INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume3, Issue6)
Available online at www.ijariit.com

Study on Solar Roadway

Varsha Dadasaheb Shingate
Dnyanshree Institute of Engineering and Technology, Sajjangad, Satara, Maharashtra
varshashingate93@gmail.com

Rohit Wangade
Dnyanshree Institute of Engineering and Technology, Sajjangad, Satara, Maharashtra
rohit_wangade@yahoo.com

Ajitkumar Manedeshmukh
Dnyanshree Institute of Engineering and Technology, Sajjangad, Satara, Maharashtra
ajit.am37@gmail.com

Abstract**: Solar energy has been the subject of great development in the past years, which led to the concept of Solar Roads. The solar roadway is a series of the structurally engineered solar panel that is driven upon. Solar roadway means the use of solar panel in road pavement. It also means replace current petroleum based asphalt road with a solar panel. A Solar roadway is a road surface that generates electricity by solar power using Photovoltaic and includes solar panels and LED signage, that can be drive on. Solar is a renewable source. Solar power generation has emerged as one of the most rapidly growing renewable sources of electricity solar power generation has other advantages over another form of electricity generation. The day by day the price of petroleum products are getting huge hike & resources are very less there will be no longer feasible material such as asphalt for our road surfaces. When Solar Road Panels are refurnished, the solar cells will be upgraded to the newest technology, which will allow keeping up with population growth and increased energy needs. Now a day the human beings are looking for the answers to our deteriorating highway infrastructure, our crumbling power grid, and the climate crisis. For all such questions, the answer is "SOLAR ROADWAYS". Solar power production generates electricity with a limited impact on the environment as compared to other forms of electricity. The solar roadways are eco-friendly, feasible & reduce the 70%accident.

Keywords:** Solar Roadway, Renewable Source, Asphalt, Eco-friendly etc.

I. INTRODUCTION

The ultimate goal is to store excess energy in or along-side the Solar Roadways. This renewable energy replaces the need for the current fossil fuels used for the generation of electricity. This, in turn, reduces the greenhouse gases by half. The Solar Roadways system would might, at present, cost about three times what it costs to install an asphalt road, but would be more durable more easily replaced in a modular fashion, and able to pay for itself by generating more electricity than our economy can consume. At just 15% efficiency, far below what is expected, a 100% Solar Roadways enabled driving infrastructure would produce three times total electricity demand. There are additional benefits as well, which is a built-in smart grid, major new investment, and job creation, the economic benefits inherent in global leadership in building the most advanced clean energy infrastructure every dollar invested in renewable sources, ultimately generates returns, because the resource is not burned and lost. The roadways can also communicate with drivers, alerting drivers with visual messages to the presence of pedestrians in a crosswalk. The most important element of the Solar Roadways technology is that its power-generation capacity demonstrates the base load viability of renewable energy sources. Clean energy technology existence can power the entire countries economy and more. But the required is a commitment to major investment and incentives in building the infrastructure. If up-gradation is done with this technology, we can create jobs, and a clean energy boom, spurring private investment on a massive scale, with relatively little extra cost. A solar roadway is a road surface that generates electricity by solar power photovoltaic cells. One current proposal is for 12 ft x 12 ft

(3.658 m x 3.658 m) panels including solar panels and LED signage that can be driven on. The concept involves replacing highways, roads, parking lots, driveways, and sidewalks with such a system.

Figure 1: Solar Roadway

II. WORKING PRINCIPLE

A solar roadway is a series of structurally engineered solar panels that are driven upon. The idea is to replace current petroleum-based asphalt roads, parking lots, and driveways with solar road panels that collect energy to be used by homes and businesses, and ultimately to be able to store excess energy in or alongside the solar roadways. Thus renewable energy replaces the need for the current fossil fuels used for the generation of electricity, which cuts greenhouse gases and helps in sustainable development. Parking lots, driveways, and eventually highways are all targets for the panels. If the entire United States Interstate Highway system were surfaced with Solar Roadways panels, it would produce more than three times the amount of electricity.

III. SPECIFICATIONS

The structural design requirements for a solar road panel are as the structure must be able to support the cyclic distributed load from vehicle tires without failing through deformation, fracture, or other means; it is expected that 480kPa is a typical design stress requirement from tires contacting the panel. The transparent layer cannot deflect over the cell compartments so much that the layer transmits the load to the solar cells. The structure must be corrosion resistant to salts and other potential contaminants. The design must be modular and facilitate easy maintenance. For this prototype's purposes, the panel must be made out of readily available components and materials. To accommodate construction, testing, and the measurement units of available components, the designed panel should have 0.91 m (3 ft) side lengths and be of sufficient thickness to satisfy the other requirements. The weight of the panel must be low enough so that two people can manoeuvre it for testing and installation purposes.

IV. ROAD SURFACE

Electrical Design Requirements are the panel should be designed so that no shading of the solar cells occurs. The interconnection between the cells should be strong enough to withstand potential deflections from the optical layer. The panel must be weatherproof so that water and other contaminants are not able to interfere with the electronics. There must be a diode installed on the output electrical line of the panel to block reverse currents, as this would damage the solar cells within the panel.

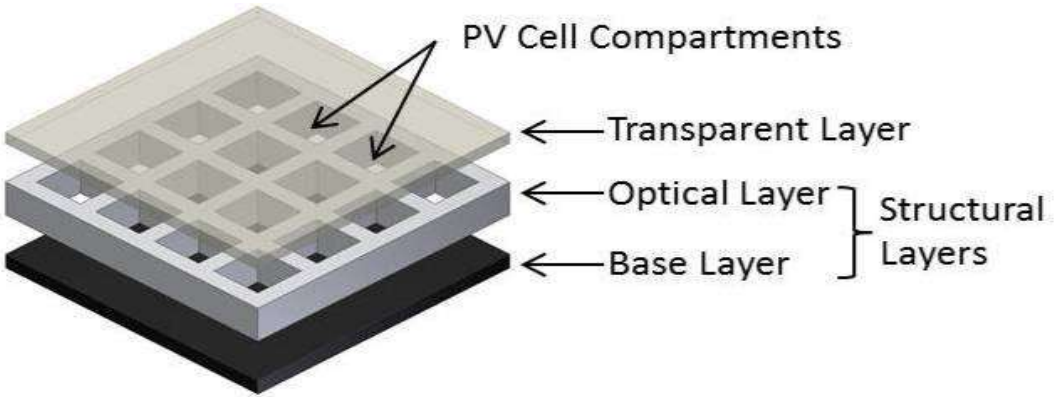

Figure 2: Construction of Solar Roadway

Road Surface Layer: This is the top most layers of the assembly & also from this layer the solar rays will reach up-to the photovoltaic cells; they should be translucent and high-strength. Also, this is made in such a fashion that it is rough enough to provide great traction to avoid the skidding of vehicles. The material is made rough but the material used is translucent, it still passes sunlight through it to the solar collector photovoltaic cells embedded within it, along with LEDs & a heating element. And it is tough enough for handling today's heaviest loads under the worst conditions and it is made water-proof so that it can prevent electronics layer beneath it.

Figure 3: Road Surface Layer

Electronics Layer Contains a microprocessor board with support circuitry for sensing loads on the surface and controlling a heating element. By implementing this technology no more snow/ice removal and no more school/business closings due to inclement weather in the snow falling regions.The on-board microprocessor controls lighting, communications, monitoring, etc. which are fitted at every 12 feet distance; which can prove the Solar Roadways as an "Intelligent Highway System". While the electronics layer collects energy from the sun, it is the base plate layer that distributes power (collected from the electronics layer) and data signals (phone, TV, internet, etc.) "down-line" to all homes and businesses connected to the Solar Roadway.

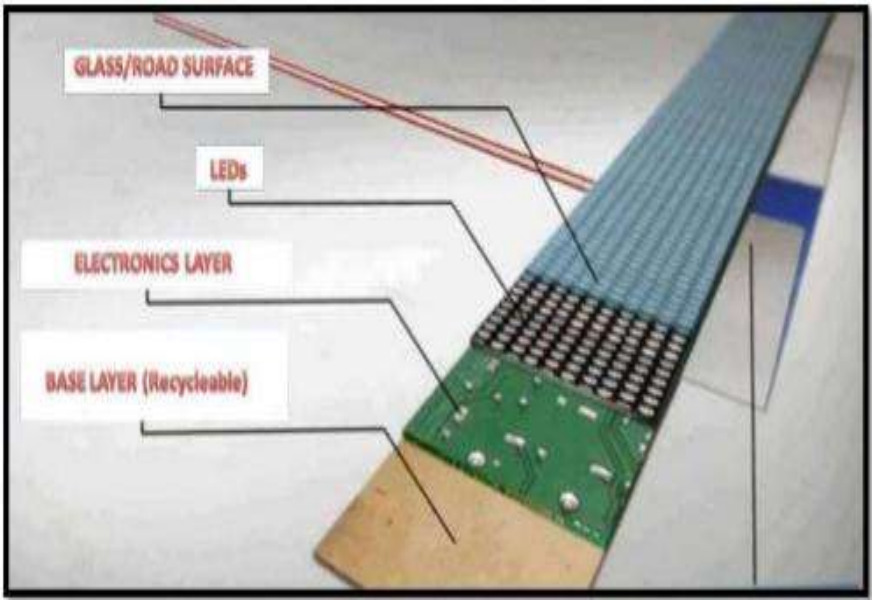

Figure 4: Construction Layers Solar Roadway

In order for solar roadways to be successful, the three parts need to be working in unison. The road surface layer needs to be clear enough to let the sunlight pass through to the electronics layer, the electronics layer needs to collect energy and keep the road functioning properly, and the baseplate layer needs to determine where the energy is supposed to go. Due to the fact that the road lines on solar roadways are actually LEDs, the baseplate layer needs to ensure the roadway has enough energy needed before sending the rest of the energy out toward. A transparent surface made of textured glass that vehicles are driving on, optical layer to transmit the load around the solar cells, and a base to further transmit the load to a pavement, us subgrade, or base structure.

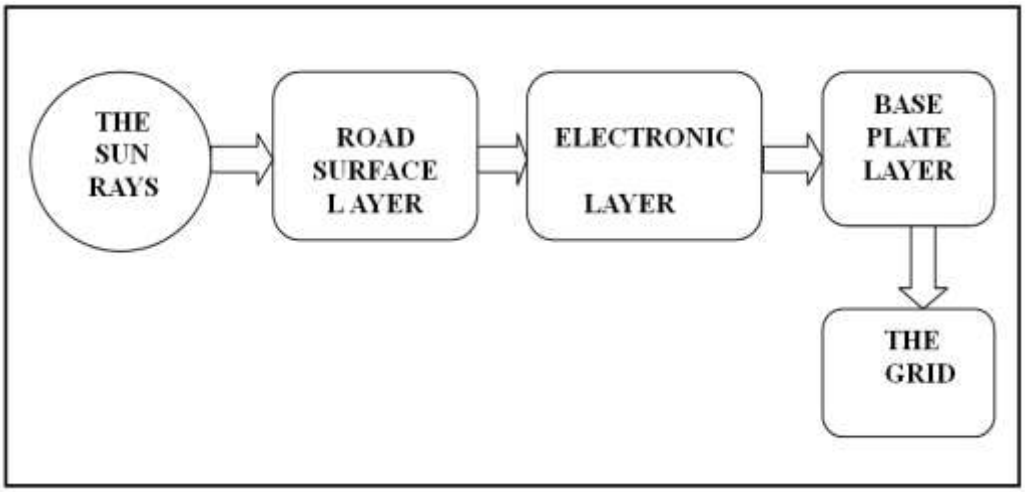

Figure 5: Path of Energy in Solar Roadways

V. ADVANTAGES

Renewability & Life span: The main advantage of the solar roadway concept is that it utilizes a renewable source of energy to produce electricity. It has the potential to reduce dependence on conventional sources of energy such as coal, petroleum and other fossil fuels. Also, the life span of the solar panels is around 20 years, much greater than normal asphalt roads, which only last 7–12 years. Military & Rescue assistance: In the event of an environmental disaster or military emergency, solar roadways would provide power when it is needed most. As solar power is renewable, it obviously requires no external connection to an artificial power source. Lighting up of roads: By adding LEDs beneath the transparent panel, the road can be lightened up for safe night travel and aesthetic look.

Figure 6: Solar Roadways at Night Time on the Curved Road.

Figure 7: LED in Solar Roads

CONCLUSION

The Solar Roadways can be implemented roughly the same cost of the current systems (asphalt roads and fossil fuel burning electricity generation plants).No more Global Warming. No more power outages (roaming or otherwise). The Safer driving conditions & 70% reduces the accidents. Solar roadways are non polluted or less polluted. The new secure highway infrastructure which pays's for itself. The decentralized, self-healing, secure power grid. No more dependency on foreign oil. Also, solar roadways are ecofriendly. Solar roads are feasible.

REFERENCES

1 Alark A. Kulkarni, "*Solar Roadways" – Rebuilding our Infrastructure & Economy*, IJERA (May 2013) Vol. 3, Issue 3, May-Jun 2013, pp.1429-1436.

2 Er. Rajeev Ranjan, *Solar Power Roads: Revitalizing Solar Highway Electrical Power and Smart Grid,* International Journal of Engineering Research and General Science Volume 3, Issue 1, January-February, 2015 ISSN 2091-2730.

3 Adelino Jorge Lopes Ferreira*, "Recent developments in pavement energy harvest systems",* Proceedings of the ICE-Municipal Engineer, Volume 165, Issue 4, 01 December 2012, Pg. 189 –192.

4 Northmore & S. Tighe, "*Innovative Design: Are Solar Roads feasible"*

