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"Foot Step Power Generation"

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A B S T R A C T :

Since the beginning of time, man has required and consumed energy at an accelerating rate for substance and well-being. As a result, numerous energy resources have been depleted and squandered.For densely populated nations like India, where train stations, temples, and other places are constantly packed, the idea of using the waste energy of foot power with human locomotion is particularly pertinent and significant.These days, one of the fundamental necessities in the modern world is energy and power.The demand for energy is rising daily. However, the numerous energy resources are being depleted and squandered.Millions of individuals travel around.All of this energy is squandered. It would be a fantastic invention if this energy could be used for something.We are transforming unconventional energy from simply walking footfalls into electrical energy in this project.Simple drive mechanisms like rack and pinion assemblies are used in this project.The rack and pinion, D.C. generator, gears, shafts, plates, and multimeter are all carried by the control mechanism to display output.We have spoken about the several uses and potential extensions.These days, non-conventional energy systems are crucial to our country.In order to generate electrical power, nonconventional energy using foot steps requires no fuel input power.This project uses a basic driving mechanism, such as a rack and pinion assembly mechanism, to generate power by using the force generated while walking on steps, which is then transformed into electrical energy with the aid of mechanical systems We have also spoken about its many other applications with extensions.Although the electricity generation is quite worthwhile, there are not many initial cost-effective factors.

Keywords:Multimeter,Mechanical Systems,D.C Generator, rack & pinion,shaft,gears and plates

INTRODUCTION

Finding alternative energy sources is necessary when traditional energy becomes less available.Almost all of our nation's state electricity departments struggle to meet demand for electricity deliveries.It is quite difficult to redirect the energy for other public purposes in such a dire circumstance, as the power generated by these corporations is not even enough for household utilities.Therefore, a different source needs to be found. A lot of people suggest solar energy, but it will be the most expensive option. In addition, solar energy is not very reliable because of its limited availability, especially during the winter and rainy seasons.Therefore, for a few applications, a different and less expensive approach must be found; as a result, this project effort, which aims to generate electricity from footsteps mechanism, has been undertaken.This technology is the ultimate source of all known types of energy among the several alternative energy resources that are discussed in this project report.It will be a very strong alternative in the days ahead as it is transparent, free, safe, and does not harm the environment.Because of the massive rise in the number of people, the strain that people's footsteps are putting on the area creates constant energy that may be stored and used to power the street lights.Transforming mechanical energy into electric energy is the idea here.Since he first appeared on the planet a few million years ago, man has required and consumed energy at an accelerating rate for his survival and well-being.

Food was the main source of energy for prehistoric man.He obtained this by consuming either plants or animals that he had hunted. As time went on, humans began to develop land for farming. By domesticating and educating animals to work for him, he added a new dimension to energy utilization.As the need for energy increased, man utilized the wind to propel windmills and sail ships, the force of falling water to turn water wheels, and the force of falling water to propel windmills with its force.Up until now, it would be accurate to state that man relied solely on renewable energy sources and that the sun provided all of his energy needs, either directly or indirectly.This entire human energy is being wasted; if it can be used, it would be a fantastic invention, and power-producing platforms would be highly helpful sources of energy in nations with high population densities.

1.1 TYPES OF ENERGY RESOURCES

1.1.1 CONVENTIONAL ENERGY SOURCES:

The term "primary energy sources" refers to sources that offer a net supply of energy, such as coal, oil, uranium, etc.These fuels take a lot less energy to obtain than what they can produce through nuclear reactions or combustion.There is a limited quantity of main fuel.Using these fuels sparingly becomes crucial. For instance, nuclear energy, coal, natural gas, and oil.

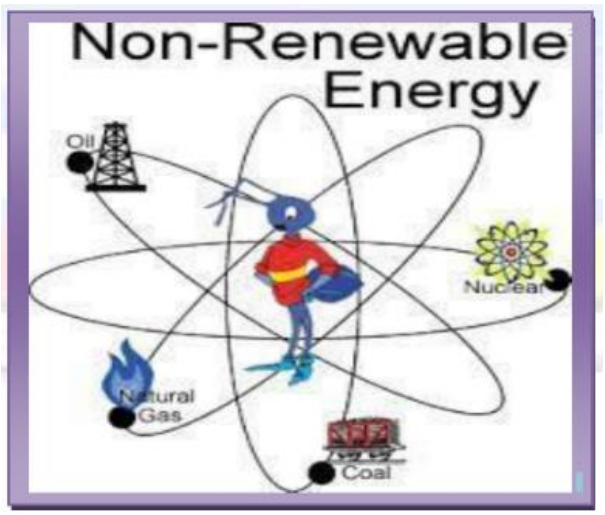


Fig 1.1 :- Non- Renewable Energy

1.2 ALTERNATIVE ENERGY SOURCES:

It refers to any energy source that can be used instead of fossil fuels.The purpose of these substitutes is to allay worries over these fossil fuels. Both the definition of an alternative energy source and the debates around its use have evolved significantly over time.These days, it is very contentious to classify some energy sources as "alternative" due to the wide range of energy options and the varying objectives of their proponents.In general, alternative energy is defined as energy that is generated or recovered without the negative effects that come with using fossil fuels, including significant carbon dioxide emissions, which are a major contributor to global warming.

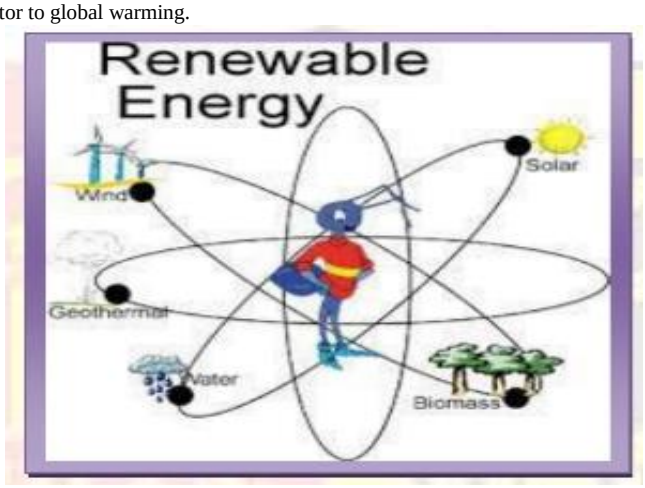


Fig-1.3.1 Renewable Energy

The issue that always arises in any nation is the requirement for unconventional energy sources or systems. The country is becoming more and more reliant on fossil fuels like coal, oil, and gas as a result of rising energy demand, which is why these systems are necessary. The future security of the energy supply is now questionable due to rising oil and gas prices and possible shortages, which has a major impact on the expansion of the national economy.The primary culprit is the growing usage of fossil fuels, which also has a negative impact on the environment. Therefore, using sustainable energy sources such as solar, wind, tidal, biomass, and energy from waste is essential.Since he first appeared on the planet a few million years ago, man has required and utilized energy at an accelerating rate for his survival and well-being.Food was the main source of energy for prehistoric man.He obtained this by consuming either plants or animals that he had hunted.Over time, humans began to develop land for agricultural purposes.Through the domestication and training of animals to serve man, he introduced a new aspect to energy utilization.As the need for energy increased, man utilized the wind to propel windmills and sail ships, the force of falling water to turn water wheels, and the force of falling water to propel windmills with its force.
As of right now, it would not be incorrect to state that man only uses renewable energy sources and that the sun provides all of his energy needs, either directly or indirectly.For an alternative approach to electricity generation, there are several ways to produce electricity; if these approaches are successful, footstep energy generation can be a useful technique.The most popular activity in human life is walking.Because his weight is transferred to the road surface by his footfalls on the ground with each stride, a person walking loses energy to the road surface in the form of impact, vibration, sound, etc. This energy can be captured and transformed into a form that can be used, like electricity.If installed in the walkway, this gadget has the ability to transform impact energy from feet into electrical energy. Since the beginning of time, humans have used walking, running, and swimming as forms of human-powered transportation.But because to current technology, human power can now be used more effectively thanks to machines. Using the strongest muscles in the body, pedal power has been used since the nineteenth century and is a great source of energy in this context. Approximately 95% of the

effort applied to pedal power is transformed into energy.Pedal power is an easy, affordable, and practical energy source that may be used for a variety of tasks. But human kinetic energy Now let us come to its some working principle, this device if embedded in footsteps of railway platforms, city malls, city footpaths etc. can convert the weight impact of people into electrical energy. When a pedestrian will step on the top plate of this device, the plate will go down and this downward motion results in rotation of the shaft of the alternator which produces electrical energy. After removal of force the top plate returns to its original position due to springs.

1.4 EXISTING SYSTEM

Although piezo-electric (mechanical-to-electrical) surfaces have been created by others in the past, the Crowd Farm has the ability to completely transform urban space by introducing a sense of fluidity and motivating people to move around locations.Although it is currently costly to construct, the Crowd Farm floor is made up of easily replicable standard elements.Railway stations, bus stands, subways, airports, sports fields with spectator areas, music halls, theaters, nightclubs, and a sizable gathering area for rallies, protests, and celebrations would all be made easier by this technology. One example is the ability to use human locomotion to generate electricity.

1.5 PROPOSED SYSTEM

In densely populated nations like China and India, where millions of people move around the clock and roads, train stations, bus stops, temples, etc. are all overcrowded, proposals for using the waste energy of foot power with human locomotion are highly pertinent and significant.Crowd energy farms will be very helpful energy sources in crowded countries, and if it is feasible to make use of this entire human/bio energy that is being wasted, it will be a tremendous idea.It will therefore be enjoyable for idlers to walk across a "Crowd Farm" floor, where they may exercise while earning money.Applications close by will benefit from the electrical energy produced at these farms.The primary requirement for human survival is the development of new sources of consistently affordable, ecologically acceptable electrical energy to replace the rapidly decreasing fossil fuel resources.Only roughly 25 years' worth of oil and 75-100 years' worth of coal reserves remain.Drought and decertification would occur from the use of coal in thermal electric stations to supply the people, which would cause a fundamental shift in the world.Nuclear power plants' buzzards are only too willing.Microwaves are being used to directly beam electricity to satellites in orbit.Even though several nations have been actively working on solar photovoltaic and solar thermoelectric energy sources, solar power stations (S.P.S.) offer a cost-effective answer. There are certain fundamental drawbacks to solar installations located on Earth.

2. OBJECTIVES

We are transforming mechanical energy into electrical energy in this project.Our goal is to find a practical application for the squandered energy.We are transforming the steps' to-and fro motion into the dynamo's rotational motion by employing a rack and pinion setup.In the first phase, we rotate the dynamo directly using a rack and pinion configuration.To increase efficiency, however, we use a gear mechanism in the second phase.Electrical energy is produced from rotational energy using a dynamo.Either the LEDs will glow or a multimeter will display the electrical energy output.In the prototype, the output power should be between 3 and 4 volts, or slightly higher.Based on the literature review of many articles mentioned above, we have made the decision to proceed with putting this initiative into action.Our goal is to use rack and pinion motion to build a footstep mechanism prototype for this purpose.

3. LITERATURE REVIEW

“ELECTRICITY GENERATION FROM FOOTSTEPS, A REGENERATIVE ENERGY RESOURCE” by Tom Josh V, Binoy Boban, Sijo MT,March 2013.

The author of these study papers created a model out of stainless steel, scrap aluminum, and automobile tires. It also has a lamp implanted in the pavement that turns on whenever a step is converted into energy (using just 5% of the generated energy).An average pavement square generates roughly 2.1 watts of power.Additionally, the author claims that 50,000 steps can be seen daily on a single square of pavement in an area with considerable foot activity.According to this research, a bus stop's lights may be kept on all night long using just five units of Pavegen pavement.

“POWER GENERATION FOOTSTEP” by Shiraz Afzal, Farrukh hafeez – April 2014.

This study focuses on creating electricity while people walk on the floor. If we can create a power generating floor that can generate 100W on just 12 steps, we can generate 1000W on 120 steps, and if we put such a system on 100 floors, it can generate 1 MegaWatt.Actually, just 11% of our primary energy comes from renewable sources.In addition to helping us solve the energy crisis, this project's implementation will help bring about positive environmental change on a worldwide scale.In this project, a flywheel is connected to a gear system that rotates the dynamo when a tile on the deck is pressed. The power generated is stored in batteries, and we can also monitor and regulate the quantity of electricity produced.

POWER GENERATION THROUGH STEP” by Vipin Kumar Yadav, Vivek Kumar Yadav, Rajat Kumar, and Ajay Yadav – May 2014. The following specifications were utilized by the writers of these research papers: 10 volts is the motor voltage. Type: D.C. Generator, RPM: 1000 rpm, Gear

1: Mild Steel, with 59 teeth for the big gear and 36 teeth for the tiny gearSpur gear type, number of gears used: two springs 1. Mild steel, load-bearing capacity: 60-90 kgTotal displacement:5 inch, Bearing 1: Shaft 1: Diameter: 15 mm; Material: mild steel; Type: ball bearing, bearing number N35 author stated that with these method energy conversion is easy efficient and pollution free.

"POWER GENERATION IN AUTOMOBIL SUSPENSION SYSTEM",by C. Nithiyeshkumar,K. Gowtham, M. Manikandan, P. Bharathkanna, T.Manoj Kumar–January2015.

The author of this study compared three footstep power generation techniquesthe gasoline piston, rack and pinion, and piezoelectric methodsand discovered that the rack and pinion mechanism is more effective while requiring a reasonable amount of upkeep and operation.

"GENERATION OF ELECTRICAL ENERGY FROM FOOT STEP USING RACK AND PINION MECHANISM" by Md.Azhar, Zitender Rajpurohit, Abdul Saif, Nalla Abhinay, P.Sai Chandu – June 2017.

The authors of this study employed a 500mA, regulated 5V power source.The 230/12V step down transformer's secondary ac output is rectified using a bridge type full wave rectifier.One kind of linear actuator that transforms rotational motion into linear motion is a rack and pinion, which consists of two gears.The rack's teeth are engaged by the "pinion."Since the power generation in this study uses footstep, it obtains its energy needs from non-renewable sources.This energy source is less polluting and does not require power from outside sources (mains).It is quite helpful for locations such as all roadways and foot traffic that is utilized to produce unconventional energy, such as electricity.

"ELECTRICAL POWER GENERATION USING FOOT STEP FOR URBAN AREA ENERGY APPLICATIONS" by Joydev Ghosh, Amit Saha, Samir Basak, Supratim Sen – January 2018.

As a first invention, the researchers in this study employed a single coil that produced 80 volts and 40 milliamperes of current. After rectifying the AC, the second invention's 95 volts and 50 milliamperes of electricity can be utilized to illuminate an LED array, run a DC fan, or charge batteries.They installed a powerful magnet vertically in the second gear's axil for maximum efficiency, so that when the gear rotates as a result of the weight of the human body, the magnet likewise rotates.The magnet is inserted into a copper coil of the loop variety.There will be an induced electromagnetic field (emf) in the coil when the magnet begins to rotate in accordance with Faraday's law of electromagnetic induction.

"POWER GENERATION FROM STEPS" by Ramesh Raja R, Sherin Mathew – July 2018.

This study aims to demonstrate how energy can be captured and utilized at a typical floor step.Given that even tiny buildings include levels, the number of stairs used in buildings is growing daily.The loss of heat and friction during floor walking wastes a significant amount of energy each time a man ascends stairs.By turning each staircase into a power producing unit, there is a tremendous chance to harness this energy and produce electricity. Batteries can be utilized to store the generated power, which will be used to weaken the structure.

4. PROJECT METHODOLOGY

The electric power is produced using the footstep arrangement.The footstep arrangement is used to create electrical power in order to compensate for the rising demand for electric power in the modern world. This configuration transforms mechanical energy into electrical energy.

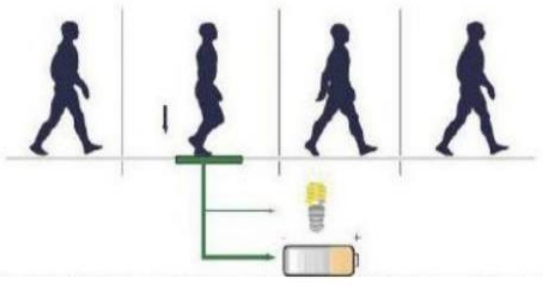


Fig 3.0 Schematic Representation Of Foot Step

4.1 WORKING AND BASIC PRINCIPLE

The shaft of an electrical generator installed in the apparatus rotates as a result of the plate's downward movement, producing electrical energy. Because the mechanism has negating springs, the top plate returns to its initial position.The upper plate is supported by four springs, and with the right control unit, the weight impact is transformed into electrical power.Beneath the foot step, which is fastened to the base, is the spring and rack and pinion mechanism.After the load is released, the upper plate is returned using a spring system.This belt and pulley combination helps rotate the DC generator

Lightning LEDs are attached to the DC generator's terminal.The footstep power generating diagram in its entirety can be found below. The power is generated by inclining only one step at a specific tiny angle.With the right driving arrangement, the pushing power is transformed into electrical energy.

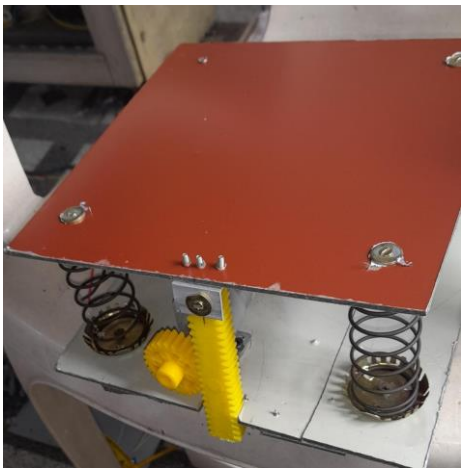


Fig.4.1 Model Structure

4.2 SYSTEM BLOCK DIAGRAM

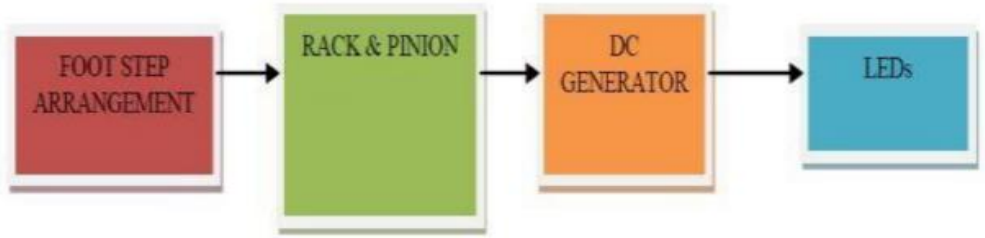
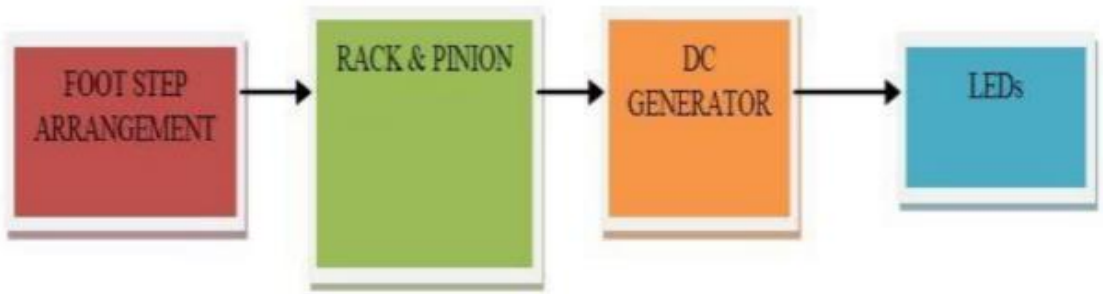


Fig.4.2 Block Diagram

4.3 WORKING:

Foot Step's entire fake model image is seen above.The upper plate is supported by four springs, and with the right control unit, the weight impact is transformed into electrical power.Beneath the foot step, which is fastened to the base, is the spring and rack and pinion mechanism. After the load is released, the upper plate is returned using a spring system. There is other equipment available. The shaft is connected to a gear. The dynamic is connected to the gear wheel that is part of the shaft. This dynamo has a 12V capacity.The wires are removed from the dynamo. To display the output power, these cables are linked to LEDs.A 12V permanent magnet DC generator is the one being used here.Lightning LEDs are attached to the DC generator's terminal.The rack and pinion arrangement is directly linked to the first step's footsteps.LEDs are connected to a dynamo that is supplied to the pinion shaft. Electrical energy is thus produced from mechanical energy.



With the help of block diagram as shown in Fig. 4.3, the working procedure is explained in step by step manner as follows

Step 1: When force is applied on the plate by virtue on stamping on the plate the force spring gets compressed.

Step 2: Due to this the rack moves vertically down.

Step 3: The pinion meshed with the rack gear results in circular motion of the pinion gear.

Step 4: For one full compression the pinion Moves one semicircle, when the force applied on the plate released the pinion reverses and moves another semi- circle.

Step 5: The generator attached to the intermediate will obtain the rotating motion, hence results in the sinusoidal waveform (for single Generator).

Step 6: The obtained voltage is passed through Ac neutralizer in order to reduce the ripples that are produced due to uneven motion of generator.

Step 7: From here the power is stored directly in battery.

Step 8: Now the voltage obtained is used for small applications.

4.4 COMPONENTS USED:

The footstep arrangement is used to generate the electric power. Now a day's power demand is increased, so the footstep arrangement is used to generate the electrical power in order to compensate the electric power demand.
In this arrangement the mechanical energy is converted into electrical energy. This section is constructed by of rubber or other material which is placed within the surface areas. This section is mainly placed in the crowed areas. This footstep arrangement is attached with spring section.

Footstep section consists of:

- Springs.
- Foot – step.
- Rack and Pinion section.
- DC Generator.
- Led or Multimeter.

The spring system and rack and pinion are fixed at the angled step.The spring is used to release the load and return the inclined step to its initial position. The shaft, which is attached to the DC generator, is connected to the gearwheel arrangement. The LEDs and batteries are linked to the DC generator.

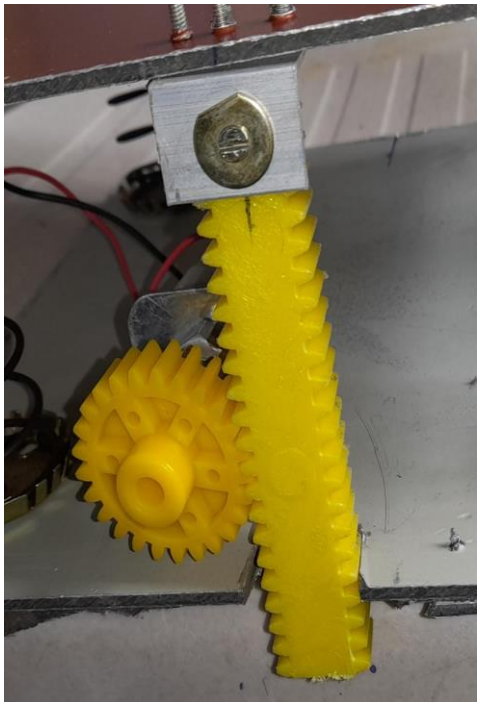


Fig 4.4 Spring Fig.4.5 Rack & pinion attachment

Fig.4.6 DC Generator

5. NEED OF THIS TYPE OF SYSTEM

- In densely populated nations like China and India, where millions of people move around the clock and roads, train stations, bus depots, etc. are constantly congested, proposals for using waste energy of foot power with human locomotion are highly pertinent and significant.
- The rise in the level of living, which is directly correlated with energy use.
- Converting a population's lost kinetic energy into electrical energy that can be used.
- Cutting back on the use of non-renewable resources that are on the verge of going extinct.
- Making technology more user-friendly so that even the average person can utilize it.
- Sustaining and expanding a continuous provision for electricity generation.
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CONCLUSION

The "FOOT STEP POWER GENERATION MECHANISM" project work has been successfully conceived and developed. A prototype module with lower device ratings has been built for demonstration purposes, and the results are good.The concept is close to the actual operating system, but since it is a demo module, it cannot be utilized for realworld applications. To make it more realistic, a higher rated power generator with an appropriate gear mechanism is necessary to generate more energy.This idea is within the category of nonconventional energy resources. Solar energy is one of the most reliable sources of alternative energy, but it is also the most expensive. Therefore, producing power from foot traffic is an alternate and less expensive source.This technique has been shown to be the most cost-effective source of energy of any kind.Practically speaking, each footstep may generate tens of kilowatts of power each day, depending on the size and traffic flow. This power can be used for a variety of purposes.We can create effective, practical electricity for a variety of uses if we employ this project at the crowded Stair Palace.The fact that this technique does not pollute the environment is a significant benefit of energy production.As a result, all of a city's street lights can be turned on simply using this technology to change these foot steps.

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