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Economic and Technical Analysis and the Use of Geothermal Energy in Nano Materials

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Abstract: In the present century the only thing that can. Cause of the crisis in the country will include lack or decline in the supply and distribution of energy. As a result, developed countries for energy supplies away from the crisis (the crisis caused by sudden changes in oil prices to 160 dollars and reducing the border to the border of a sudden it 40 dollars) a lot of willingness to move toward renewable energy from geothermal have shown. Through this affiliation to him during the energy crisis (due to energy price increases or shortages of energy reserves) is less. Including nano-technology areas where it has been entered, geothermal wells are upstream industries. According to the definition of exploration before the refinery is included. Drilling in deep water and deep ground temperature is low, desired properties such as initial compatibility and good adhesion to cement the time. Considering the time reduction of cement adhesion finds a product added to the nano less amorphous silicate and drilling continues with more speed.

Key words: Geothermal · Economics · Nano materials · Technology · Energy · Electricity · Well

INTRODUCTION

The Nature of Thermal Energy Sources: Total capacity of geothermal energy in 1990, a figure close to 6000 MW and the direct use of geothermal resources to the digital equivalent was 25%. Earth's average temperature for each 100 m deep, 3°C increase. This means that if the depth of 2 km from the Earth's surface temperature about 70°C, then the depth of 3 km around the temperature reaches 100°C, but in some places, technical activities caused by hot lava flow or melt the surface, formed specifically with the temperature at ground level is available.

Geothermal energy generally are divided into four categories which include:

Hydrothermal Sources: The hot water vapor in the parts with low or average depth of the earth's crust (4500 - 100 m) faults within the pores or porous rocks have been called hydrothermal resources.

Pressure Layers Resources: Resources layers under pressure, hot table containing methane gas is dissolved in about 3 to 6 km deep surface, under high pressure in the sedimentary layers has been in prison.

Hot Dry Rock: More resources in this very hot and dry areas or areas that contain minor amounts of water are the eyes again.

Lava, molten rocks that are temperature between 700 to 1200°C. Compartment containing lava potential energy of an extraordinary and almost the largest source of geothermal form. The most appropriate type of geothermal resource steam or steam hot water resources under pressure are. By drilling wells that they can be achieved. Geothermal resources, but mainly as hot stones are dry [2-5].

Application of Nano Materials in Geothermal Wells: During drilling wells, wells for wall stabilization and prevention of falling walls, periodically, tubes (tube wall) are driven into the well and the back is cement and cement to the pipe wall by wall are well and firmly attached are. This process is done this way to the first wall tubes are connected to each other and are driven to end well. Cement from the bottom of the tube wells back wall (space between the pipe wall and spans well) are pumping. Comes up to ground level. Finally, the time needed for drying cement can be considered. Walls of the tube wall are well connected. Since the injection of cement to complete drying, the tube wall is connected by cable to

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the tower. Cement used must adhesion properties, respondents pump, viscosity and final hardness can be controlled to have.

Cement used in this process should viscosity characteristics, good strength and setting time are using nano additives can satisfy these characteristics. Nano particles added to the cement properties due to the quantum properties of mass and properties of materials caused properties are suitable. One of the obvious characteristics of these particles after adding all the same homogeneous mixture is homogeneous, which makes cement properties will be. Ability of cement at high temperatures is a member, so can be a good option for deep wells in oil and geothermal wells.

Nano additive product that amorphous silica is used in making it has been founded by fine grain particles constituting, in terms of special properties stability, quality and capability of being used to cement the wells. The two-cement Grout result is quite stable and additional water will be eliminated. Due to an appropriate density, the grout style, excellent acts. Drilling in deep water and deep ground temperature is low, desired properties, including primary compatibility and good adhesion to cement the time. The fact that the adhesion time of cement decreases more quickly, so drilling continues [1-4].

Geothermal Power Production: If the high temperature heat source, then this is the preferred source for electricity generation is used. Of course, it can be to use or enter the network or locally for use in industrial processes. These sources usually produce base load are used only in certain conditions to produce peak times are used. Difficult to control due to peak load problems making deposits or corrosion in the tanks full and not full of turbines and the influence of different liquid air on their shows is on. Using oscillating time, for remote areas (like Iceland or inaccessible regions) or to increase the amount of energy produced can be appropriate. (Dry steam fields in corrosion problem or making deposits are not necessary true). Types of power plants generating electricity from geothermal energy include:

Dry Steam Plant: After the vapor, extraction wells, along with steam from the solids separated and purified directly by steam tube is guided into the turbine. This fully-fledged technology is accessible and economical. Working within the plant capacity of about 120 to 35 MW.

Instantaneous Vaporization of Steam Power Plants: Cycles that generate electricity from the vessel liquid hot, enough (above 160°C) are used. In many areas, usually for economic and turbo generators with a capacity of between 10 and 55 MW has been developed.

Cycle Power Plant in Two Circuits: This type of power plant hot fluid taken from the ground with 90 to 2000°C is. Down by a well pump, pressure is held. Then into a heat exchanger is sent. Due to heat, cycle with two fluid circuits (e.g. ISO Butane), cause it to vaporize. Fluid evaporates after passing through a turbine to be expanded and then the condensate is. In addition, repeat this cycle is heated. Geothermal fluid residue is usually injected under the surface is used.

The Cost Structure of Geothermal Projects: Four geothermal projects operating expenses include following items:

- Analyze the source of discovery and a source of geothermal energy estimate.
- The amount of maintenance to produce geothermal fluid production.
- Energy Conversion, appropriate extraction of energy from geothermal fluid.
- Other Operations, any other cost factor for cost.

Growth market geothermal power plants until it seems largely depends on the following four factors is essential that are:

- Competitive fuel prices, particularly oil and gas natural.
- Considerations intended for environmental costs.
- Rate of development of this technology in the future.
- Obtaining permission from the authorities.

Use of geothermal energy has other benefits such as less land occupation than other power plants (Table 1).

Technical and Economic Analysis of Geothermal Electricity: Use of geothermal resources, such as other fossil fuel sources that require a heavy investment for exploration, drilling, development of geothermal fields, buying equipment and power plant equipment and accessories should be considered. Total initial investment

Table 1: Technology occupied area (per square meter mega-watt hours per year for 30 years)

Type of plant	Area need (m)
Coal (including coal mines)	3642
Solar thermal	3561
PC	3237
Wind (occupied area and surounding roads)	1335
Geothermal	404

cost of geothermal power plants can be a function of Φ will cost devices and power plant equipment and accessories Φ_E, drilling and completion cost of production and injection wells Φ_W, cost geothermal field exploration and use of land and cost of pipe Φ_S Drawing fluid for transfer of geothermal power plant producing wells Φ_F considered. To calculate the total investment cost of the following equation is used:

$$\Phi = (i + \sum f_i)\, f\frac{1}{E}\,\Phi_E + f\frac{1}{S}\,\Phi_s + f\frac{1}{W}\,\Phi_w + f\frac{1}{f}\,\Phi_f \quad (1)$$

Where f_i coefficients for direct costs of preparing the device, power plant equipment and construction plant lineage.

$$f\frac{1}{E},\ f\frac{1}{f},\ f\frac{1}{W},\ f\frac{1}{S} \quad (2)$$

Coefficients for indirect costs, including design engineering, legal costs, etc. in order to plant, field exploration, drilling and transfer of geothermal fluid.

Cost of Power Transmission Equipment and Devices Unit Φ_E: This cost includes purchase cost of the turbine, generator, condenser, cooling tower, pumps, separators, etc.For a geothermal power plant with a cycle of vaporization and immediate high-capacity 100 MW, this cost about 500 dollars per kilowatt capacity power plant is considered. Conversion price of power units with capacity above the price lower than units with a capacity less. For a 100-megawatt power plant is equal to this cost: Φ_E = 50000000 $ (3)

Exploration Costs Φ_s: Access to the geothermal reservoir and estimate the amount of its capacity is very difficult and costly, especially if the area looking for early reviews and signs are not there and pretend geothermal energy, such as some hot springs, Gas volcanoes and altered zones of geothermal fluid in the Earth's surface is not visible. Geothermal energy exploration, including geological studies and operations, Hydro geological, Geo chemistry, geophysical and drilling test wells is heat polls. So that its cost increases mentioned operations. In addition, the cost of buying land use for drilling wells and ground plant part of these costs are considered. Impact of these costs is very important and is significant because these expenses long before any operations are performed should be. For 100 MW power plant costs about 10 million dollars in exploration is considered [5-9].

Cost of drilling ΦC: ΦC estimated cost of drilling wells in production and injection many factors must be considered. Drilling cost is generally a function of the number of wells, deep wells, rock types and distances wells (drilling machine relocation cost) ways to access the site excavation and so on. The main parameter in determining the cost of drilling the well is deep. Cost test wells, mud, cement and tubing as part of the cost of excavation is considered. Number of production wells needed to supply steam power plant efficiency, depending on wells is variable. Amount of steam required per MW of the 7 tons per hour and the average steam production rate per well to 30 tons per hour, the number of producing wells is equal to = 23 wells. If the average depth of these wells to 1,700 meters and the number of injection wells 7 loop and approximate depth of 100 m S of about 46,000 gathered to consider m drilling is necessary. With regard to 1000 dollars per meter, drilling cost is equal to W=46,000,000$ Φ (4)

Transmission Fluid Cost Geothermal Φ_F: Cost of transfer piping between the geothermal fluid production wells and various parts of plants and related pumping system is a function of the distance between production wells and power transmission unit, the diameter of pipes in connection with the pressure Dubai and the fluid is determined, the percentage composition of insulation and geothermal fluid (corrosion and sedimentation in the pipes). With regard to the pipeline 15 km long and 162 dollars per meter, the cost to transfer a 100-megawatt power plant is equal to 10 million dollars. Total initial investment cost for an instantaneous vaporization cycle power plant 100 MW capacity with alternative values to make and related high considering the coefficients is equal to: Φ= 221,400,000$ (5)

Or in other words, the cost for a geothermal power plant capacity of 100 MW, equal to 2214 dollars per kW. Total initial investment cost of 24 percent related to exploration drilling operations and transfer of geothermal fluid and 58 percent related to the line and power plant equipment and installation.

Electricity Production Cost S: Production cost using the following equation has been calculated.

$$\frac{1}{N}\left\{i\left(\frac{S_E(i+1)n_E}{(1+i(n_{E-1}}+\frac{S_E(1-1)^{n_S}}{(1+i)^{n_{S-1}}}+\frac{S_W(i+1)^{n_W}}{(1+i)^{n_{W-1}}}+\frac{S_f(i+1)^{n_f}}{(1+i)^{n_{f-1}}}+0M\right\}=S \quad (6)$$

Where N kilowatt hour of electricity produced in the year that is calculated from the following equation:

$$N = 8760\ [\text{days}] * CF\ [\text{percent}] * P\ [\text{kW}] \quad (7)$$

Where CF is equal to plant capacity factor, which varies as 70, 75, 80, 85 and 90 percent has been considered.

P equals power plan, I discount rate is equal, that as a variable 6, 10, 14, 18 and 20 percent has been.

SE, Ss, SW and SF with equal total costs to purchase equipment, exploration, drilling and transfer of geothermal fluid from Φ E, Φ S, Φ W and Φ F are calculated. nE = 20 years, ns = 50 years, nw = 10 years, nf = 20 years respectively for power plant equipment time return on investment, exploration, drilling and transmission lines that are listed longevity equal parts is assumed.

OM operation and maintenance cost is 3 percent of the total initial investment cost is considered.

Production cost increase plant capacity factor decreased with increasing discount rate increases. With regard to capacity ratio of 80 percent and 18 percent discount rate the cost of electricity production to geothermal power plant capacity of 100 MW is equal to 5 cents per kilowatt-hour. Compare this cost with the cost of electricity from various sources, energy spectra result cost of electricity is geothermal energy 4 6 cents per kilowatt-hour of electricity produced from a much lower cost electricity from other non-conventional energy is. Of course, this comparison should be environmental costs considered [1-9].

CONCLUSION

The real motive of exploitation of geothermal energy in order to convert this energy to electricity. Considering that the current growth rate of geothermal energy use 20 percent for developed countries is. So, good growth prospects to use this energy to prove.

Geothermal power capacity factor in the range of 70 to 90 percent and the plant is mainly based on feed used. Efficiency of geothermal power plants due to low pressure and temperature steam geothermal power plants in about a third of the fossil fuel is steam. Meanwhile, the cost to buy equipment and power plant equipment circuit system higher than evaporation system is instantaneous.

Geothermal energy resources are considerable. The extremely high amount of thermal energy. and at one year can require several times more than the projected world primary energy by 2020 (1.16 ×10 4 to 1.35 ×10 4).

Using technology such as geothermal and modular flexibility of being gives us the benefits we can allow the system to any level of capacity that we (even for very low values) with relatively low investment costs increase do. The installation of this power plant is relatively short (between one and two years) while the time of research, exploration and development of energy sources is too long.

In developing countries due to factors such as increasing population and labor productivity (GDP per worker), was relatively high flexibility and relatively low price flexibility, the primary energy consumption is expected from the relatively higher growth rate is entitled. Most developing countries with renewable energy sources, especially geothermal energy are. A large part of new energy demand in developed countries towards clean renewable energy sources, which has diverted more than that on energy to maintain influence in these countries, on environmental pollution in the world will affect said.

There geothermal energy in developing countries in addition to reducing dependence on fossil fuels (which is very important), make transfer modern technologies to these countries will also transfer the bulk of the work related to engineering and development resources Local companies can contribute up to strengthen the infrastructure in these countries is technical.

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