regions to near-surface regions by natural circulation. Temperature of well-known liquid-dominated geothermic systems varies from close or slightly higher than to as high as 360°C.dominated resource sorts square

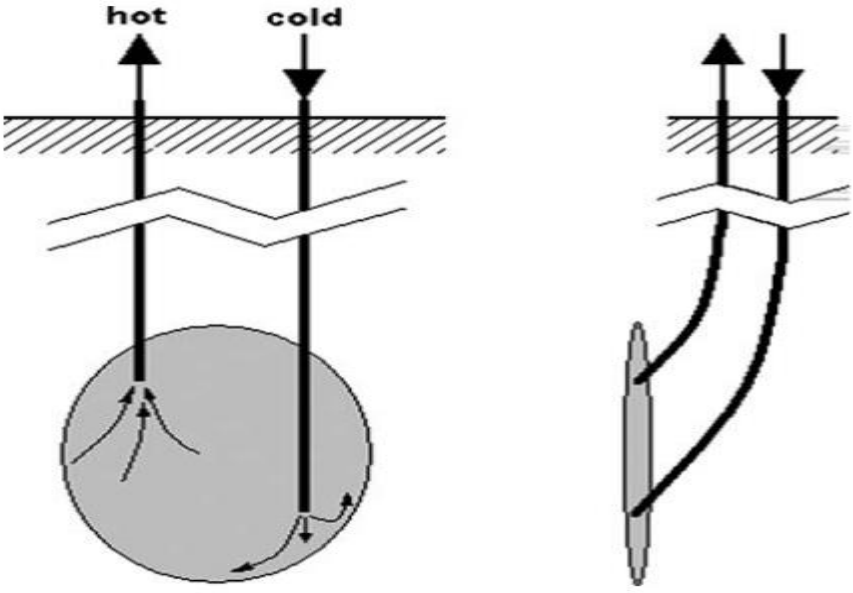
measure way more pr than the vapor-dominated ones. actually way more liquid-dominated systems are discovered than vapor- dominated systems.

2.2.3 Vapor-Dominated Systems:

Vapor-dominated systems, generally mentioned as dry steam fields, area unit comparatively rare. However, the foremost vital and undefeated geothermic power developments within the world these days area unit related to the event of vapor-dominated systems (Larderello, Italy; The Geysers, California; and Matsukawa, Japan).In such systems the continual part within the pore house within the near-surface region is that of steam, whereas within the deeper regions water is likely to be gift. Temperatures area unit usually within the vary of 220-150°C. Production of steam from this kind of reservoir is comparatively straightforward, and very often a small superheating of the steam happens throughout production.

2.2.4 Hot Dry Rock Systems:

Since temperatures increase with depth freelance of hydrothermal convection, it's cheap to assume that rather more heat is hold on within the rock matrix than within the current water. Since body usually decreases with depth, it should be any assumed that immense volumes of hot dry rock exist at larger depths among the crust. analysis efforts ar underneath thanks to develop strategies of introducing cold surface waters into such hot dry rock systems with natural or unnaturally evoked fractures and extracting heated water through a pattern of holes trained within the neck of the woods of the injection holes. Calculations counsel that the warmth reserve in noted energy systems is far larger than the warmth contained within the fluids solely.



Figures 2.1: Ideal hot dry production scheme.

It is conceivable that several of the hydrothermal systems better-known these days might become depleted of geofluids long before the warmth reserve itself has been exhausted. Thus, it's attainable that today's liquid-dominated geothermic systems could also be more exploited as hot dry rock systems at a while within the future.

Country	**Location**	**Dates**
United States	Fenton Hill, New Mexico	1973-1996
United Kingdom	Rosemanowes	1977-1991
Germany	Bad Urach	1977-1990
Japan	Hijiori	1985-present
Japan	Ogachi	1986-present
France	Soultz	1987-present
Switzerland	Basel	1996-present
Australia	Hunter Valley	2001-present
Australia	Cooper Basin	2002-present

Table 2.1: HDR projects worldwide

2.2.5 Magma energy

The last of the geothermic resources is one that goes on to the supply of the warmth, namely, a stone body comparatively about to the surface of the planet. The thought is to drill a well into the stone, insert associate injection pipe and pump cold water down the well below nice pressure. The cold fluid can solidify the liquid stone into a glassy substance that ought to crack below the thermal stress obligatory thereon. If the water will be created to come to the surface by passing upward through the cracked, very hot glassy material, it might reach the surface hot and prepared to be used during a Rankine- kind power station. As straightforward because it is to explain the thought, it's not as simple to hold out such an inspiration. The U.S. Dept. of Energy conducted 2 analysis comes geared toward understanding the stone setting within the Seventies and Eighties. the primary one was disbursed at the volcanic rock lake among the crater of Kilauea Iki on the island of Hawaii [24]. This effort succeeded in drilling through the solid crust of the lake into the still-molten volcanic rock that had a temperature of regarding 1000ºC (1830ºF). really one hundred and five m of core were obtained from the soften zone and several other experiments were run to grasp the mechanism of energy extraction from a volcanic rock body.

CHAPTER 3: Geothermal Energy in Bangladesh

3.1 Geographical Information of Bangladesh:

Bangladesh, a tropical to semitropic country, is found within the northeast a part of South Asia between 20°34′ and26°38′ North latitude and 88°01′ and 92°42′ East meridian. Bangladesh, with its a hundred and sixty million individuals in an exceedingly land mass of 147,570 km2, is one in every of the foremost densely inhabited countries within the world with seventy nine of its population living in rural areas. Bharat surrounds the country on 3 sides (West, north and East), sharing 3715.18 metric linear unit of a standard border; Myanmar shares a mountainous border within the southeast; altogether this constitutes ninety three of the borderline. The Bay of geographical region is receptive the south. The coastal zone of People's Republic of Bangladesh consists of regarding 710 metric linear unit lineation, the most important patch of a natural flowering tree forest shared with Bharat and a protracted ocean beach on the southeast coast. 3 major sorts of landscapes area unit found in Bangladesh: floodplains (80%), terraces (8%), and hills (12%). Excepting the japanese craggy region, most of the country lies within the active delta of 3 of the world's major rivers: the river, the Brahmaputra, and therefore the Meghna (GBM). The water system of the country contains the tributaries and distributaries of those major rivers and various perennial and seasonal wetlands like haors, baors and beels. immense amounts of rain runoff occur within the entire GBM catchments throughout the monsoon season (June-October), whereas within the dry amount the country suffers from severe wetness.

3.2 Tectonic & Geological Settings:

The Neogene (Figure 3) matter sequence penetrated within the Asian country a part of the Bengala|geographic area|geographical region|geographic region} Basin (Figure 4) are diagrammatical by alternating beds of sandstones, siltstone, shales and claystones with occasional conglomerate bands of variable thickness. Here, the sandy sediments with consistency starting from twelve to thirty per. of ample permeableness square measure the reservoir rocks, whereas the clayey beds can act as cap rock for preventing the loss of geothermic heat from the sandy reservoir beds. The matter column within the Platform Flank moreover because the jap pleated Belt of geographic region Foredeep attain stupendous thickness of regarding twenty metric linear unit as unconcealed within the aero-magnetic and deep unstable surveys moreover as terribly deep drilling information, (Guha and Bakhtine 1966) as evident within the regional tectonic setting of Asian country (Figure 4) On the opposite hand within the shelf space lemanderin Saddle forms the apex of the Garo-Rajmahal Gap wherever the Pre- Cambriam basement is diagrammatical by igneous rock, granodiorite, granite and igneous rock together with gneisses and schists, that square measure blanketed by solely ca a hundred m of epoch Dupi Tila arenaceous rock, followed by regarding one0m Pliestocene Madhuput Clays and 1 to three m Holocene deposits (Guha 1978). Permian Gondwana coal deposits (sub-

bituminous) occur within the shallow faulted basement grabens at variety of places like Barapukuria, Khalashpir, Phulbari, Dighirpar etc. as evident from native tiny negative gravity anomalies (Petro bangla 1977). the primary 2 underground mines at Barapukuria (coal) and Madhya) face with unforeseen issues of water flooding specially Barapukuria, that upset the target by a few years. The fate of the 300MW thermal station at Barapukuria mine head has become unsure though the infrastructure has already been developed. From lemanderin Saddle (Figure 5) the basement dips gently initial towards north-west on the Dinajpur Slope and so steeply towards the Sub - Himalayan Foredeep and therefore the basement attains the depth of 2500 m at Shalbonhat well placed on the north-western most tip of Bangladesh(Tetulia). The basement dips terribly gently (2 to three degrees) towards southeast on the Bogra Slope, as evident in sequence stratigraphy on the surface of the epoch Sylhet / Bogra stone till the Hinge Zone, wherever dips gets vessel, fifteen to thirty degrees (Guha 1978). The Cretaceous Rajmahal entice fashioned by upwelling of plastic basaltflow on the fissures at Rajmahal, Bihar (India), is merely regarding seventy metric linear unit west of Rajshahi border, that was encountered in deep wells to the east as so much as Singra and Kutchma placed regarding two hundred metric linear unit east of Rajmahal.

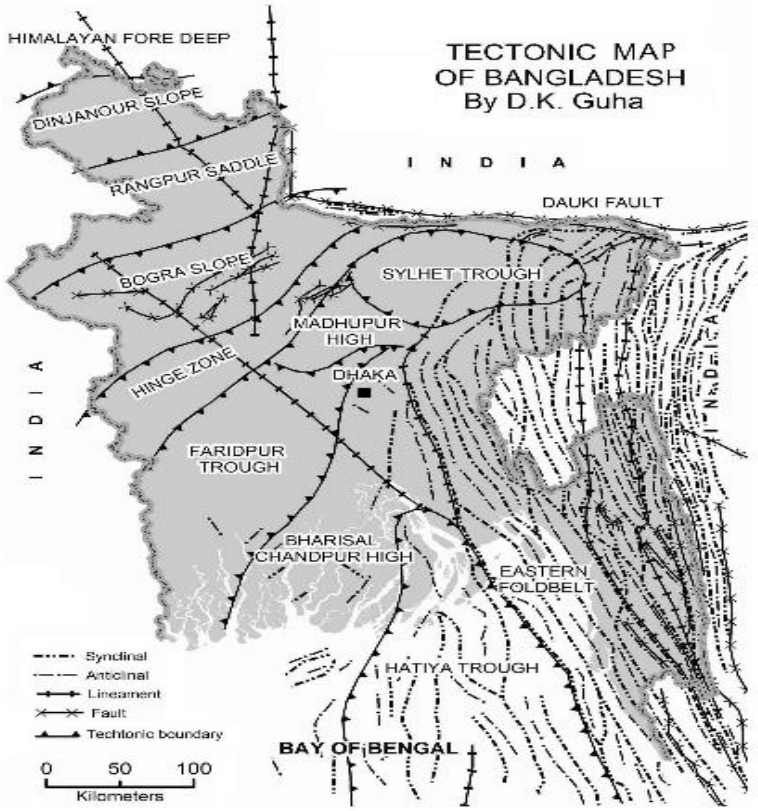


Figure 3.1: Tectonic framework of Bangladesh with fold axes

3.3 Global Scenario of Renewable Energy:

Based on Renewable Energy Policy Network for the twenty first century, renewable contributed nineteen.2% of humanity's world energy consumption and twenty three.7% to their generation of electricity in 2014 and 2015, severally. This energy consumption is split with eight.9% returning from ancient biomass, 4.2% as heat, 3.9% from electricity and a couple of.2% is electricity from wind, solar, energy and biomass. Worldwide investments in renewable technologies amounted to quite US$ 286 billion in 2015, with countries like China and therefore the us heavily investment in wind, hydro, star

and befouls. Globally, there square measure associate degree calculable seven.7 million jobs related to the renewable energy industries, with star electrical phenomenon being the biggest renewable leader. star PV may be a key technology for capturing the advantages particularly having no waste, no moving elements, no emissions, less transportation prices, not requiring water throughout power production and no adverse effects on the setting. Renewable power generating capability saw its largest annual increase ever in 2016, with associate degree calculable 161 giga watts (GW) of capability being additional. the globe continuing to feature additional renewable power capability annually than it additional (net) capability from all fossil fuels combined.

3.4 Present Electricity Generation Situation in Bangladesh:

The potential for power generation rose from 4,942 MW in 2009 to 13,883 MW in 2015[2].Table 1 below summarizes the capacities and distribution of the power sector in the nation[3]

Item	September, 2016
Power Generation Capacity	15,755 MW
Transmission Line	10,436 circuit km
Distribution Line	341,000 km
Access to Electricity	77%
Per Capita Power Generation	371 kWh
Nos. of consumers	25,26,594
Average System Loss	14%

Table 3.1: Power sector details in Bangladesh

3.5 Energy Scenario of Bangladesh:

Bangladesh considered a developing economy over the last few years with a reported GDP growth o f over 5% is one of the world's energyhungry countries. By some figures because of a lack of energy and lower power production, a GDP growth rate of 1-2 percent is forgotten every year.

Responsible Department	Generation Capacity MW	Sub Total	Percentage of Generation	Total Generation
BPDB	3600	4544 MW	55%	8315 MW
APSCL	682			
EGCB	210			
RPCL	52			
IPPs	1297			
SIPPs(BPDB)	99			
15 Years rental	169			

Table 3.2:Power Generation of Bangladesh

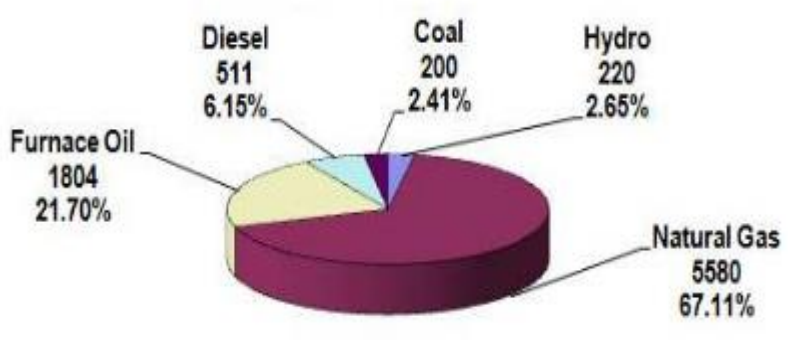


Figure 3.2: Total generation Capacity: 8315 MW

3.6 Renewable Energy Scenario of Bangladesh:

Bangladesh, thought-about a developing economy with a recorded GDP growth of on top of five-hitter throughout the previous few years, is one in every of the energy starved countries of the planet. By some estimates, a GDP rate of growth of 1-2% is forgone annually due to a shortage of energy and lower power generation. a serious portion of energy is consumed for subsistence (e.g. cooking, lighting, heating, etc.) and solely alittle portion is employed for economic process (e.g. agriculture, industry, transport, commerce, etc.) gas plays the most role in Bangladesh for generating electricity. Recently chamber oil square measure been used massively in fast rental power plants.

Category	**Generation**
SHS 45 MW	45 MW
Other solar PV application	1 MW
Wind Energy	2 MW
Biomass based electricity	<1 MW
Biogas based electricity	1 MW
Total	50 MW

Table 3.3: Renewable Energy Scenario of Bangladesh

Considering the fuel crisis, and exploring new, safe, and property energy resources, the govt. has taken varied steps to push energy conservation and therefore the use of renewable sources.

3.6 Geothermal Prospects in Bangladesh:

Bangladesh is one in all the bottom per capita energy consumption countries within the world. The country may be a facing downside with shortage of energy and depended principally on the fossil fuel and foreign fuel for electricity generation, industries, vehicles etc. Bangla Desh has little reserves of oil and coal, however giant fossil fuel resources. industrial energy consumption is usually fossil fuel (around 70%) followed by oil, hydropower and coal. Electricity is that the major supply of power for country's most of the economic activities. Bangladesh's put in electrical generation capability was over

ten GW. The country must develop alternate energy resources like renewable energy to satisfy up the demand. Bangla Desh has no volcanic region however tectonically lies within the northeastern Indian Plate close to the sting of the Indian piece in addition as Eurasian-Indian plate boundary which can accompany high geothermic gradients

3.7 Geothermal Activities in Bangladesh

So far, there is no major work in this country with regard to geothermal energy. Under the funding of KTH (Royal Institute of Technology Stockholm, Sweden), Herbert Henkel (Sweden) and Prof.

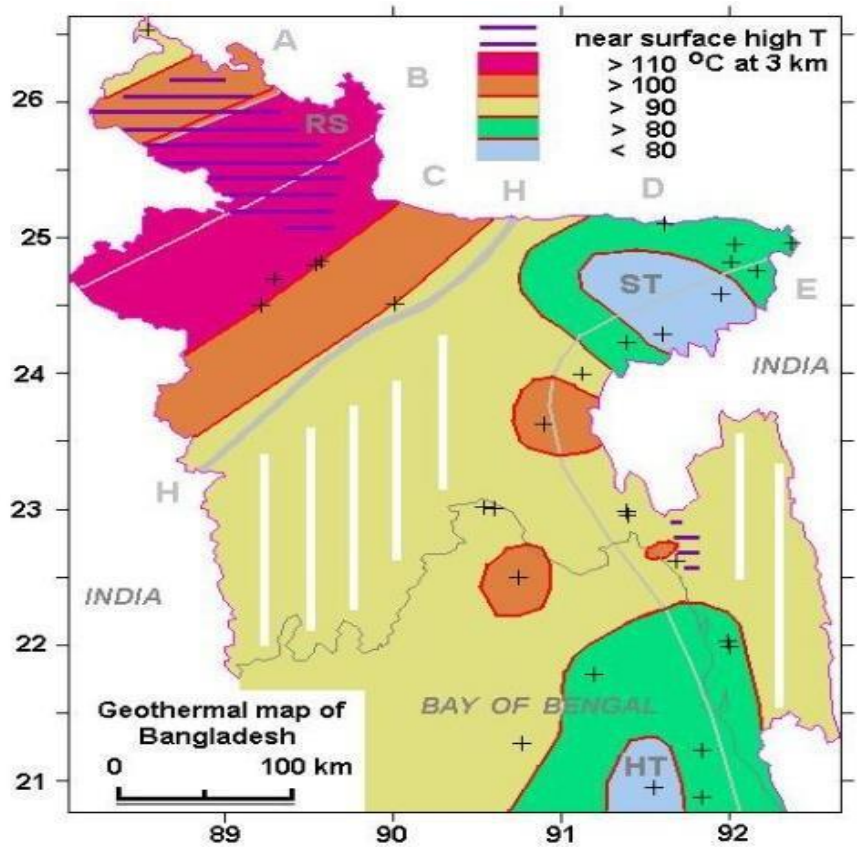
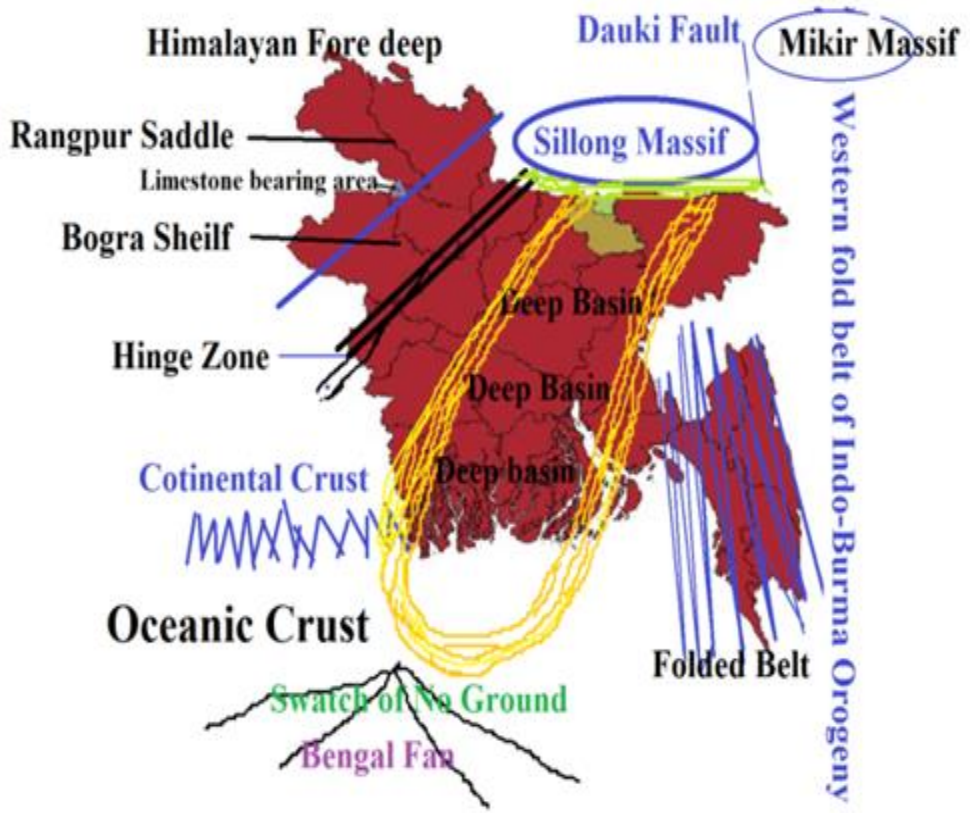


Figure 3.3: The geothermal gradient of Bangladesh at 3 km depth (modified from Guha. 2010).

They studied fifty additional abandoned wells in Asian country and counseled some steps for heat energy production from these wells. On the idea of the musician Henkel and Guha study and findings the team projected a project that was coordinated by academician. Dr. Badrul Mohammedan of Dacca University. Finally counseled for a pilot study (reopening of the abandoned wells) in a minimum of one in all the three wells (Singra, Shalbanhat and Sitakund wells) however it absolutely was not materialized. earth science Survey of Asian country dispensed a drilling program (GDH-65/11) within the space of Thakurgaon district. Drilling terminated at the depth of 586 m and temperature recorded 47°C that is sort of traditional gradient of Asian country (Figure three.3).

3.8 Geo-tectonic Settings of Bangladesh

The earth science of East Pakistan is suffering from the country's location, as East Pakistan may be a riverine country. it's the japanese common fraction of the river and Brahmaputra delta plain stretching to the north from the Bay of geographical region. whereas the japanese a part of East Pakistan is that the continuation of the frontal belt of the Indo-Burma vary. geographical region Delta is one among the most important deltas within the world. earth science evolution of geographical region Delta is expounded to the uplift of range thanks to collision of Indian and Asian plates. The geographical region Delta is characterised by monumental sediment provide from Himalaya, fast geological phenomenon and subsidence leading to vast thickness of siliciclastic deltaic sediments. Tectonically East Pakistan lies within the northeastern Indian Plate close to the sting of the Indian part. Stable Pre-Cambrian Platform and an enormous geosynclinal basin within the southeast ar dominating tectonic options of East Pakistan that ar separated by a slim northeast-southwest trending Hinge zone (Figure three.4), presently called palaeo Davy Jones's locker (Salt et al. 1986). Stable Pre-Cambrian Platform covers the country to the west and northwest of the Hinge zone and is split into 3 major zones: Citrus limonia Saddle, Bogra slope and Dinajpur slope (Figure three.4). The thickness of matter column on the stable shelf of geographical region Basin varies from but two hundred m to ten,000 m (Alam 1989). Citrus limonia Saddle connects the Indian defend with the Shillong and also the Mikir Hills formation leading to elated basement with skinny cowl of matter rocks. In Madhyapara space the basement is encountered at a hundred thirty m depth and overlain by Plio-Pliestocene sediments. The northern and southern slopes of Citrus limonia Saddle ar quite light and also the basement plunges gently from Madhyapara towards the southeast up to the Hinge zone. It separates the geographical region Foredeep and also the mountain range Foredeep. The Northern Slope of Citrus limonia Saddle is additionally recognized as Dinajpur Slope, and gently slopes towards the Sub-Himalayan Foredeep. The thick matter basin is divided into fold belt within the east and geographical region Foredeep to the west.Fore deep occupies the immense area between Hinge Line and fold belt of Arakan Yoma folded System. It contains a platform region within the west and a folded region within the east. The western platform flank is characterised by many highs and lows specifically Faridpur Trough, Barisal-Chandpur High, Hatiya Trough, Madhupur High and Sylhet Trough (Figure three.4). The tectonic and geothermic maps of clearly demonstrate a pattern of geothermic conditions in Bangladesh (Figure three.3 and 3.4).



Figures3.4:The high geothermal gradient area and tectonic settings of Bangladesh

3.8.1 Sub-Himalayan Foredeep Geothermal Province:

The mountain range Foredeep lies south of the most Boundary Thrust (MBT) right along the foothills of the the Himalaya. during this space atthe NW tip of Bangladesh the basement happens at a pair of,500 m depth as encountered in Salbanhat-1 well (abandoned hydrocarbon Tetulia, Ponchagarh). At this depth 79oC bottom hole temperature is projected. The Neocene of the Siwalik area unit well developed within the mountain range Foredeep. Low-geothermal gradient is (2.25oC/100 m, Figure 3.3 and 3.4), barely possible to explore heat energy. within the well GDH-65/11 recorded four7oC temperatures at the depth of 587 m and Shalbanhat well projected temperature 110oC at the depth of 4,000 m that is shown nearly traditional gradient during this region (Figure three.4).

3.8.2 Rangpur Saddle Geothermal Province:

The rangpur lime Saddle represents the Indian Platform and connects the Indian protect with the Shillong geological formation and therefore the Mikir Hills(Figure three.3). within the Madhyapara space the basement happens atonly one hundred thirty m depth. within the western a part of the rangpur lime Saddle, variety of graben and 0.5 graben structures are found with Gondwana sediments, a number of that contain coal seams. The Gondwana arenaceous rock sequence below the coal seams in Barakupuria mine features a temperature of 50°C at a depth of four hundred m. The coal seams along have associate degree insulating result leading to augmented temperature within the basement below. the world is characterised by comparatively high surface temperatures according from some irrigation wells and in coal bearing graben structures and underground

exhausting rocks mine. The geothermic resource is probably going situated among the elated basement and would need hydraulic fracturing ways to form porousness at depth with enough hot temperature for gift technology of electricity generation. as a result of within the nice flowing Basin in Australia, the Paris Basin, Molasse Basin in Germany and North China Basin used this energy for power production. Their temperature recorded around 120°C.

3.8.3 Bogra Shelf Geothermal Province:

The southern The Bogra Shelf represents slope of the citrus tree Saddle. it's a regional geological formation plunging gently towards the south east towards the Hinge Zone and marks the transition between the citrus tree Saddle and therefore the Bengal Foredeep from depositional further as structural purpose of read. Stanvac company (SVOC) dispensed aero-magnetic and unstable surveys within the fifties followed by drilling 2 wells at Kuchma and Bogra and their geothermic gradient ar 27oC/km and 30oC/km severally. This space is favorable condition for low-temperature heat energy production because of slightly high geothermic gradient (Figure three.3 and 3.4). The formation of this space consists of loose water bearing permeable arenaceous rock that is additionally useful for geothermic resources. This space perhaps appropriate for power generation utilizing the heat energy of abandoned wells like as that of Texas substance basin and Williston substance basin in USA.

3.8.4 Madhyapara hard rock mine area:

Madhyapara granite mine is found in Madhyapara of the Dinajpur district within the northwest a part of Asian country. This space lies inside the lemanderin saddle, representing the foremost elated block of basement rock within the northwest stable shelf space. the realm features a minimum matter thickness of as very little as one hundred thirty m, whereas no Precambrian eon exposed rock has been found in Asian country. The basement rocks square measure preponderantly dioritic with minor granitoids (Hossain et al., 2007). The basement is extremely faulted and intensely broken and produces a major amount of water once deep-mined. Two distinct geological formation systems that prevail within the space square measure the higher Dupi Tila geological formation and also the lower basement geological formation. The geological formation is regarding one hundred twenty five m thick and lies half dozen m below ground level in most of the realm (Reza, 1988). The basement geological formation lies beneath the higher geological formation. The presence of white clay layers in between remained as associate degree aquitard that separates the 2 aquifers. The confined basement geological formation of Madhyapara granite mine contains worn and contemporary igneous and metamorphic rocks of Achaian basement advanced. Water happens within the lay to rest granular pore areas of the worn a part of the basement advanced and, along side the fissures and fractures of contemporary basement rocks, is accountable for the physical phenomenon of warmth flow through the rocks. the typical

elevation of the groundwater table at Madhyapara is twenty four m. The groundwater of the basement geological formation of Madhyapara is marked by higher temperature (40.4°C) than the annual mean surface temperature of regarding twenty four.7°C (CMC, 1994). The thermal gradient for the overburden sediments varies from nine to twenty nine.3°C/km with a median twenty two.6°C/km; Another analysis work discovered that the typical thermal gradient was twenty six.8°C/km for superjacent sediments and 32°C/km for the underlying Precambrian eon basement advanced.

SL/ No	Well Name	Gradient(°C/Km)
1	Kuchma 1	28.5
2	Shalbanhat 1	20.8
3	Jaipurhat	25
4	Bogra 1	29.5
5	Singra 1	34.1
6	Madhyapara	31.6
7	Thakurgaon	34.2
8	Barapukuria	48.7

Table 3.5: Geothermal gradients for the deep wells on the northwest stable shelf region

3.8.5 Thakurgaon high-temperature area:

The Thakurgaon high-temperature space, settled northwest of Barapukuria belongs to the Tista flood plain and constitutes the East Pakistan a part of the mountain range Foredeep region. The depth of the crystalline Hellene basement any north to the fan advanced was found at a depth of 2500 m at Shalbonhat one well (BSPD, 1988). The basement happens solely at one hundred fifty m depth at Phulbari coal basin to the southeast (GSB, 1990). Neogene Siwalik sediments and up to date alluvial sediment directly overlie the basement in most of the northwest a part of the stable shelf (Rabbani et al., 2000). though the surface of the Tista geological phenomenon seems sleek and undisturbed, the fan is deposited in an exceedingly tectonic transition zone subject to advanced robust forces driven by the collision of the Indian plate with the Eurasian plate to the north. In response to past tectonic events, a series of well-defined deep seated basement faults has occurred (Khan, 1991). The fault systems and associated structures area unit answerable for conducting heat into the superjacent close to surface substance formation, inflicting the surface manifestation of energy sources during this region. extreme temperature groundwater was noticed in Barunagaon village (well 278) of the Thakurgaon district

throughout groundwater pumping (Bashar and Karim, 2001). later analysis disclosed a high abnormal gradient in some groundwater wells (Table 8) in some components of the Thakurgaon space (Rahman, 2006; Kabir, 2008) as shown in Figure sixteen. The geologic Survey of East Pakistan conjointly trained a thermal searching well there recently and located a gradient of thirty four.2°C/km at a depth of 550 m.

SL/No	Name	Temperature (°C/km)	Depth (m)	Gradient (°C/km)
1	T-278	35	87	126
2	T-277	30	56	107
3	HTW-1	29	27	182
4	HTW-2	27	26	115
5	HTW-3	29	26	192
6	STW	33	36	250

Figure 3.6: Variable temperatures at 100m depth and thermal gradient (°C/km) at Thakurgaon area.
T- Irrigation well; HTW- Hand tube well; STW-Shallow tube well; Average temperature 24°C.

CHAPTER 4: Comparison of Geothermal and Other Energy

4.1 Geothermal and other energy

According to the consultants, heat energy is cleaner, efficient, and cheaper than different fossil fuels. This energy is collected while not burning any fuel and also the heat energy plants releases little quantity of greenhouse emission, inhalation general anaesthetic or sulfur gases. capital of Iceland in Iceland, called one amongst the world‘s cleanest cities as a result of ninety fifth of their buildings area unit mistreatment heat energy [24].

Compare to different fossil fuels, it doesn’t have energy transportation value, as a result of the energy is generated right close to the plant. It can also run systematically twenty four hours every day and 12 months a year, that makes it a lot of reliable than different fuel energy plants or maybe nuclear plants [13].

To build a heat energy plant is dear, and drilling wells will value close to concerning $4 million. And to put in a home energy pump system, it's going to value $30 thousand [14] and this value can pay off by itself in five to ten years [15]. however this home based mostly energy system will cut back the energy bills up to four-hundredth compare to different energy systems [14].

This energy is additionally renewable as once extracting the warmth from the water the system injects back the water into the planet. at the present concerning seven thousand megawatts [16] of heat energy is manufacturing round the world. And solely USA is manufacturing a pair of.7 thousand megawatts, this is often cherish burn sixty million barrels of oil p.a. [16].

The availability of heat energy is far beyond we tend to area unit harvest home currently. this is often not just for the restricted geographic availableness however additionally for the price and also the drilling difficulties in energy harvest home wells. This drilling technique got to be developed to drill deeper. however at the present, the energy heat pumps area unit the foremost viable choice, which may be put in nearly anyplace within the world as a result of the temperature at a lower place the bottom invariably remains constant.Geothermal energy not solely attracts the natural heat of the planet and manufacture energy however additionally it's most reliable than different energy sources. different clean energy, like star and wind energy wants applicable sun or wind to supply energy, that makes them weather dependent energy supply, however on the opposite hand heat energy doesn't depends on uncontrollable outside forces.In terms of star or wind energy, it's necessary to satisfy the precise natural conditions, which suggests an ideal location wherever enough sun or wind gift. except for the energy systems area unit less strained by natural topography. It doesn’t need the maximum amount as land to supply energy compared to different inexperienced energy power plants. it's be discovered that to supply same quantity of energy a heat energy plant would like 100% of the land than a solar energy plant [17].

4.2 A Comparison of Wind, Solar and Geothermal Energy Sources:

Like heat, the wind and star energies do no spend precious earth resources and all of them area unit inexperienced energy, which implies all of them area unit non-harmful for the setting. however all of them area unit indifferent in terms of prices and environmental imprint.In wind energy system, it's been seen that once the turbine rotate, it makes a prejudicious impact on native life and additionally once the blades spin they strike birds and round the bend that case them death. additionally the wind energy, that additionally depends on weather patterns air pollution levels, terrain, vegetation and close geographic or unreal developments alter the wind patterns. therefore the wind speed varies and fashionable turbine will manufacture 70-85% electricity at some point of the year [19]

In case of system, though capturing daylight doesn't hurt the setting, however the assembly of the sun ray collectors and therefore the storage containers will cause pollution. it's additionally dearer to provide electricity from the sun than from fossil fuels. it's additionally pricey to create star instrumentality. solely half the day energy is harvested thanks to daylight convenience, and additionally throughout the winter or throughout the cloudy climate once the daylight is a smaller amount the assembly of energy via system decrease.

Inside the planet wherever is that the core, it's extraordinarily hot and therefore the temperature is higher than 6000°C [18]. This heat gets unfree in rocks or in rock and remains underground as a geothermic reservoir. And energy is harvested there from steam or quandary by extracting the warmth and inject back the water into the planet. This heat is born-again to electricity and this method case less emissions and environmental impact. it's reliable and continually on the market with increasing potency.Geothermal could be a renewable energy, which implies, it value nearly nothing to provide. tho' it's a chic construction method however it's less environmental or geographic impact. thanks to the situation and therefore the quantity of daylight at some point of the year the system wholly depends on the weather conditions and it's been found that current star panels manufacture but twenty fifth of the energy what they might have created if there was constant quantity of daylight at some point of the year.

On the opposite hand, geothermic heat sources near rely on any external factors like wind or sun, so way they're most reliable and renewable supply of energy. geothermic power plants will run nearly twenty four hours on a daily basis and twelve months a year, and their power generating potency is up to ninety fifth [19]. this price-per-kilowatt hour for every of those renewables is – geothermic $.06-$.10 per kWh, Wind $.04-$.07 per kWh and star $.21-$.081 [19].

There is additionally a priority regarding land and visual impact in terms of any station institution. each station will present's its typical situation whereas it's ruination and manufacturing energy. In figure five.1, we are able to simply see that by inserting turbine the situation of Palm Springs, CA; has

modified. On the opposite hand, by putting in a geothermic plant (see figure five.2) in Mono County, CA; still keeps the natural situation of this space.

Both wind and alternative energy plants got to work on wide open space wherever enough wind and daylight is on the market. They additionally need a lot of units to supply adequate power, for instance, the sun doesn't give same energy at an equivalent place all the time and it desires an oversized space to gather energy at a helpful rate, and each wind energy plant comes with two hundred to three hundred feet tall turbines that have to be compelled to adjoin a large space. So, in each of those energy plants want a lot of space to provide decent quantity of energy.

On the opposite hand geothermic power plants have nearly no visual impacts. Compare to wind or alternative energy it need terribly tiny space to provide continuous energy twenty four hours on a daily basis. It additionally doesn't want storage, transportation, combustion of fuels, not even greenhouse gas emissions. solely steams area unit visible. So, the eventualities of those geothermic plants area unit terribly totally different and these qualities scale back the general visual impact.

4.3 Geothermal Energy Use Compared to Other Renewables:

According to the International Energy Agency (IEA), all energy that square measure employed by the tip users (excluding electricity however together with the energy that employed by the electrical utilities to come up with electricity) square measure delineate in terms of Total Primary Energy offer (TPES).The following table shows the TPES in world throughout the entire year 2004, that was eleven,059 Mtoe (Million Tonnes of Oil Equivalent). Of that thirteen.1% or 1,448 Mtoe came from renewable energy sources [20].

Oil	34.3	3793	158.8	44.1
Coal	25.1	2776	116.2	32.3
Natural Gas	20.9	2311	96.8	26.9
Nuclear	6.5	719	30.1	8.4
Non-Renewable Waste	0.2	22	0.9	0.2
Renewables	13.1	1448	60.6	16.8

Table 4.1: Fuel shares in world renewable energy supply in 2004

Renewables	Percentage	Mtoe	10^6 TJ	10^6 GWh
Biomass	79.4	1150	48.1	13.4
Hydro	16.7	242	10.1	2.81
Geothermal	3.2	46.3	1.94	0.549
Wind	0.5	7.24	0.303	0.084
Solar/Tide/Ocean	0.3	4.43	0.182	0.067

Table 4.2: Product shares in world renewable energy supply

In table 2, the renewables are expanded in detail, were 3.2% or 242 Mtoe came from Geothermal.

Fuel	Percentage	Mtoe	10^6 TJ
Oil	6.7	119	1.38
Coal	39.8	705	8.20
Natural Gas	19.6	347	4.04
Nuclear	15.7	278	3.23
Non-Renewable Waste	0.3	5.31	0.00618
Renewables	17.9	317	3.69

Table 4.3: Fuel sharing in world's electricity production in 2004

Renewables and fossil fuels are shown in Table 3 in terms of electricity generation. Where renewable account for 17.9% of electricity output, of which 0.8% is geothermal[20].

CHAPTER 5: Geothermal System, Power Plant and Equipment

5.1 Geothermal Systems:

Geothermal systems ar classified supported temperature, enthalpy, physical state or their nature of fluid and utilization likewise as earth science settings (Axelsson et al. 2000). varied energy systems in all probability still remains to be discovered, since several systems haven't any surface activity. The classification of energy systems into low-temperature (LT) and high-temperature (HT) on the idea of energy field ar ordinarily employed in the planet

Reservoir Temperature	Reservoir Fluid	Common Use	Technology Commonly Chosen
High Temperature >220°C(430°F)	Water or Steam	Power Generated Direct Use	➢ Flash Steam ➢ Combined (Flash & Binary) Cycle ➢ Direct Use ➢ Heat Exchangers ➢ Heat Pumps
Intermediate Temperature 100°C-220°C(212°F-390°F)	Water	Power Generated Direct Use	➢ Binary Cycle ➢ Direct Use ➢ Heat Exchangers ➢ Heat Pumps
Low Temperature 50°C-150°C(120°F-300°F)	Water	Direct Use	➢ Direct Fluid Use ➢ Heat Exchangers

Table 5.1: Common use and technology commonly used for various reservoir temperature.

5.2 Low-Temperature Geothermal Systems:

Low-temperature (<150°C) substance energy resources square measure widespread within the continental regions of the earth's crust. they're quite completely different in nature from the energy resources related to volcanic systems or tectonically active regions of the crust. Low-temperature heat is that the system wherever energy water or underwater plight (temperature ranges from 40°C to 150°C) utilised directly as house heating , greenhouse, cultivation, gardening, industries and bathing yet as conjointly employed in electricity production (10 to twenty MW power plant). unremarkably this method is developed out of a volcanic region and is {often} liquid dominant wherever water section controls the pressure (hydro-static) often characterised by hot or boiling springs. vasoconstrictive energy activity is touch most areas of the planet and located in varied earth science settings. this method depends on the regional energy gradient, porosity, consistency and depth of circulation at differing types of rocks and their temperature is variable betting on depth of semipermeable rocks. Water is opening water, ordinarily brine, erst thought to -pressure, increased and

shallow resources types) developed as a low-temperature energy system. In convective broken management systems, the warmth supply is that the hot crust at depth wherever tectonically active with sure heat-flow. Here the energy water has circulated to goodish depth (> one km), through largely vertical fractures, to mine the warmth from the rocks (Figure 2). substance systems square measure found in several of the most important substance basins of the planet. These systems owe their existence to the incidence of semipermeable substance layers (Figure 3) at nice depths (> one km) and average energy gradients (>30ºC/km) that square measure semiconducting in nature instead of convective even if fractures and faults play a job in some cases. Some convective systems might, however, be embedded in substance rocks. Geo-pressure system developed in stratigraphic lure at many substance basins which will have pressures getting ready to lithostatic values. increased system developed in created reservoir porosity or Hot Dry Rock (HDR), such varieties can largely be used through production/reinjection doublets (Axelsson 2008). Shallow resources developed because of heat pumping from the bottom sources. Recent developments within the application of ground supply heat pumps have spread out a brand new dimension in utilizing these resources.

Country	Capacity MWt	Annual Use in TJ/YR	Annual Use in GWh/YR	Capacity Factors
Germany	2485.4	12764.5	3546.0	0.16
France	1345	12299	3591.7	0.30
Canada	1126	8873	2464.9	0.25
China	8898	75348.3	20931	0.27
Japan	2099.53	256979.4	7138.9	0.39
Norway	1000	10800	3000.2	0.34
Turkey	2084	36885.9	10246.9	0.56
USA	12611.46	56551.8	15710.1	0.14
Switzerland	1060.9	7714.6	2143.1	0.23
Netherlands	1410.26	10699.4	2972.3	0.24
Sweden	4460	45301	12584.6	0.32
Poland	281.05	1501.1	417	0.17
Finland	994	7966	2213	0.25
Italy	887	9941	2761.6	0.36
New Zealand	393.22	9552	2653.5	0.77

Table 5.2: Low-Temperature energy utilization as direct use around the world leading 20 countries

5.1.2 Low-Temperature Geothermal Energy Utilization:

Around the World Low-temperature heat is wide employed in energy dominant countries of the planet. This energy used in numerous categories' in terms of capability, energy utilization and capability issue. Some leading countries WHO utilize the low-temperature heat as direct use square measure mentioning in Table five.2.

5.1.3 High-Temperature Geothermal Systems:

These ar volcanic or intrusive in origin as regards to prevalence and warmth supply and related to the plate boundaries and their temperature ar quite one50°C at the depth of 1 klick. this method is well matched for the assembly of electricity and continually related to the volcanic system. the warmth sources for such systems ar hot intrusions or rock. they're most frequently settled within, or getting ready to, volcanic complexes like calderas, most of them at plate boundaries however some in hot spot areas. semipermeable fractures and fault zones largely management the flow of water in volcanic systems. Aquifers ar strata-bound and/or fracture controlled. several high-temperature energy fields ar in tectonically disturbed areas like calderas, rift valleys and block faulted areas. significantly favorable ar the intersections of regional faults and faults bordering major structural blocks. characterised by fumaroles, steam vents, mud pools and extremely altered ground moreover as each of liquid and vapour dominated. this kind of field ar often found within the space of middle Atlantic ridge (Iceland), Continental Rift (East African rift valley), Ring of fireplace (Pacific region) moreover as within the space of many types of volcanic region (continental margin arc volcanos, micro-continental arc volcanos, young island arc volcanos and lay arc basin, compressional regime, flank zone volcanos, hot spot volcanos etc). USA, Philippine, Iceland, Indonesia, New island, Japan, Italy, North American nation and Central American nation ar the leading countries whose used the high –temperature heat energy for power generation**.**

5.2 Types of Geothermal Power Plant:

Generally there are five (5) types of power plant running all over the world.

5.2.1 Single Flash System

For those energy resources with a temperature usually on top of 190ºC, a single-flash sort of plant is commonly the most effective economic alternative. Higher temperature reservoirs can generally turn

out each water and steam underneath natural pressure. This two-phase flow is sometimes directed to a extractor that permits the steam fraction to be piped to the plant and therefore the water fraction to be piped back to the reservoir via injection wells**.**

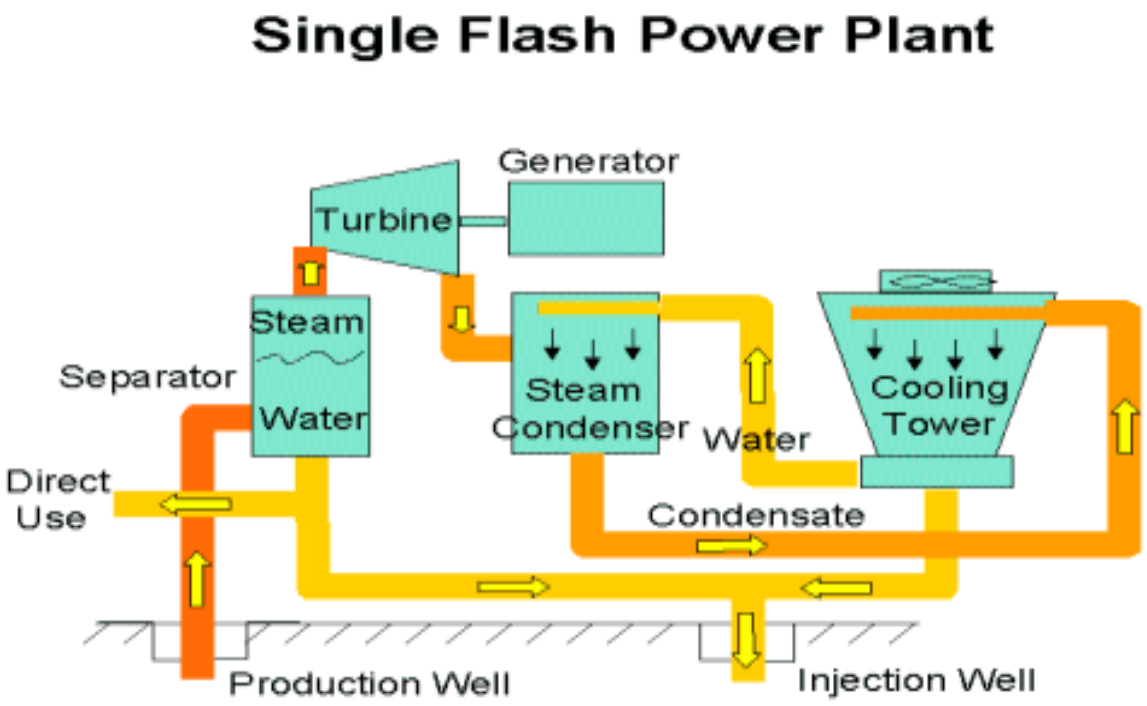


Figure 5.1: Single flash power plant

The steam coming into the plant is usually run through a warmer to eliminate any entrained droplets of wetness. alittle portion of the steam is directed to a steam jet ejector system and therefore the balance is directed to the rotary engine. The ejector system generates a really low vacuum at the rotary engine exit, increasing the energy created by the rotary engine. Steam exiting the rotary engine is directed to a condenser operational at the low vacuum. Water from a cooling is usually sprayed within the condenser, compressing the steam back to water. This water is then tense to the highest of the cooling for warmth rejection to the atmosphere.

5.2.2 Double Flash System:

A double flash system uses 2 flashes separating systems so as to come up with additional steam from the energy liquid and increase cycle output. The cycle starts with warm temperature fluid extracted from a energy supply to a air mass centrifuge (HPS) for flashing. The HPS produces a saturated steam that enters the air mass rotary engine and also the remaining brine is directed into a secondary air mass centrifuge (LPS). Reducing the flashing pressure will increase the mixture quality within the LPS, which ends up in higher steam production. air mass saturated steam is mixed with the steam flow

exhausted from the air mass rotary engine and also the ensuing steam flow is directed to the air mass rotary engine and produces additional electricity. Steam that's exhausted from the air mass rotary engine can then be compressed and injected back to the bottom. in a very flash system, centrifuge pressure contains a important impact on the quantity of power generated from the system and therefore the the} flashing pressures also influence double flash cycle considerably. so as to optimize one style the worth of parameters versus price of operations ought to be taken into consideration.

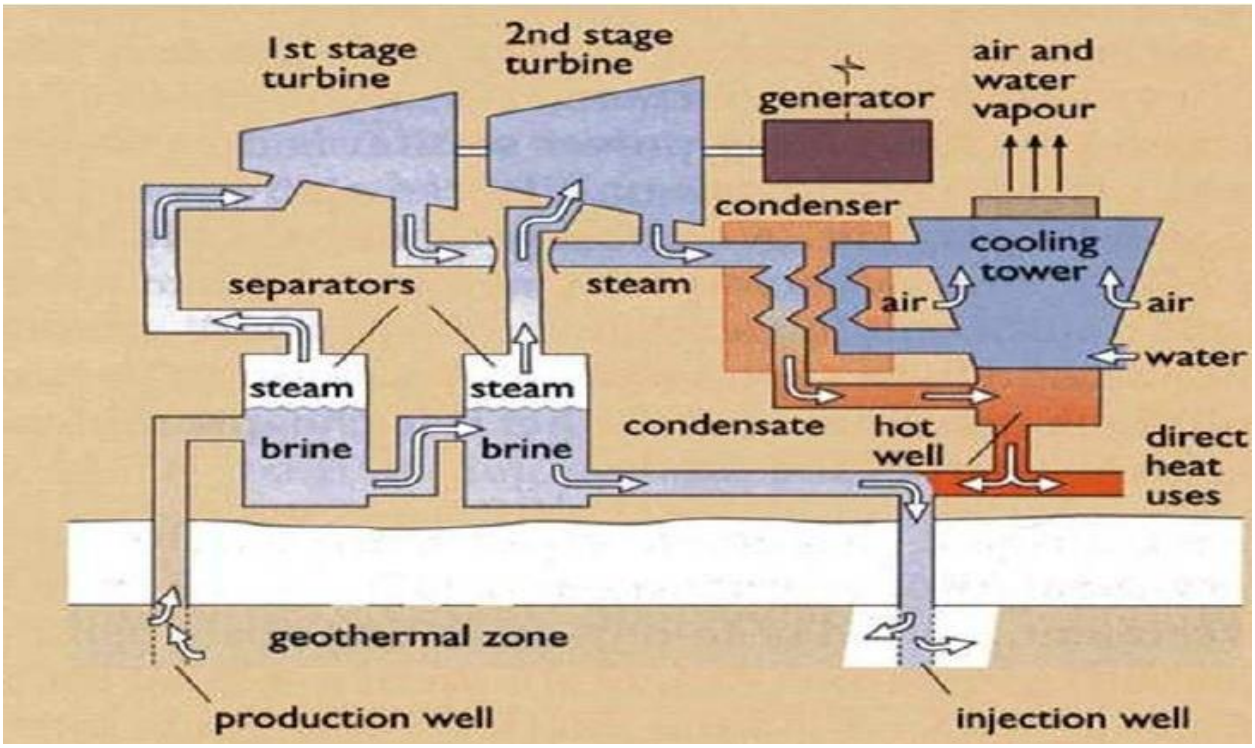


Figure 5.2: Double flash power plant

5.2.3 Dry Steam Power Plants:

Hydrothermal fluids that are mainly steam are used by dry steam plants. The steam flows directly t o a turbine that drives an electricity-producing generator. The steam removes the need to burn,

Fossil fuels (also removing the need to transport and store fuel) in order to power the turbine. Such plants release only excess steam and very small quantities of gases.

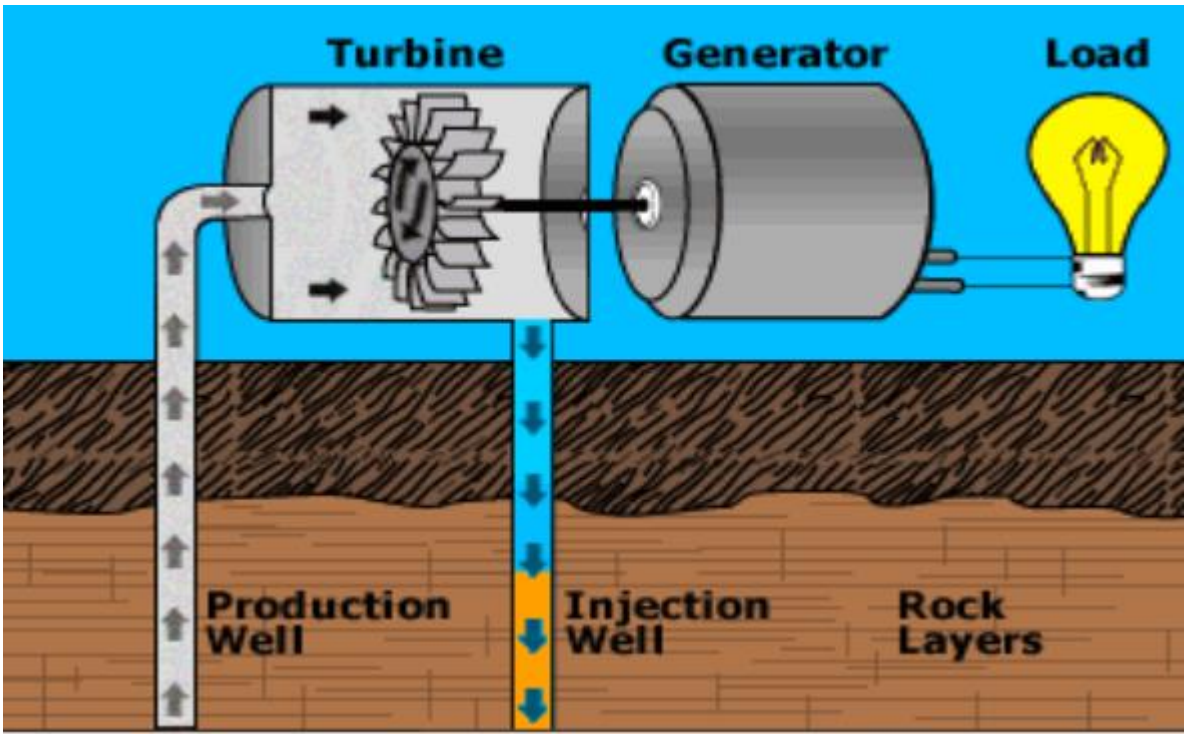


Figure 5.3: Dry steam power plant

The first type of geothermal power generation plants installed (they were first used at Lardarello in I taly in 1904) were dry steam power plant systems.Currently use at Geysers in northern California the world's largest single geothermal power source, steam technology is still successful today.

5.2.4 Binary Cycle Power Plant:

Binary cycle energy power generation plants dissent from Dry Steam and Flash Steam systems therein the water or steam from the energy reservoir ne'er comes up-to-date with the turbine/generator units. Low to moderately heated (below 400°F) energy fluid and a secondary (hence, "binary") fluid with a far lower boiling purpose that water withstand a device. Heat from the energy fluid causes the secondary fluid to flash to vapor, that then drives the turbines and afterward, the generators.

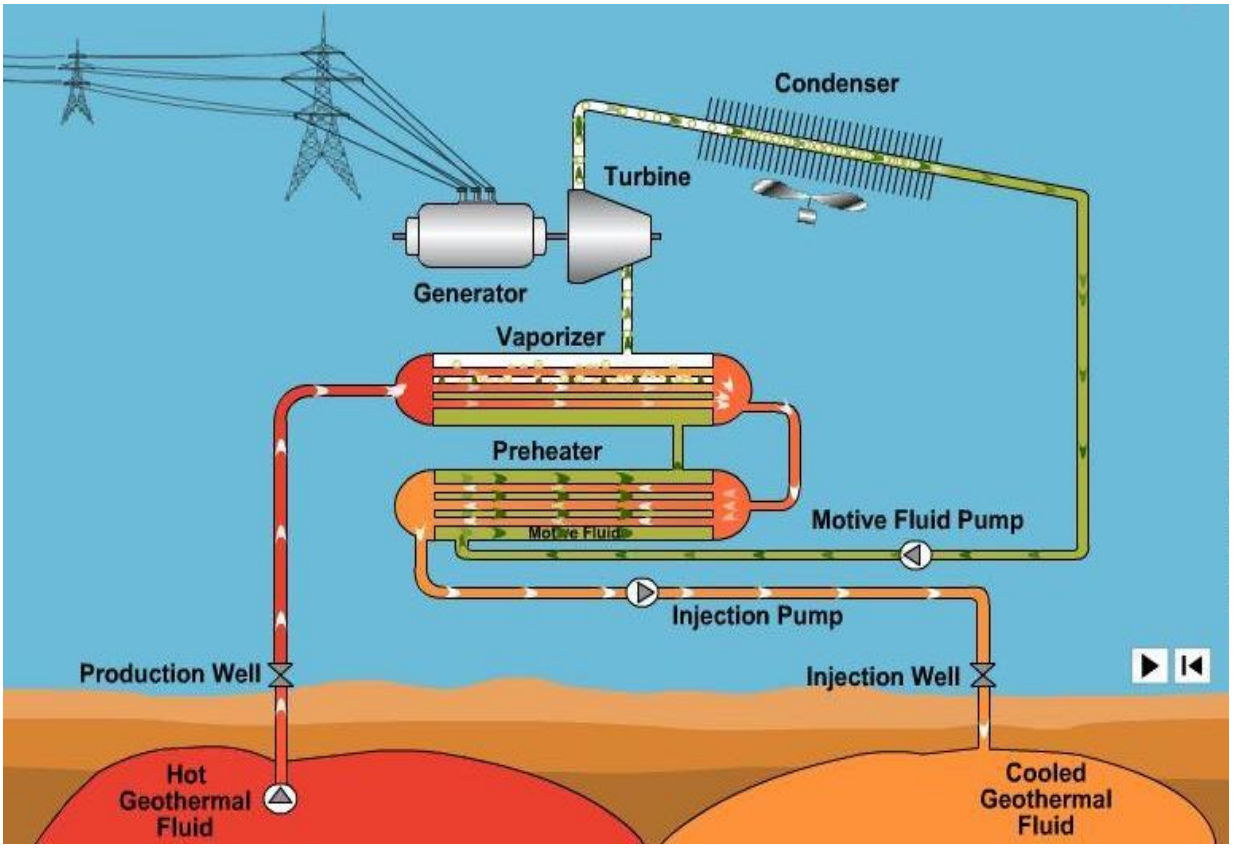


Figure 5.4: Binary cycle power plant

Closedloop systems are binary cycle power plants and practically nothing is released into the atmosp here (except water vapor). Since the most common geothermal resource is resources below 300 ° F, a large proportion of geothermal electricity could come from binary-cycle plants in the future.

5.2.5 Combined Cycle Power Plant:

Combined cycle geothermic station is plant a within which the steam initial produces power during a backpressure turbine and is later on condensed during a vaporizer of a binary plant, that produces further power. Our combined cycle technology is delineate within the graphic below. within the conversion of heat into electricity, our technology includes a range of benefits compared with standard geothermic turbine plants. a traditional geothermic turbine plant consumes vital quantities of water, inflicting depletion of the formation, and additionally needs cooling water treatment chemically and so a requirement for the disposal of such chemicals. a traditional geothermic turbine plant additionally creates a big visual impact within the type of Associate in Nursing emitted plume from the cooling throughout weather condition. against this, our binary and combined cycle geothermic power plants have an occasional profile with minimum visual impact and don't emit a plume once they use air cooled condensers. Our binary and combined cycle geothermic power plants reinject all of the geothermic fluids utilised within the various processes into the geothermic reservoir. Consequently, such processes typically haven't any emissions. alternative benefits of our technology embrace simplicity of operation and straightforward maintenance, low revolutions per minute (RPM), temperature and pressure within the OEC.

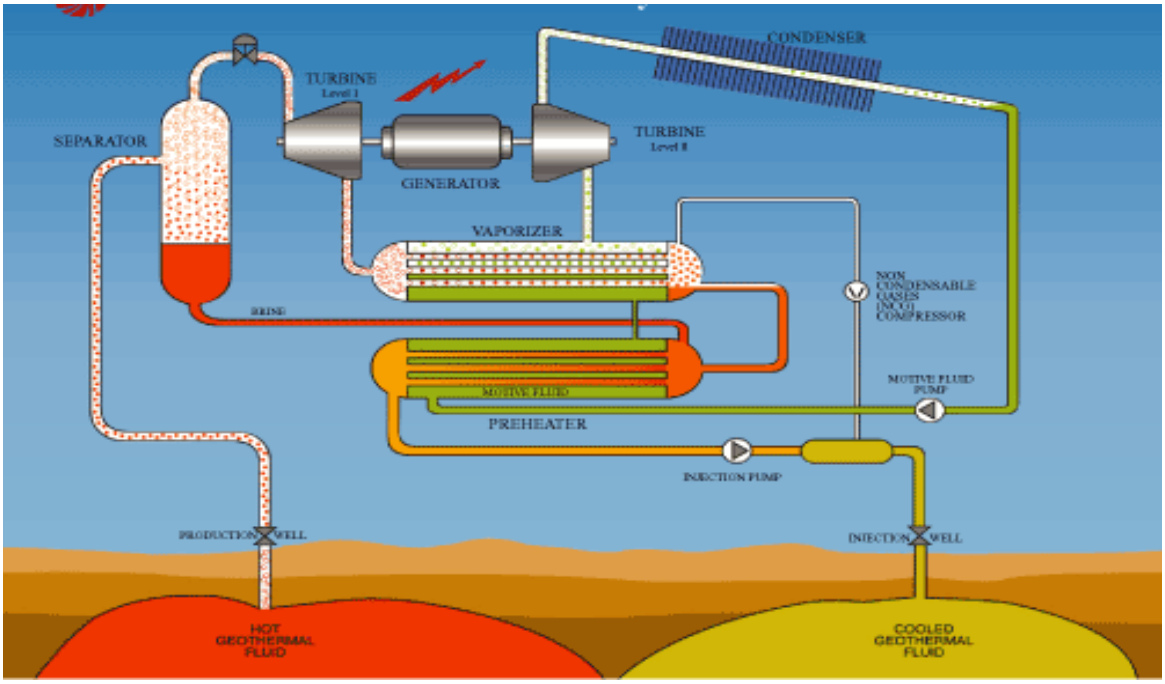


Figure 5.5: Combined cycle power plant

We use an equivalent components of our technology in our recovered energy product. the warmth supply could also be exhaust gases from a straightforward cycle turbine, air mass steam, or medium temperature liquid found within the method business. In most cases, we tend to attach a further device within which we tend to flow into thermal oil to transfer the warmth into the OEC's own vaporizer so as to supply bigger operational flexibility and management. Once this stage of every recovery is completed, the remainder of the operation is the image of the OEC employed in our geothermic power plants. an equivalent benefits of mistreatment the Organic Rankine Cycle apply here yet. additionally, this technology permits for higher load following than standard steam turbines exhibit, needs no water treatment because it is air cooled, and doesn't need the continual presence of a steam licenced operator on web site.

5.3 Power Plant Equipment:

5.3.1 Geothermal Vents:

The geothermic vent is that the 1st element of a geothermic plant. A geothermic vent could be a deep well trained into the world that the facility plant uses to faucet into the Earth's heat. A geothermic plant might have 2 goals for its vent; most current geothermic plants draw superheated, controlled water upward; these ar known as flash steam plants. geothermic plants can also merely dig so much enough underground, as several as 3 kilometers, to succeed in a degree wherever the world is heat enough to boil water, these ar known as dry steam vents.

5.3.2 Steam Generator:

The geothermic vent is that the 1st element of a geothermic plant. A geothermic vent could be a deep well trained into the world that the facility plant uses to faucet into the Earth's heat. A geothermic plant might have 2 goals for its vent; most current geothermic plants draw superheated, controlled water upward; these ar known as flash steam plants. geothermic plants can also merely dig so much enough underground, as several as 3 kilometers, to succeed in a degree wherever the world is heat enough to boil water, these ar known as dry steam vents.

5.3.3 Turbine:

Regardless of the plant kind, each flash steam and dry steam plants pump the steam from the geothermic vent to an outsized rotary engine. The steam passes this rotary engine, turning it within the method. This rotary engine is connected to an electrical generator, and because the rotary engine turns the generator turns the energy into electrical energy, therefore changing the warmth from the world into usable electricity. The rotary engine converts a district of the vapour H to shaft work and so electricity within the generator. The vapour recess to the rotary engine, and {also the} rotary engine run and also exit.

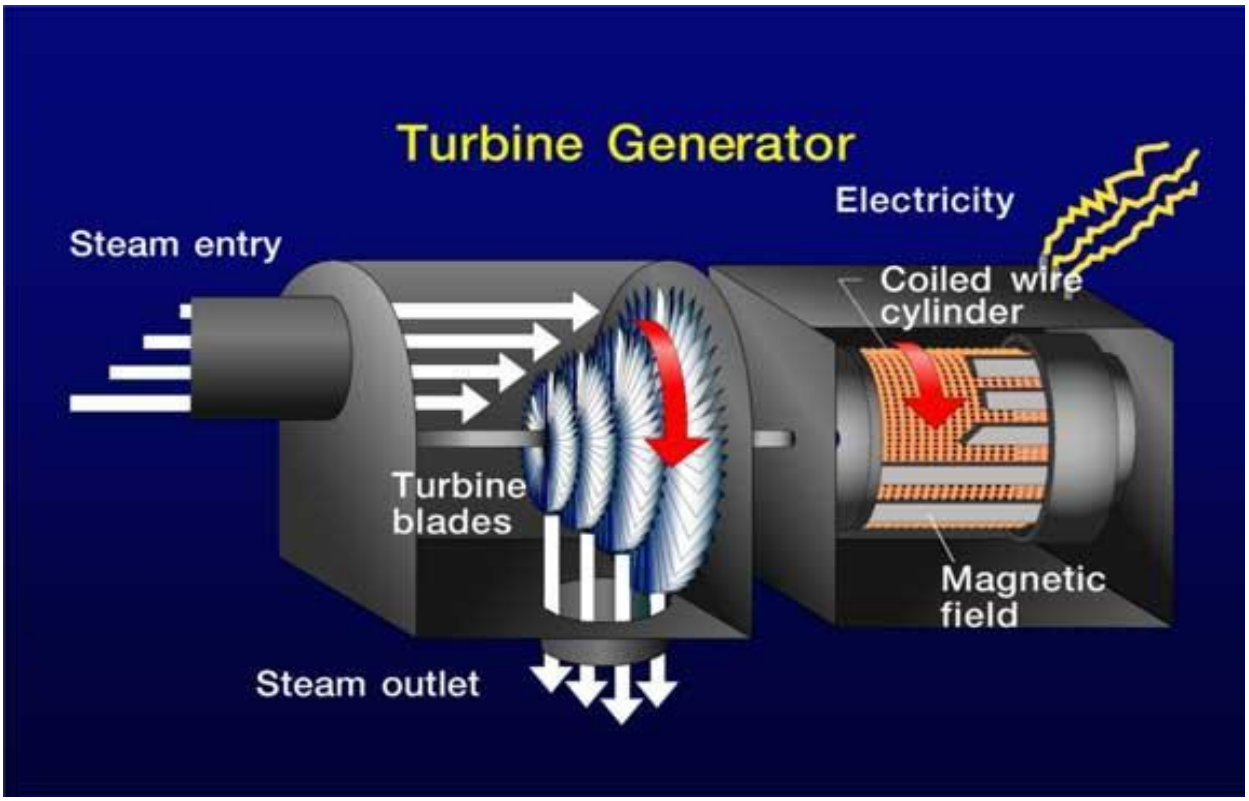
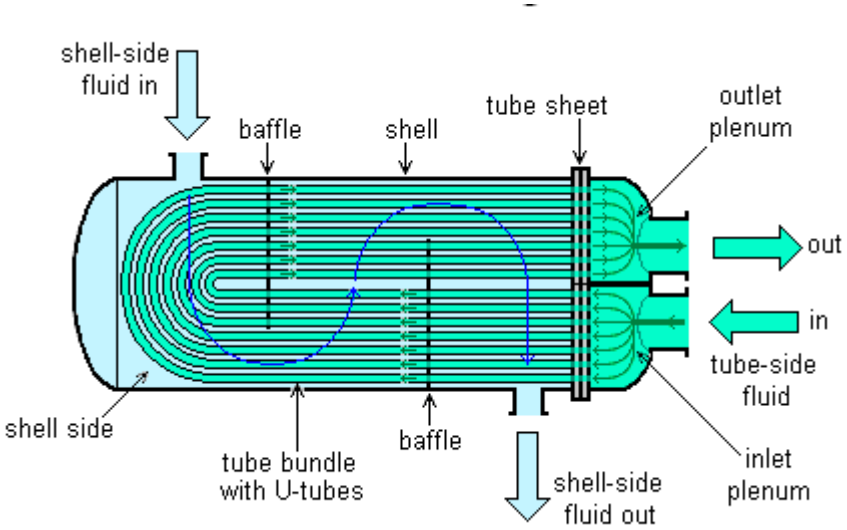


Figure 5.6: Turbine & Generator

5.3.4 Condenser:

After the steam passes through the rotary engine, it continues to a condenser chamber. This chamber condenses the steam into liquid water by cooling it. the surplus heat lost because the steam turns to liquid water is also used for alternative applications, like heating or greenhouse farming. The cooled liquid water is then generally wired into the bottom to either restart the boiling method for dry steam or to refill the natural heated geological formation for flash steam plants. The condenser is nothing however a device between the new vapor from the regenerator/turbine and also the cooling operating fluid of the cycle. it's to be determined that the temperature of the new fluid is beyond the one among the cold fluid throughout the condenser. moreover it should be unbroken in mind that the relation between the total heat and also the temperature is non-linear, requiring that the vaporizer is split into acceptable sections for the calculation. this is often particularly valid for Kalina cycles, within the ORC cycle there's solely a property amendment at the temperature, wherever de-superheat ends and condensation begins.



Figture 5.7: U-tube heat exchanger

5.4 Operation of Power Plants:

Different components of the surface elements of power generation system have associated differing kinds of flora. it's so expedient to divide the system into the subsequent seven principal portions:

Equipment for the power house: Comprising of turbine/generator unit complete with condenser, gas system.

Cooling system: pumps of cooling water, condensate pumps, cooling of fresh water (seawater), or cooling towers.

Particulate and/or droplet erosion: This is an erosion problem usually associated with the co mponents of the device where the fluid is accelerated (e.g. in control valves, turbine nozzles, etc.) a nd/or the direction of change suddenly made (e.g. through pipe twists, T-fittings or wanes)

Heat exchangers: either the type of plate or the type of tube and shell. These are usually only us ed in conversion systems of binary and hybrid forms and/or in integrated systems.

Gas Evacuation Systems: High temperature geothermic fluid contains a big amount of non-condensable gases (C02, N2, H2S, and others). These ought to be removed as an example from the condensation plant for reasons of conversion potency. Some countries need the gas to be cleansed of H2S or Hg to reduce atmospherical pollution.

Re Injection System: involves pipelines for the storage of liquid effluent, injection pumps, injection pipelines, injection wells and control system.

Chemical Injection System: In order to scale back scaling of spar in production wells typically a scale substance is injected through capillary down hole. Similar injection is applied with hydroxide to neutralize acid wells to scale back the corrosivity. Acid is employed for pH modification so as to arrest the scaling of oxide in waste water attending to reinjection, for cases wherever the water is saturated . Chemical management of pH by hydroxide and of biofilms is additionally applied to the cooling water (turbine condenser/cooling towers).

CHAPTER 6:Application, Economics & Outlook for the Future

6.1 Present Uses:

Geothermal energy applications aside from for electricity generation ar loosely classified as nonelectric. many factors build nonelectric applications at geothermic resource sites fascinating. Electricity generation might not be economically possible at geothermic resources with temperatures below 150°C. For higher-temperature resources wherever electricity generation is economic, thermal energy uses will scale back the price of each the electricity and therefore the nonelectric uses. geothermic resources could contain economic quantities of minerals which will probably be recovered. In special circumstances the geothermic resource may be either a very important provide of water or a very important provide of low-priced energy that may be accustomed purify water.

The most widespread interest and application of heat for nonelectric functions has been as a provide of thermal energy. This thermal energy has been at temperatures close to the lower finish of the dimensions, that don't seem to be fitted to economic electricity generation. Mineral recovery and water purification, though not presently important on a worldwide basis, can be of terribly nice importance in native things. Nonelectric applications, either currently or recently operation, cowl a good spectrum. At one finish is that the antique balneological use (therapeutic baths), whereas at the opposite finish is that the use of heat for cooling, as presently practiced in New Seeland. Applications vary from the warming of water for laundry placental mammal stalls to providing the thermal energy needs of a contemporary pulp and factory.

The calculable total energy use rate drawn by Table seven is concerning 7000 MW (th).This quantity of power isn't an oversized contribution to the whole energy use rate of the planet. however in some cases it's the most nonelectric applications throughout not associate degree insignificant quantity, since for variety of the countries with geothermic potential, it represents quite their total wattage needs. it's evident that nonelectric applications are receiving widespread attention, however not the combined attention necessary for a considerable variety of large-scale developments. The degree of utilization in any given country is also associated with the supply of geothermic resources and therefore the relative price of getting energy from different sources. The processes that ar most developed with regard to their overall significance as nonelectric applications ar house heating, industrial applications, and agricultural applications.

6.1.1 Space Heating:

Space heating with heat energy is turning into wide- unfold throughout the cooler regions of the globe, with sizable applications during a range of states. the 2 main classifications of house heating systems square measure district and individual. Most of the many applications square measure within the district heating class. 2 noted exceptions, that square measure individual systems, square measure at Rotorua, New Sjaelland; and Klamath Falls, Oregon, U.S.A. the biggest noted, and doubtless the foremost economical, district heating is in capital of Iceland, Iceland. It provides a complete population of ninety,000 with house and domestic water heating from resources at temperatures varied from 80°C to 120°C. The geothermic water is pumped up directly from well to pipeline, command in storage tanks to fulfill demand, circulated to the buyer at concerning 80"C, and so wasted to the municipal facility or reinjected. the town is split into variety of districts, every served by its own house. Water meters square measure wont to confirm individual shopper use for request functions. the current capability of the geothermic system is 350 MW, with peaking energy demand met from a 35-MW oil-unemployed heating. The system is presently being enlarged by concerning twenty fifth to serve an extra twenty six,000 people. For shoppers being equipped by this method, the typical value of heating is concerning half-hour of what it might be if equipped from Associate in Nursing oil- unemployed heating.A number of distinctive systems exist in one or a lot of of the numerous geothermic house heating applications. for instance, in Russia, France, and us, electrically high-powered heat pumps square measure employed in conjunction with geothermic resources to supply either base or peak heating. . In Rotorua, New Zealand, cooling with heat energy is accomplished victimization Associate in Nursing absorption system.

6.1.2 Industrial Applications:

The pulp, paper, and wood process plant of navigator Pulp and Paper Company, situated in Kawerau, New Sjaelland, was the primary major industrial development to utilize heat energy for heating functions. The plant website was chosen attributable to the supply of heat energy. The heat energy was 1st used for timber drying in kilns and for wood preparation in 1957, then for the pulp and paper operation in 1962. Pa is employed for the assorted heating necessities of the plant. this technique has been operational quite satisfactorily and contains a power output of concerning 100-125 MW. a novel feature of the plant is that the standby 10-MW noncondensing turbo-alternator, that is given priority for the geothermic steam within the event of a failure within the external power provide. 56 at pressures of half-dozen.9 x ten and one.4 x 10 . the assembly of kieselguhr at Namafjall, Iceland, is important development for heat energy in industrial applications. it's not solely a large-scale application; it's

additionally associate example of the manner during which heat energy will build a method economical, once it couldn't somewhat be even. Following the invention wealthy deposits of top-grade ground on all-time low of Lake Myvatn, technical and economic studies indicated that solely by the employment of doubtless low cost heat energy from the close Namafjall high-temperature geothermic field might the recovery and drying of the ground is competitive with typical ground production from relatively physical object. In late 1967 operation of the kieselguhr plant began with a production rate of twelve,000t/yr. In 1970 the plant expanded and production enlarged to twenty four,000t/yr. The geothermic fluid, obtained from the wellhead at 250°C and a pressure of a minimum of three.9 x 10 Pa, is flashed to supply saturated steam at one x lo6 Pa pressure that's transmitted to the plant. within the plant used for drying, suspension heating, area heating, and de-icing storage reservoirs throughout winter. the whole consumption throughout the winter amounts to concerning fifty t/h of the one x lo6 Pa steams, another use that's indicative of the big variety of applications for heat energy is that the gift use of comparatively low-temperature waters to thaw giant areas of ground to permit mining in sure regions of the Soviet Union.

The 3 primary agricultural applications of heat energy area unit greenhouses, farming, and cultivation. far and away the foremost intensive use of geothermic fluids is in greenhouses. This application is commonest in regions wherever growing seasons area unit short and greenhouses area unit necessary to satisfy the native demand for vegetables. In Iceland most of the tomatoes, lettuce, cucumbers, and alternative recent vegetables area unit full-grown with heat energy activity the heating energy. Similarly, the Soviet Union and Republic of Hungary have intensive greenhouse applications that use heat energy. The farming and cultivation applications area unit far more restricted than area unit the greenhouses. Republic of Hungary has the sole giant application of heat energy for farming, and it's expected that this can not be a big, widespread use for heat energy within the future. There area unit solely a comparatively few tiny cultivation applications that use heat energy at this point.

6.2 Economics of Geothermal Power:

Since several actors have an effect on the price of energy power, and knowledge remains terribly restricted, it's impractical to generalize concerning these prices. the key value factors are:
The key
cost considerations are:

- Reservoir development
- Geothermal fluid purity and temperature quality
- Site-specific considerations
- Power plant Exploration
- Waste geothermal fluid disposal
- Environmental protection
- Operation and maintenance
- Taxes
- Royalties
-Lead time from reservoir discovery to power generation

Many of these cost factors vary across countries, and the competitive position of geothermal power would be influenced by other external factors, such as alternative sources of energy. Nonetheless, so me findings on experience in the United States can be important.

6.2.1 Power Plant Cost:

Hydrothermal powerhouse prices area unit expected to be concerning an equivalent as those for oil unemployed plants; but, the plant price for dry steam fields could also be somewhat lower. Plant prices can vary looking on the conversion cycle and resource kind (e.g., flashed steam, binary-cycle, geopressured) however can most likely not exceed nuclear energy plant prices unless the lower-temperature reservoirs area unit used.

6.2.2 Operating Cost:

It is estimated that the annual operational and maintenance expense of the power plant will be around 4.5 percent of the capital cost of the plant. The projected energy costs include the operational and maintenance costs associated with the construction of the reservoir.

6.3 Outlook for the Future:

The total quantity of heat contained within the geothermic resource base of the globe was shown to be massive. however speedily this huge resource are going to be developed throughout the varied countries don't seem to be extremely evident at this point. However, recent value will increase of fossil fuels in world markets ought to stimulate such development.Since several of the nonelectric applications will use low-temperature resources, the full resource base given in Table eleven is also used for such applications. an oversized fraction of the energy needs of most of the world's gift societies may conceivably be glad with thermal energy from geothermic resources. There are, however, several factors that has got to be evaluated to see the practicableness of application at every resource web site. though area here doesn't allow a full discussion of those details, there area unit variety of things that typically indicate the desirability of applications:

6.3.1 Industry:

The energy usage and/or energy intensity of the process must be high; the source of raw materials and the location of the resource must be compatible; if large quantities of electricity are required in addition to thermal energy, electricity should also be provided by the geothermal resource.

6.3.2 Agriculture:

The main applications ar greenhouse heating and cultivation. each of those seem to be growing in significance and have excellent potential applications in countries at higher latitudes. the most limitation to such applications can come back from competition with the {large|the massive} quantities of waste heat obtainable from large fossil- or nuclear-fueled electricity generating plants. The geothermic systems may need a location advantage, and in several little countries they'd not have the ability stations to vie with.

Disscussions and Recommendations

Low-temperature heat and matter basin square measure terribly about to one another thanks to their interconnection of origin, formation moreover as transportation. massive numbers of low-temperature energy fields square measure found in matter basins round the world (The Paris Basin, North China Basin, Molasse Basin in Federal Republic of Germany and nice flowing Basin in Australia, etc.). energy studies up to now dole out in Asian country indicate that the country is ideally fitted to any elaborate studies to faucet the heat by closing focused effort to completely explore the potential of the country. massive a part of the matter basin in Asian country is sort of just like some energy dominant matter basins round the world. There square measure several abandoned gas wells within the basin a part of this country wherever reservoir rock is water bearing arenaceous rock is nice sign for heat production, here solely an appropriate temperature is want. Some abandoned gas wells in TX Basin, USA utilised as heat production that square measure quite similar of Asian country. they're manufacturing heat from abandoned gas and oil wells. Low-temperature heat is manufacturing electricity in nice flowing Basin in Australia (98°C) and in Asian country some abandoned gas wells wherever temperature is over 120°C, so, it should be used as heat for electricity production. it's not out of context to say that there's vast potential to faucet the heat in Asian country halficular|especially|specially|particularly|above all|specifically} in Bogra Shelf and Citrus limonia Saddle moreover because the basin part wherever abandoned gas wells square measure on the market. The country is wanting partnership, businessperson, agencies, NGO's moreover as energy developed countries that developing the heat during this countryso that low-temperature square measure utilised as direct use and power generation. Utilization of deep abandoned oil and gas wells for production of energy electricity for meeting the necessities of rural population of Asian country so cost would be reduced. consequently conjointly counseled use of economical pumps for cooling the buildings and heating square measure for heat water production. It ought to be required to detail survey of energy provinces (Rangpur Saddle and Bogra Self region) and prepare underground energy map for utilization of the energy. it's steered that detail work regarding additional prospective abandoned gas wells round the country. Asian country could be a new comer country with relation to energy activities, so, correct arrange, management and analysis of heat prospective zone (Rangpur Saddle and Bogra Self region and abandoned gas wells area) ought to be taken as a run for the extraction of those resources. generally the energy prospects, geologic mapping of surface energy manifestations moreover as low-temperature surveys square measure essential to judge the each energy province in Asian country.

Geothermal energy not solely attracts the natural heat of the world and manufacture energy however conjointly it's most reliable than alternative energy sources. alternative clean energy, like star and wind energy wants acceptable sun or wind to supply energy, that makes them weather dependent energy supply, however on the opposite hand heat doesn't depends on uncontrollable outside forces.

In terms of star or wind energy, it's necessary to satisfy the particular natural conditions, which suggests an ideal location wherever enough sun or wind gift. except for the energy systems square measure less strained by natural topography. It doesn't need the maximum amount as land to supply energy compared to alternative inexperienced energy power plants. it's be determined that to supply same quantity of energy a heat plant want 100% of the land than a alternative energy plant [17].

Conclusion

From 1990, the renewable energy sources area unit growing average one.9% annually. the expansion of wind energy is twenty four.4%, liquid biomass eight.1%, solid biomass one.6% [20].According to the globe geothermic Congress 2005 (WGC2005), from 1995 the expansion of heat energy was "almost two-fold for direct-use (6.6% annually while not heat pumps) and one.3 times for wattage capability (2.7% annually). the expansion for direct-use was virtually two-fold (6.6% annually while not heat pumps) and 1.5 fold (4.1% annually) for electricity generation [21-22]. In North America and Europe the annual growth of the heat energy production by heat pumps nineteen.6% however worldwide this rate is twenty three.6% [20].

In sense of cleaner, atmosphere friendly and property energy system the heat energy plays a awfully vital role within the world. it's one amongst the renewable energy sources that may provide continuous base load power a bit like fossil fuels. Since 1980, the worth of the electricity from geothermic plants is declining. In USA to provide one kilowatt-hour of electricity from geothermic facilities price regarding $0.08 that's additionally enclosed a production decrease in USA [23].

It is additionally attainable to use geothermic resources as a heating supply for homes and businesses in any location. geothermic heat founds everyplace beneath the world surface however the conditions that micturate flow into to the surface area unit found solely in but 100% of Earth's surface area [4].

Many oils and gas fields area unit beneath observation to search out the likelihood to provide electricity by geothermic. several existing oil and gas reservoirs has vital quantity of high-temperature water and hard-hitting conditions, that permits to provide electricity from oil or gas, and at a similar time these wells will be used for heat energy production.

TO increase the bottom load electricity in Asian nation, have to be compelled to take long run development project for manufacturing electricity. to extend the assembly and reduce the energy price a lot of down, different countries will take initial steps in co-producing electricity.

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