iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 **Issue:** XII **Month of publication:** December 2016

DOI:

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)

A Study On Roads Using Solar Energy

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Abstract— A solar roadways is a series of structurally engineered solar panels that are drive on. This paper provides information about solar roads. These solar roads work on solar energy. Solar roadways use solar panels, photovoltaic effect, LEDs and microprocessor chips. In this paper, solar roads are discussed in brief. The advantages and disadvantages of solar roads are also discussed in this paper. At end the study has been summarized.
Keywords: solar, roads, renewable, LEDs, panels

I. INTRODUCTION

Solar energy is an important source of renewable energy. Solar roadways consist of structurally designed solar panels. Each solar road panel interlinks with neighbouring panel to form solar roadways system. The solar roadway replaces petroleum-based asphalt highway infrastructure with an intelligent road that pays for itself through the generation of electricity.

II. SOLAR PANELS

The solar panels are divided into three basic layers:-

A. Road surface layer

This is the top most layers of the assembly. This layer is used to capture solar rays. These rays will reach the photovoltaic cells. This layer should be translucent and high in strength. At the same time, this layer should provide enough friction. This friction avoids skidding of vehicles. Also, it should be waterproof so that it can protect electronics layer beneath it.

B. Electronics Layer

Electronics layer contains microprocessor with support circuits for sensing loads on the surface and controlling a heating element. It helps in implementing the technology where no more snow/ice removal is required. The on-board microprocessor controls lighting, communications, monitoring, etc. which are fitted at definite intervals.

C. Base Plate Layer

As the electronics layer collects energy from the sun, it is transmitted to the base plate layer which distributes power (collected from the electronics layer) and data signals (phone, TV, internet, etc.). The base layer is made weatherproof so that it can provide the electronic layer above it.

III. SOLAR ROADS AS INTELLIGENT HIGHWAYS

The solar roadway is an intelligent road system that utilizes energy which is clean and renewable [1]. The solar roadway will pay for itself through the generation of electricity along with other forms of revenue. The cost that spent to construct and maintain asphalt roads can be used to build the solar roadways.

IV. SOLAR ROADS AS ILLUMINATED ROADS

Many people face the problem of low vision during night as they face the trouble in obeserving the road lines at night. This problem is prominent when the oncoming headlights are blinding on them. The problem becomes still worst when it's raining at night. By implementation of these illuminated roads, which are based on solar energy one can overcome this problem & also number of accidents at night will reduced. Hence, the night driving will be safer for all.

The LEDs can also be incorporated to move along with cars at the speed limit. These LEDs will give warning to drivers instantly when they are driving too fast or the speed of the car increases beyond the speed limit. These LEDs will also be used to paint words right into the road; it gives warning to drivers if an animal arrives on the road, an accident, or construction work. It is shown in Figure 1.

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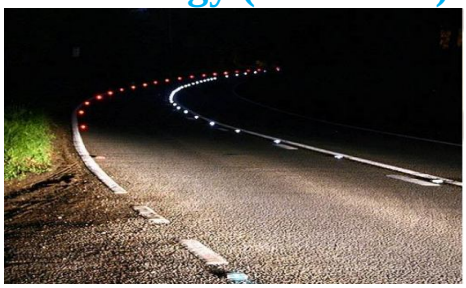


Figure 1: Illuminated solar road [1]

V. OIL INDEPENDENCY OF SOLAR ROADS

In absence of fossil fuel, how many people can the world support? Our planet's current population is now approaching 7 billion people. So again, what will happen when the world runs out of oil? Solar roads are fuel independent. They require only sunshine for producing electricity.

A. Electric Vehicles

Electric cars have been around since long time. They have been never very practical, due to the fact that they have to be recharged. There is no sufficient infrastructure for that. The Solar Roadways allow electric cars to recharge at any rest stop or business places that have a parking lots made up of Solar Road Panels. Drivers can recharge their vehicles while eating at a restaurant or shopping at a mall.

VI. ADVANTAGES & DISADVANTAGES OF SOLAR ROADS

Following advantages and disadvantages are summarized for solar roads:

A. Advantages

1) The main advantage of the solar roadway is that it utilize a renewable source of energy to produce electricity.
2) Advantage of the solar roadway is that it does not require the development of unused and potentially environmentally sensitive lands.
3) With induction plating embedded inside these roads, all electric cars can be recharged while in motion on top of these roads. This would reduce the costs and the time-inconvenience to wait at a charging station.

B. Disadvantages

In spite of above mentioned advantages, solar roadway has following disadvantages:

1) Initial cost of construction and maintenance such roadways may be extremely high.
2) The average efficiency of solar panels is still a matter of concern.
3) Road surfaces also accumulate rubber, salt, etc., which block sunlight. Hence, these roads need frequent cleaning and maintenance.
4) These may not work properly in rainy season as poor sunlight is available during day time.

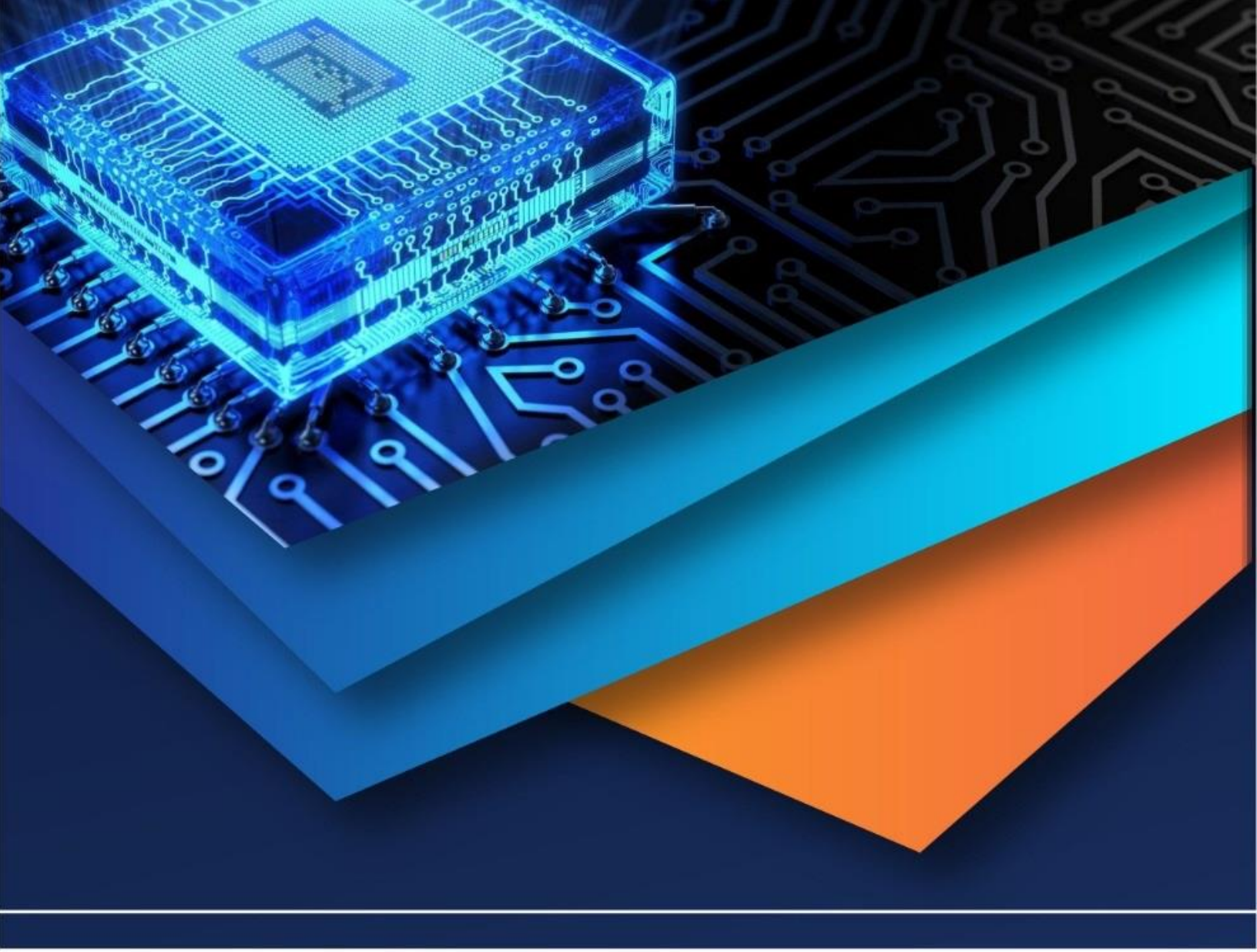
VII. CONCLUSIONS

The solar panel road panels can make a major environmental as well as social difference in India. They can offer new major source of clean energy which on its own will greatly impact the climate in a positive way. Smart roads can also optimize traffic so that work productivity is not lost, fuel is preserved and many accidents are avoided. These panels may be a large investment initially, without a doubt, but the will pay off in the long term, not only financially but environmentally as well.

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