Producing Electricity through Gravitational Force

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Abstract – In this paper we have devised an approach to convert gravitational pull of Earth (or any other planetary object) into a useful form of energy (mainly electricity). The main concept is based on drilling the Earth's surface at corner (not at center) and passing a rod through the hole causing a to and fro motion of the rod which could then be converted into some useful form of energy. This concept is not limited to Earth only we can implement this prototype in other astronomical bodies (like Moon, Venus) as well having some gravitational force of its own.

Keywords: Astronomical Bodies, Kinetic Energy, Gravitational force, Potential Difference.

I. INTRODUCTION

Since the evolution of Homo sapiens approximately 0.5 million years ago there has been extensive use of energy sources like fossil fuels, coal, petroleum, minerals, wood etc. all of which come under non-renewable sources of energy. These resources are depleting day by day. Also referred to as exhaustible sources of energy, these are bound to exhaust and finish in near future. So, there is an urgent need to move to renewable sources of energy or alternative sources of energy.
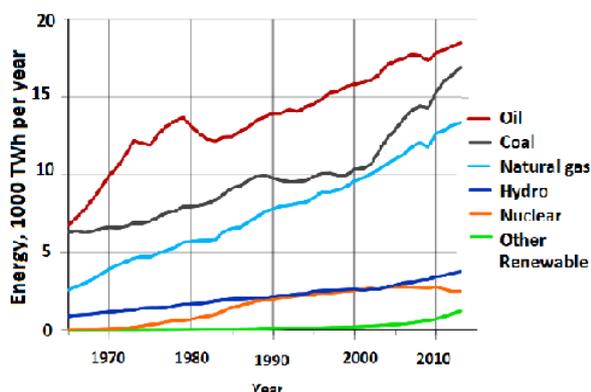

Fig 1: World Energy Consumption

Fig 1 shows the energy consumption of overall world. As we can see that there is a large portion of energy being coming from oil and coal so there is a great need of choosing alternative resources instead of exhaustible ones.

Alternative sources of energy do not use up natural resources and harm the environment. It includes **biomass, solar energy, wind energy, nuclear energy, geothermal energy, tidal energy etc**. These sources of energy are a continuously present in nature and replenished again-again. These sources of energy can never be depleted from Earth. They are free to use and requires only initial set-up

which in some cases is expensive while in other it is efficient and cheap.

For example in case of solar energy, it requires initial set up involving buying of expensive solar panels to produce electricity and that to not in fair amounts. Wind energy requires large area to set up wind mills and so on. All these alternative sources of energy which have been developed till date are not used on a mass scale and are incapable of producing large scale energy in times of crises which may be seen after 20-25 years from now.

In this paper we use gravitational force of earth to harness electricity. The prototype is not restricted for earth only; it could be used with other astronomical object as well having gravitational pull of its own. The paper has been divided into 5 sections. Section II and III talks about setting up the prototype to convert gravitational force of astronomical bodies into Kinetic energy. Section IV gives the concept to bring the rod in motion and then further section talks about converting kinetic energy into electrical energy.

II. DRILLING THROUGH THE SURFACE

Firstly we need to examine the surface of earth, its gravitational pull, radius and the distance we need to drill through. It involves a great sum of calculations of which we have tried to give just an insight as it is impossible for us to get into minor details of calculations.

Earths radius is about 6,371 km, but since it is not a perfect sphere we can consider an error of about 0.3%. As we already know, it is probably impossible to dig a tunnel through the center of earth due to its high temperature at is center, so an alternative approach could be to drill through a small portion of earth say (across Kochi, India and

Rameswaram, India) which is practically possible. This distance through surface is about 400 km.

Thus, we get an arc (from Kochi to Rameswaram) of length 400 km with radius of circle (sphere) approx. 6371 km.
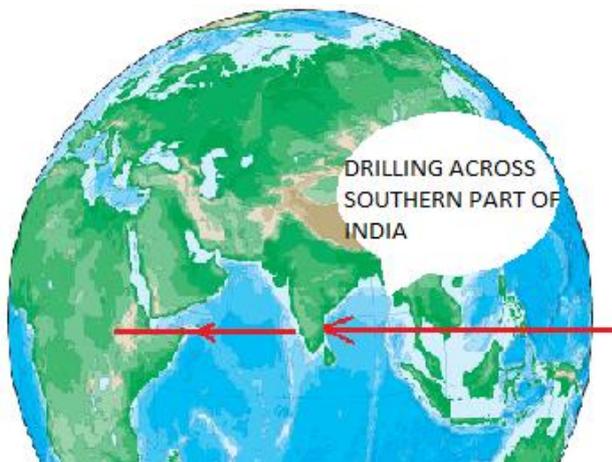

Fig 2: Earth's drilling

Formulae related to calculating the distance of tunnel inside Earth:

a = arc length of sphere (km),
c= length of tunnel or chord (km),
r= radius of Earth (km),
θ= angle in radians made by center of Earth across the two selected regions through which the surface will be drilled.

Then,

$$a = r * \theta \qquad \textbf{... (1)}$$
$$c = 2 * r * [\sin(\theta/2)] \qquad \textbf{... (2)}$$

Thus using the Eq. (1) and Eq. (2) we find that,

θ=0.07848061528 radians,
c=499.87287km.

{Where r=6371km, a=400km}

Thus we will require to drill a distance of 499.87km across earth's corner(near Indian Ocean) which is a bit difficult task but not impossible through the use of modern technologies. This drilling can also be done on Moon or Venus because their core is less hot as compared to Earth. Also Venus provides almost equal force of attraction (acceleration on Venus=8.87m/s^2). But if the prototype is set outside the Earth then we will need to transmit the energy back to Earth which is a cumbersome process.
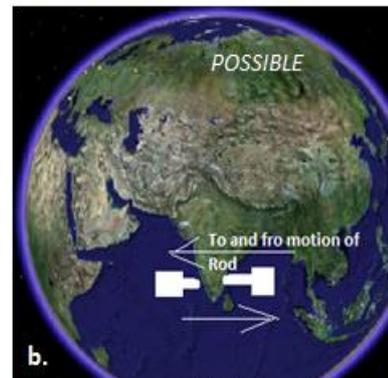

Fig 3: (a). Impossible scenario (b).Possible Scenario (To and fro motion)

III. SETTING UP THE ROD

Once the tunnel has been made the next step is to pass a strong rod. The rod may be of tungsten or some better quality alloy. Using a bad conductor of heat with tungsten could maximize the life expectancy of rod 5 times more. The important point to consider is that either the whole rod or its end must be magnetic so as to produce electrical energy because kinetic energy can be converted to electrical energy only when a magnetic bar is allowed to move inside a coil.

The length of the rod must be greater than c (as calculated) so as to provide to and fro motion to rod. We can consider the length of rod to be approx. 501km (500+1 km) where the extra 1km rod will be merging out of the surface of earth on either side or other planetary object. This rod must be of dumble shaped with its end of a bit broader diameter to ease the fall of rod when allowed to fall from a considerable height.
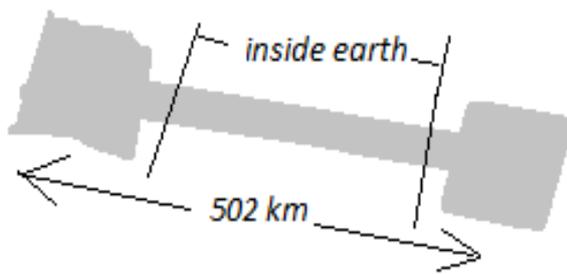
Fig 4: Rod dimensions

The broader regions of rod must be of a bit heavy metal so as to increase the speed of rod as it falls through the distance.

IV. THE CONCEPT

Next step involves bringing the rod in motion. To do this the rod must be allowed to fall from about 0.5 km. above the earth's surface. Now after leaving the rod from a

considerable height it would free fall from one side due to gravitational force of Earth with an acceleration of 9.8m/sec^2 but subsequently it would emerge from the opposite end of the surface causing it to go back inside from the opposite side again. The rod will again emerge from initial side and again go back inside due to gravitational pull. This would thus set up to and fro motion of the rod across Earth's surface. Now the Kinetic Energy produced from to and fro motion of rod needs to

V. CONVERTING KINETIC INTO ELECTRICAL ENERGY

The basic principle to convert Kinetic into Electrical energy is to move a bar magnet through the center of a coil of wires which would then produce emf across the coil. The same principle can be applied to our proposed model. To harness electrical energy the tunnel of Earth must be covered with coil made of strong metal. Now as the magnetic rod is allowed to move across the tunnel it would produce an emf in coil. This potential difference in coil can then be stored and transformed for domestic or industrial purposes.

I.   CONCLUSION

Since the prototype involves digging up a tunnel through Earth's surface, it is an expensive and dangerous process but once done could produce energy for large masses and is continuous source of energy. It could light up whole city like Goa 24X7 without any external power usage.

This source of energy is not required in near future but may be considered as an alternative after 15-20 years. This prototype is not restricted to earth only but could be used on any other planet or satellite on the condition that it has some considerable gravitational pull. If the energy is harnessed from another planet then it needs to be transferred to Earth via waves which Japan is working on from last many years.

REFERENCES

[1]   (2010) The Renewable Energy website. [Online]. Available:http://www.renewableenergyfocus.com/view/12469/drilling-10-000-m-deep-geothermal-wells/
[2]   (2009) The Phys. website. [Online]. Available: http://phys.org/news165513789.html
[3]   (2011) The Phys. website. [Online]. Available: http://phys.org/news/2011-03-scientists-drill-earth-mantle.html