

A Review on Solar Roadways

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ABSTRACT:

The solar Roadways can save the world from energy crisis and climate change. The day by 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". An intelligent highway infrastructure and a self-healing decentralized power grid will eliminate our need for fossil fuels and also it will lead to less investment in antiquated technology and overhead power lines. As 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 refurbished, the solar cells will be upgraded to newest technology, which will allow keeping up with population growth and increased energy needs. Our idea is to increase awareness and to step on further work and further development of the concept of Solar Road technologies, developed by Solar Roadways. The proposed work of review of solar energy system and it require the development of strong, transparent, and self-cleaning glass that has the necessary traction and impact-resistance properties.

KEYWORDS: Global Warming, Solar Panels, Solar Roadways, Power Generation, Much Less Pollution, Eliminating Fossil Fuel

1 INTRODUCTION

Limitation of petrol, diesel and other fossil fuels in nature will create a resource crisis in near future. It's hazardous pollution and global warming is creating severe environment problem even for the survival of human. This has attracted attention all around the world and alternative resources and technologies are

becoming significant today. Solar energy collected from radiant light and heat from sun had given a range of ever-evolving technologies such as solar voltaic, solar heating, solar thermal energy, solar architecture, satellite based solar power plant and artificial photosynthesis.



Figure 1 Solar Highways

The concept of solar roadways is to replace the all traditional fuel driven power generation system by

using solar energy plates providing eco-friendly environment and an ultimate infrastructure to meet

the energy challenges. The Solar Roadways consists of structurally engineered solar panels that we drive on. Each Solar Road Panel interlinks with neighbouring panels to form the Solar Roadways system. The Solar Roadway replaces the traditional crumbling petroleum-based asphalt highway infrastructure with an intelligent road that pays for itself through the generation of electricity. The Solar Roadway generates electrical power from the sun and gives decentralized power, intelligent and self-healing power grid, replacing our current deteriorating power distribution infrastructure.

2 WORKING PRINCIPLE

The solar panels are divided into three basic layers:-

- (a) Road Surface Layer.
- (b) Electronics Layer.
- (c) Base Plate Layer.

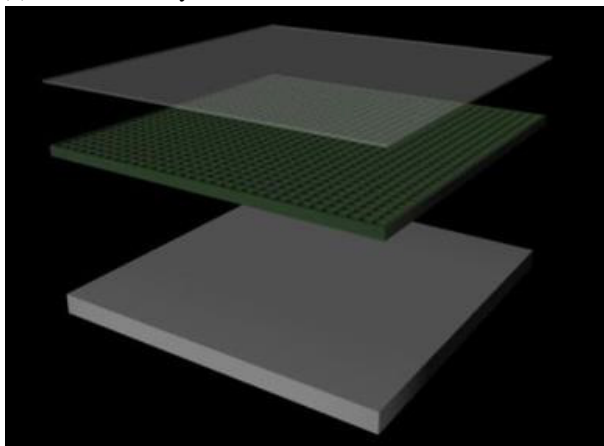


Figure 2 Layers of solar panels

(a) Road Surface Layer

As this is the top most layers of the assembly and also from this layer the solar rays will reach up-to the photovoltaic cells; they should be translucent and should have very 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. As 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 and 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.

(b) Electronics 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 there will be no more snow or ice removal problem due to inclement weather in the snow falling regions. A recent study shows that the solar-road studs to light-up the lines of roads during night time in an area of England, which has reduced night time accidents by 70%. The LEDs will also be used to paint words right into the road, it gives warning to drivers if an animal arrives on the road, a detour ahead, an accident or construction work. Central control stations will be able to instantly customize the lines and words in real time, alleviating traffic congestion and making the roads more efficient. The on-board microprocessor controls lighting, communications, monitoring, etc. which are fitted at every 12 feet distance makes the Solar Roadways as an "Intelligent Highway System".

(c) Base Plate Layer

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. The base layer is made weatherproof so that it can provide the electronic layer above it.



Figure 3 Hexagonal solar panel

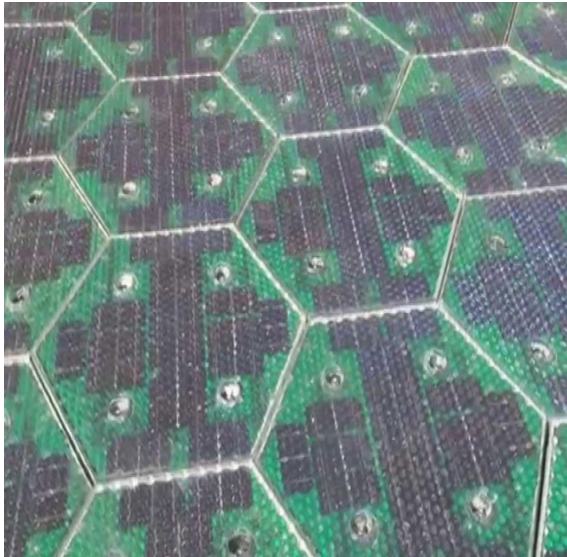


Figure 4 Electronic arrangements in solar panel

3 SOME APPLICATIONS

1. ILLUMINATED ROADS

Accidents drastically reduced unlike the dark roads we drive on by night today, the Solar Roadways will have LEDs which will "paint" the lanes, and can be instantly customized as needed. Many people face the problem during the night driving as they face the trouble seeing the road lines at night, particularly when the oncoming headlights are blinding them or when it's raining. By implementation of these illuminated roads, the country can overcome from this problem & also accidents at night time will get reduced henceforth the night-time driving will be safer for all.

2. ELECTRIC VEHICLES

Since the Solar Roadway creates and carries clean renewable electricity, EVs can be recharged at any conveniently located rest stop, or at any business places that incorporates Solar Roadways Panels in their parking lots for. Owners can plug-in their cars in and recharge while they're eating or shopping. Engineers are even investigating ways to use mutual induction to charge EVs while they are driving down the Solar Roadway. By the way using electric cars would eliminate most of the other half of the cause of global warming and could virtually wean the world off oil entirely.

3. SMART GRID

The Solar Roadways replaces all current centralized power stations including coal and nuclear-powered electricity generation plants. With the Solar Roadway, the road becomes the power grid, eliminating the need for unsightly utility poles and relay stations. Power is generated everywhere - every road, parking lot and driveway. No more power outages, roaming or otherwise. The Solar Roadways generates "secure" energy; it can't be deliberately shut down. Not by terrorists, not by power companies, it simply can't be shut down. A smart grid would be more automated and more "self-healing," and so less prone to failures. It would be more tolerant of small-scale, variable power sources such as solar panels and wind turbines, in part because it would even out fluctuations by storing energy.

4 CHALLENGES

In spite of these advantages, initially, the start up and maintenance costs of building such roadways and parking lots may be extremely high. (However, advances in this technology will (hopefully) cause the costs to fall.) Another issue to deal with is the efficiency of solar panels. The average efficiency is currently a matter of concern. Another disadvantage is that it cannot be constructed in the poorest developing nations due to the high initial start-up costs. Road surfaces also accumulate rubber, salt, etc., which block sunlight. Salt might be easy to wash off, but not rubber. It would also be quite costly.

Solar roadways may not be feasible and economical as its initial and installation cost may be three times more compared to our conventional roads, but if this is evaluated as a long term investment this may prove to be much more economical as it pays back.

5 CONCLUSION

Solar Roadways has taken the first step to creating the world's largest solar panel: The Company uses tempered glass and photovoltaic cells to create intelligent, energy-harvesting pavement, complete with built-in heating elements for melting ice and LEDs for signage. The technology is still in its infancy, but with funding from the Federal Highway Administration and an Indiegogo campaign, the company finished a prototype parking lot in Idaho

last year. Solar Roadway has released the first pictures of their new Solar Roadways prototype parking lot. Initial installation is complete, with some additions still to come (i.e., covers for mounting holes, mastic between panels, software for LED patterns). The parking lot is fully functional with solar cells, LED's, heating elements, and the textured glass surface. The prototype results show the significance of solar power roads uniquely. However installation cost is very high this new technology is capable of replacing the costly fossil fuel system and can give us clean energy without any climate change.

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