W.O.G.E:- WAYS OF GENERATING ELECTRICITY

Prince N Bora

Department of Mechanical Engineering

Sandip Institute of Technology & Research Centre, Nashik, (India)

ABSTRACT

The Electricity requirements of world including India are increasing, which indicates that conventional energy in future may not be sufficient to fulfill the needs. The paper puts light on various Non-conventional ways of generating electricity. Energy cannot be created nor be destroyed but can transform from one form to another form. Similarly, solar energy is very useful and efficient to generate large amount of electricity. Today the whole world is running out of power. Again the environment is also polluted to a great extent. Considering pollution and economy, magnets can also be used as resource. Dynamo is the best example for transformation of energy. New concepts and ideas are developed to convert human body motion into energy. Trains are used a lot in India hence using the wind energy generated due to high speed to generate electricity.

Keywords: Human Body Motion, Magnets, Non-Conventional Energy, Pollution, Solar Energy.

I. INTRODUCTION

Now-a-days it is very necessary to find out the renewable energy or power sources for domestic and commercial purposes. At present in World, more than 60% of people and in India 70% of people are not getting electricity in their daily life. For electricity such as lighting, cooking, moderate machine operating etc, they are extremely depending on oil like kerosene, diesel, petrol, bio-oils and other bio-materials like trees, extracts of food grains etc[1]. The use of conventional energy sources can cause lack of resources, harmful emissions etc.

Though having non-conventional energy sources people are more dependent on conventional energy resources. Also natural resources like coal, oil, radio-active materials etc will come to shortage stage or an end in near future. The other power generating systems like Hydro- Electricity power generating plant cannot afford much power, although it causes less pollution. Therefore, it needs urgent invention to go for non-conventional energy resources. The most popular non-conventional power resources are solar energy power plant which converts solar energy or solar heat to electricity [1]. Magnets are also better option to convert the energy type and economic too. Researches are also going on converting Human body motion into electricity.

II. CLASSIFICATION

There are number of Non-Conventional resources to generate electricity, but below mentioned are very effective and efficient to imply.

III. FUNDAMENTAL WORKING

3.1 Using Solar Energy

The temperature of Earth is increasing due to many reasons. So what if we utilize this natural source to generate electricity. This heat energy from the sun, is emitted in the universe and the earth by transmission of tiny bundles of energy particles called photons which move with finite speed (almost speed of light) and energy. When photons strike an atom, they interact with the electrons by transferring their energy and hence electricity is generated [1].

The Solar Power Generation System is planned accordingly Fig. 1. The solar cell array or panel consists of an appropriate number of solar cell modules connected in series or parallel to provide the required current and voltage [1].

Fig.1. Basic Solar Panels

Solar energy can be used approximately for all electrical appliances as well as all other devices which require some kind of energy (as energy can be transformed in any form). Some recent Case Studies are mentioned below regarding usage of solar energy.

3.1.1 Case Study for Toyota Prius Solar Car

Though it is a hybrid car but instead of using any other electricity source Solar energy can be used to charge the battery and to run the motor. The first generation Prius for the U.S. market was released in 2000 with increased power to both the internal combustion engine and electric motor. This new Prius met California emissions standards and included a lighter battery pack. U.S. consumers still found it to be underpowered and burdened with other limitations including rear seats that did not fold down.

Fig.2. Toyota Prius

Starting two years before the Prius was available in the US, the campaign began by creating a dialogue with customers that resulted in 40,000 people expressing an interest in the Prius. These prospects were given early access to a private web site and were able to pre-order the Prius, which 1,800 did. (Geller, 2000). The campaign then continued onto a more traditional form using broadcast and print advertising and continued to combine interactive, outdoor and lifestyle marketing (Geller, 2000). Year 2000 Toyota begins marketing the Prius (as a 2001 model) in the United States [2]. However, this early Prius did not stack up based on either features or price compared to its competitors and the marketing campaign heavily emphasized the car's green aspects. Toyota had only succeeded in selling to an audience of innovators and a limited number of early adopters who were drawn to the technology and willing to take a risk [3].

3.1.2. Similar Examples of Solar Energy Usage

Solar Inverters (fig.3)

Solar Water Heaters (fig.4)

Solar Power Plant (fig.5)

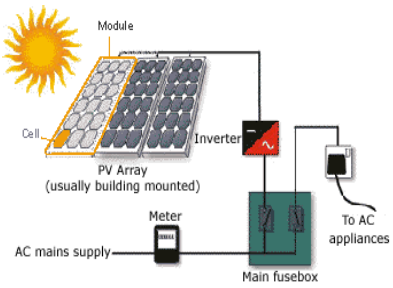

Fig.3 [4]

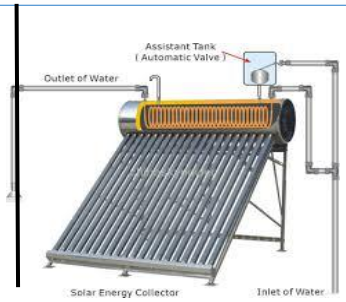

Fig.4 [4]

Fig.5 [4]

3.2 Using Magnets (PM)

Magnetic generator technologies can be broadly classified into three categories: rotational, oscillatory, and hybrid devices, as shown in Fig. 6. Rotational generators mimic the operation of macro scale motor/generators and have been designed to operate using rotational power from miniature turbines or heat engines. They are designed for continuous rotational Motion under a steady driving torque. In contrast, oscillatory generators operate in a resonance mode, usually relying on relatively small displacements between PM and Coil to harness power from environmental vibrations. Lastly, hybrid devices rely on vibrations, but convert linear motion into

rotational motion using an imbalanced (eccentric) rotor. Depending on the operating conditions, the rotation (and hence power generation) from these devices may be continuous, oscillatory, or chaotic [6].

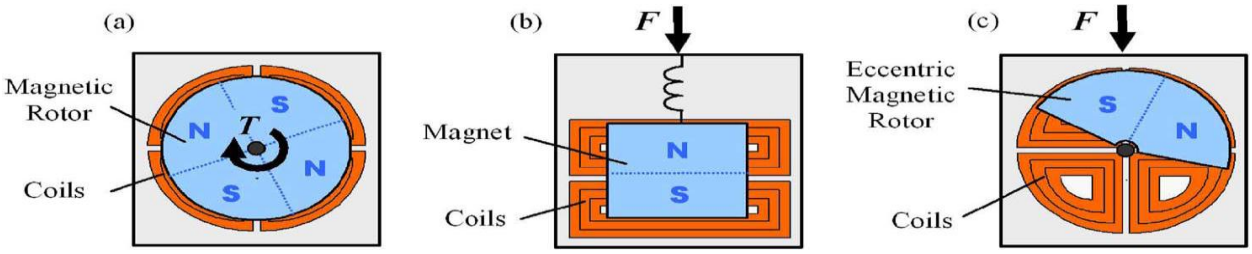

Fig.6. Different Types of Permanent Magnets for Generation [6]

One key parameter that is of great importance, but often not reported is mechanical-to-electrical efficiency. First, it is often difficult to directly measure input mechanical power, especially for rotational devices, where small torque measurements are needed. Moreover, for micro scale PM generator implementation, efficiency may not be a dominant design constraint, particularly for applications where source energy may be continuously available. Instead, size and power density may be more important [6].

3.2.1 Electricity by Fan

The magnetic objects can be permanent magnets. The rotor is surrounded with several connecting parts for fixing a blade frame. The blade frame has several blades. The bottom of the blade frame is pivotally installed with an illuminating unit. In practice, each of the first magnetizing coils is driven by the input voltage to produce an induced magnetic field. The rotor is thus driven to rotate with respect to the stator and build up inertia. When the rotor rotates with respect to the stator, the rotor rotates and cuts through the magnetic lines [7].

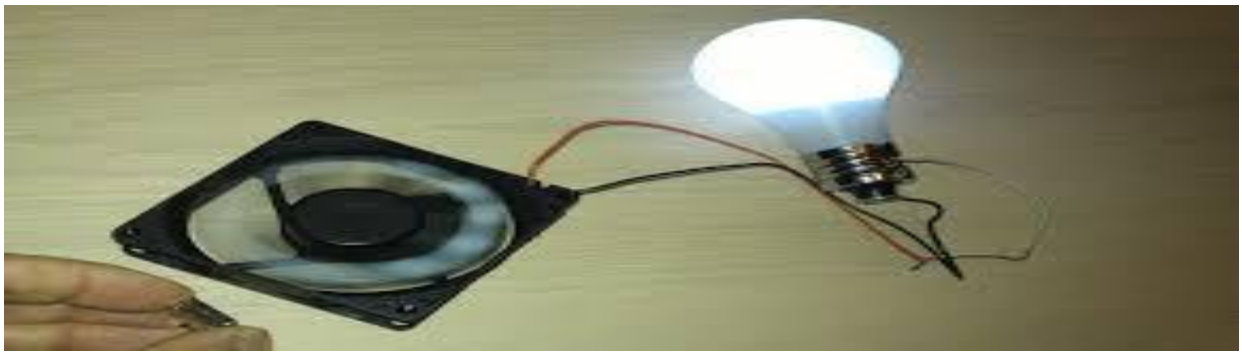

Fig.7. Electricity by Fan [5]

A back EMF is thus generated in the induced magnetic field. In this case, the second magnetizing coil on the stator detects the received EMF. The received EMF is converted by the power distribution controlling circuit into electrical power for output. In this embodiment, the power distribution controlling circuit is electrically connected with the illuminating unit at the bottom of the blade frame. The electrical power output from the power distribution controlling circuit can drive the illuminating unit at the bottom of the blade frame [7].

Therefore, the illuminating unit can produce light without additional electrical power. However, it should be mentioned that the energy saving driver con rolling circuit can convert external AC power into DC power, and eliminate the power supply noise interference. This indicates that though we are switching the fan on and wasting electricity but actually electricity will get transferred [7].

3.2.2 Using Car Tyres

A method and device for generating electrical energy from the rotation of a wheel of a vehicle is disclosed. The device is disposed within a pneumatic tire and includes a coil housing having an interior chamber with a coil disposed thereabout, which is aligned for receiving a magnet within the chamber [8].

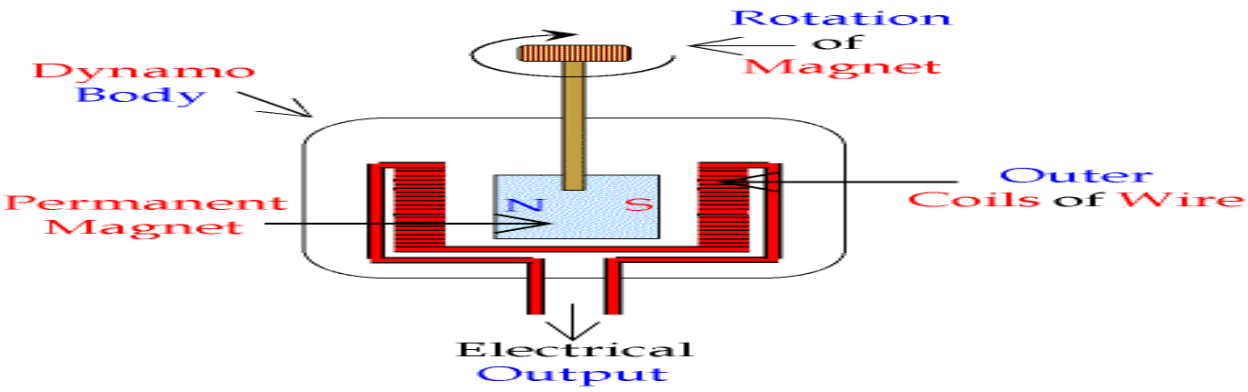

Fig.8. Basic Dynamo [9]

The magnet is mounted within a magnet housing which has a first end aligned for reception in the groove of the coil housing, and a second end in communication with the interior wall of a tire. As the tire rotates, the tire deflection causes relative motion between the magnet and the coil generating electricity. Wheel of vehicle; let it be a two wheeler vehicle consists of Axle and Tyre. Fit the two piece of magnet to the axle such that they rotate with rotation of wheel. The one end of wires is place between the magnets, the other ends of wire is attached to the battery for its charging. When magnet rotates it generate a moving magnetic field .This field cuts the conducting wires and by the principle of electromagnetic induction electric is generated [8].

This energy can be taken from all four wheels of a car so to get large amount of energy.

3.3 Using Motion

3.3.1 Using Human Motion

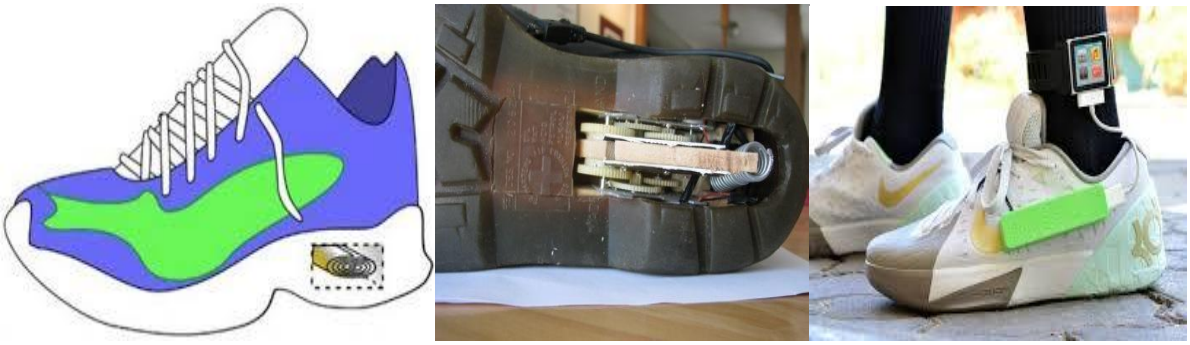

Fig.9. Converting Walking Energy into Electricity [10]

Walking is the best and common activity in day to day life. As per the study of biomechanics, we came to realize that ground reaction force (GRF) exerted from the foot, when converted into voltage gives enough power supply to run a device. While walking the person loses some energy from foot in the form of vibrations which are sensed and converted into electric form. Piezoelectric crystal does the work of generating output out of foot moment. Piezoelectric materials have the capability of absorbing mechanical energy from surroundings,

especially vibrations and transform it into electric energy that can be used as power supply in real time to other appliances like mobile phones, power banks, various small handy biomedical instruments etc [11].

3.3.2 Using Load on Steps

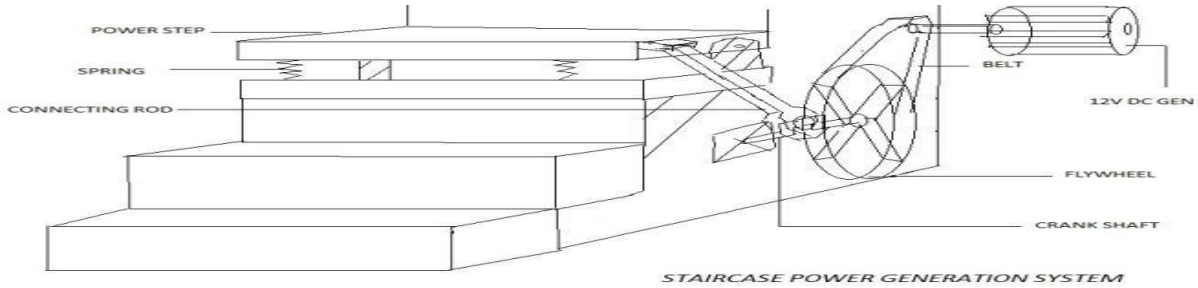

Fig.10. Power Steps [12]

Power step-setup will produce linear reciprocating motion on the power step. Here the reciprocating motion of the power step is converted into rotary motion using the crankshaft arrangement. A flywheel is used to produce rotary motion. The flywheel and the power step pedal are connected by means of connecting rod. The rotary motion of large flywheel is given to the small pulley by belt or chain. Hence the speed that is available at the flywheel is relatively multiplied by the rotation of the smaller pulley. This speed is sufficient to rotate the rotor of a 12V generator. The rotor which rotates within a static magnetic stator cuts the magnetic flux surrounding it, thus producing the electro motive force (emf). This generated emf is then sent to an inverter, where the generated emf is regulated. This regulated emf is now sent to the storage battery where it is stored. This current is then used for other purposes [12].

The generator converts the mechanical rotary motion into electrical energy.

3.3.3 Using Train Motion

In general, while entering into the railway station, the speed of the train is cut off at **FOUL MARK**. (It is a point, which is 1200 m away from the station). So the train will move only by its moment of inertia. The energy stored in the train cannot be fully recovered by regenerative braking. We are going to tap that wasteful energy and convert it into electrical energy (as shown in Fig.10.1).

This method can be easily understood from the following block diagram. The rotational energy is transferred from the train wheel to the static roller. Then the mechanical energy is stabilized by gearbox and it is fed to the dynamo or generator, which converts the mechanical energy into electrical energy. Then the electrical energy is saved in the battery [13].

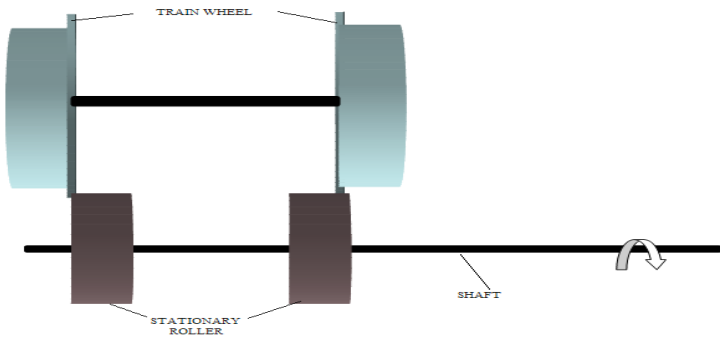

Fig.10.1. Converting Motion of Wheel [13]

Mathematically,

Speed -diameter relation is,

$V = \pi * D_1 * N_1$

$N_1 / N_2 = D_2 / D1$ (1)

Roller speed calculation

$N_2 = N_1 * D_1 / D_2$

$T = W * 9.81 * D_2$

$P = 2 * \pi * N_1 * T / 60$ (2)

Hence power can be calculated by it.

We can also fit a turbine on top of the train (shown in Fig.10.2) such that, when the train moves with an average speed, the wind turbine attached to it also rotates. The turbine should be placed in such a way that the wind strikes the blades. This gives the turbine a rotational movement. The turbine is placed along the path of the wind flow path that is mounted on the train, then the blade rotates and energy is generated. When the train moves, the turbine rotates and this rotational energy can be converted into electrical energy which provides power to the various loads such as fans and lights etc. We can also store the excess change in battery which can be used for further use [14].

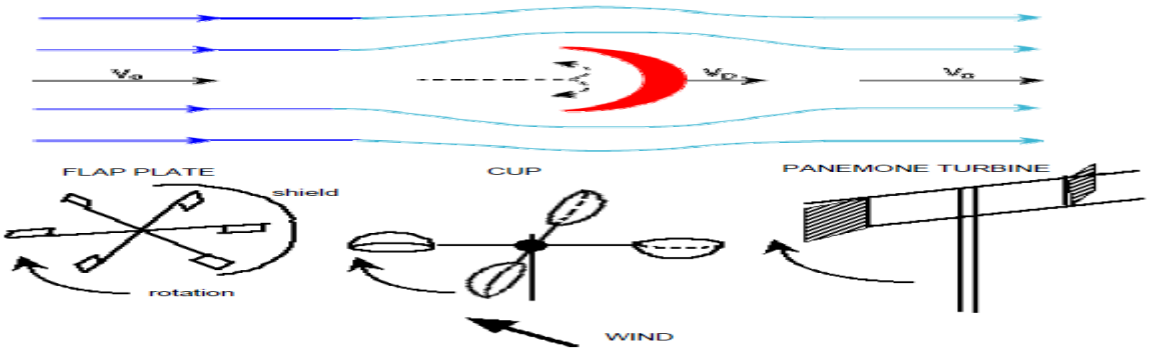

Fig.10.2. Electricity Generation by Turbine on Trains [14]

IV. ADVANTAGES & LIMITATIONS

4.1 For Solar

- Advantages of solar energy also include the ability to harness power in remote locations. This has proved a very important advantage of solar power in order to bring electricity to some of the most remote places on earth.
- A home solar power system can make a huge difference to mountain communities where it may be hard to construct power lines in order to reach such areas.
- Newer technologies have enabled us to store the solar electricity we harness though the use of solar power battery chargers. This is a huge advantage of why you should integrate solar power to influence your home power supply [15].

➢ The cost of installing solar panels is bit high.

➢ Houses which are covered by trees and landscapes and surrounded by huge buildings may not be suitable enough for installing a solar energy system.

- For big companies, a large area is required for the system to be efficient in providing electricity on a constant basis.
- Working in particular condition.

4.2 For Magnets

- Works in all types of weather conditions: Generally the wind and solar energy alternatives rely much on natural phenomena, but in case of a magnetic generator, the device would continue to perform well without depending upon weather conditions.
- Safer to use: Evidently, the user is concerned with safety of power generators, as it should be easy and safe to operate especially in houses.
- Fits in a small space: It is very easy to install an eco-friendly magnetic generator and it can fit even in a small, condensed place. Thus, these perpetual motion generators are ideally suited for houses.
- Breakdowns are possible.
- Limited electrical output.
- Expensive.

4.3 For Motion

- By increasing the gear ratio, we can get high electrical output. At that time, we can go for generators.
- Since we are going to charge the battery, so we do not worry about the continuous output.
- Heavy traffic cities like Chennai, Mumbai, Delhi, etc., This System can be easily adopted.
- Less and simple maintenance is required. Even a lineman can maintain easily. There is no impact on environment.
- Complexity is more.
- Chances of accidents.
- Installation cost is high.
- Maintenance is required.

V. CONCLUSION

The main Moto of this paper is to enlighten different ways of generating electricity and to save fuel for future. This paper shows how to generate the electric power without polluting our environment. The waste energy supplied by human is utilized in Human energy conversion method. This paper concludes that by shifting towards using Non-conventional Energy more will decrease the pollution and scarcity of the fossil fuels. While efforts are ongoing to improve overall system integration, the power densities and voltage levels are sufficient to power sensors, robotic devices, communication subsystems, and other portable electronics.

Hence using these ideas I conclude that it will take less time for making India a Smarter country.

REFERENCES

Journal Papers

[1] International Journal of Computer and Electrical Engineering, Vol. 2, No. 2, April, 2010 1793-8163 Solar-Rains-Wind-Lightning Energy Source Power Generation System Pijush Kanti Bhattacharjee, Member, IACSIT.

[2] IJEET review paper 2015 HYBRID VEHICLES Prince N. Bora princebora6@gmail.com Neeraj N. Joshi n33raj.joshi@gmail.com Priyanka V. Hire priyankavijayhire05@gmail.com Department of Mechanical Engineering Sandip Institute of Technology & Research Centre, Nashik, India.

News:

[3] Toyota Europe News (2013-07-03). "Worldwide Prius sales top 3-million mark; Prius family sales at 3.4 million". Green Car Congress. Retrieved 2013-07-03. "What is a Hybrid Vehicle?". What-is-what.com. Retrieved 2013-04-22.

Websites:

[4] Applications of solar energy, images, www.google.co.in.

[5] Electricity generation by fan and magnets, images, www.google.co.in.

Journal Papers:

[6] IEEE TRANSACTIONS ON MAGNETICS, VOL. 43, NO. 11, NOVEMBER 2007 Review of Micro scale Magnetic Power Generation David P. Arnold Department of Electrical and Computer Engineering, University of Florida, Gainesville, FL 32611-6200 USA.

[7] International Journal of Scientific and Research Publications, Volume 4, Issue 12, December 2014 ISSN 2250-3153 The Free Energy Generator Mayank Grover, B. Lohith Kumar, Isaac Ramalla.

Patents:

[8] Patent on Electrical power generating tire system US Patent number 6291901 B1.

Websites:

[9] Generating electricity using car tyres and magnets, images, www.google.co.in.

[10] Converting human motion into electricity, images, www.google.co.in.

Journal Papers:

[11] International Journal of Innovative Research in Science, Engineering and Technology(An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 2, February 2015 Copyright to IJIRSET DOI: 10.15680/IJIRSET.2015.0402049 225 Real Time Battery Charging System by Human Walking Phagna Esha Singh1, Siddhakar Bhumi2, Rami Monika3 U.G. Student, Department of Biomedical Engineering, Government Engineering College, Gandhinagar, Gujarat, India[1]U.G. Student, Department of Biomedical Engineering, Government Engineering College, Gandhinagar, Gujarat, India[2] U.G. Student, Department of Biomedical Engineering, Government Engineering College, Gandhinagar, Gujarat, India[3].

[12] International Journal of Innovative Research in Science, Engineering and TechnologyAn ISO 3297: 2007 Certified Organization, Volume 3, Special Issue 1, February 2014International Conference on Engineering Technology and Science-(ICETS'14)On 10th & 11th February Organized by Department of CIVIL, CSE, ECE, EEE, MECHNICAL Engg. and S&H of Muthayammal College of Engineering, Rasipuram,

Tamilnadu, India Copyright to IJIRSET www.ijirset.com 1200 Power Generation from Staircase(Steps) Ramesh Raja R1, Sherin Mathew2 UG Scholars, Department of Mechanical Engineering, RVS College of Engineering & Technology Dindigul, India1, 2.

[13] Train Wheel Electricity Generation S.Mukunthan IV-B.E, Department of EEE, IFET College of Engineering, Villupuram.

[14] International Journal of Conceptions on Electrical & Electronics Engineering Vol. 1, Issue. 2, December 2013; ISSN: 2345 – 960332 | 6 6 Production of electricity by using turbinemounted on train Neeraj Kumar, Venkatesh Kumar Sharma Dept. of EEE, Dr. MGR University, Chennai, India. {neerajsmarty123, venkateshbanti}@gmail.com.

Books:

[15] WBU LUBBOCK 801 N. QUAKER AVE. LUBBOCK TEXAS VOLUME 1, ISSUE 10 NOVEMBER 2012.