

Solar Roadways: An Effort to Make Safe and Smart Highways

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Abstract: A solar roadway is a road surface that generates electricity by solar panels and LED signage that can be driven on. It generates electricity by solar power photovoltaic cells. Each solar road panel (roughly 3.658m x 3.658 m) interlinks with neighbouring panels to form the solar roadways system. This concept is used to replace highways, roads, parking lots, driveways and sidewalks with such system. The energy generated by solar road panels will replace the current need of fossil fuel with little extra cost.

Keywords: Solar panels, solar roadways, photovoltaic cells.

1. INTRODUCTION

Solar roadways is a modular paving system of solar panels that can withstand the heaviest of trucks. These solar panels can be installed on roads, parking lots, driveways, sidewalks, bike paths, playgrounds, literally any surface under the sun. They pay for themselves primarily through the generation of electricity which can power homes and businesses connected via the driveways and parking lots.

They have many other features such as heating elements to stay ice free, LEDs to make road lines and signage and attached cable to store and treat storm water. A layer of embedded LEDs will be used to create traffic warning or crosswalks and excess electricity could be used to charge electric vehicles into the power grid.



Figure 1: Solar roadways
Source: [www. google.com](http://www.google.com)

2. ANALYSIS AND DISCUSSION

A solar roadway is a series of structurally engineered solar panels that are driven upon. The idea behind this is to replace petroleum based driveways with solar road panels

that collect energy to be used by homes and businesses and able to store excess energy alongside the solar roadways. The renewable energy replaces the need for the current fossil fuels used for the generation of electricity which cuts green house gases.

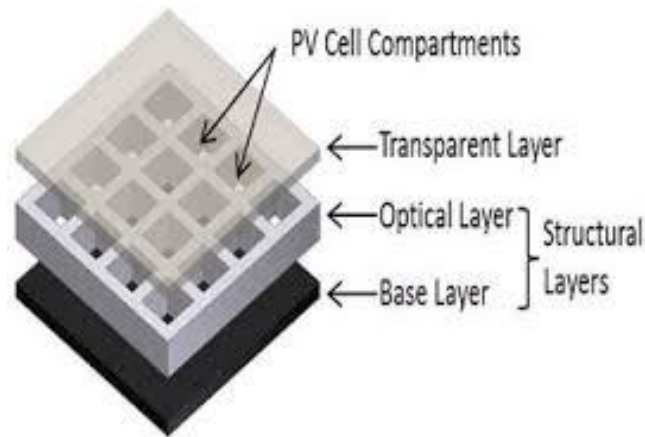
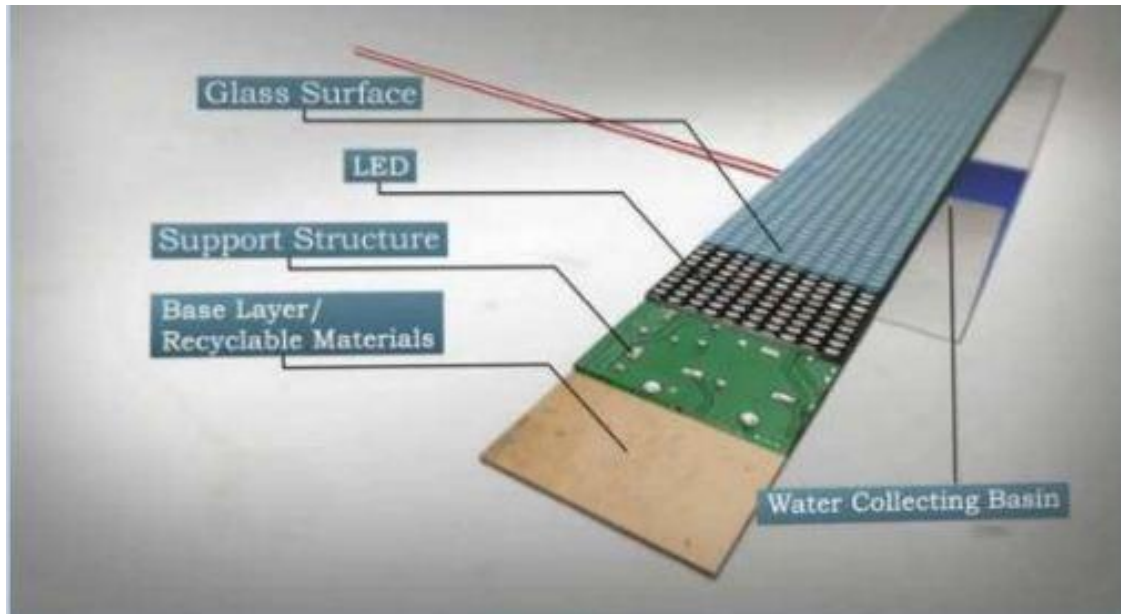


Figure 2: Structure of Solar roadways
Source: www.google.com

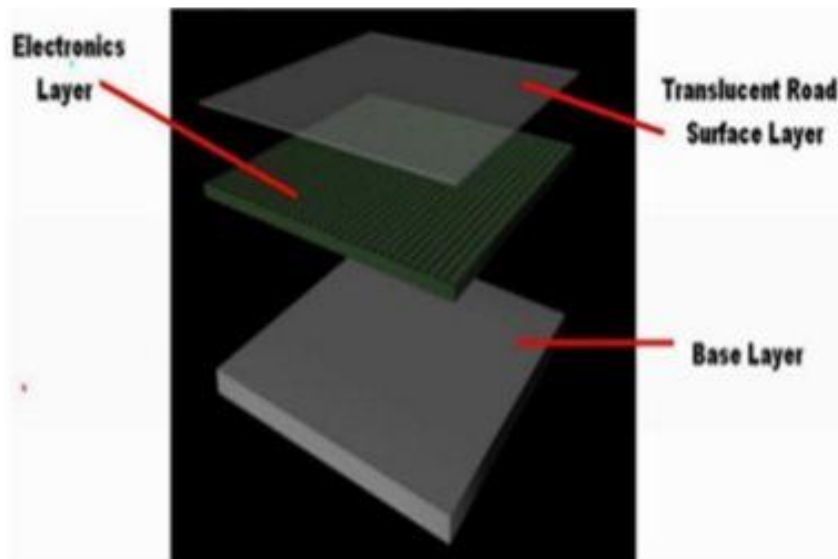


Figure 3: Different layers of a solar panel
Source: www.google.com

Road Surface layer:

The road surface layer is semi transparent and is of high strength. The sun light can still pass through it to the cells where solar energy is collected. It protects the electronic layer beneath it.

Electronic layer:

It contains photo voltaic cells which absorbs solar energy. It contains a microprocessor board with support circuitry for sensing loads on the surface and controlling a heating elements to remove ice.

Base plate layer:

It is the base plate layer that distributes power as well as data signals down the line to all homes and businesses connected to the solar roadways. It needs to be weather proof to protect the electronic layer above it.

Solar roadways involve photo voltaic effect. It is a method of generating power by connecting solar radiations into direct current electricity by using semiconductors that exhibit the photo voltaic effect.

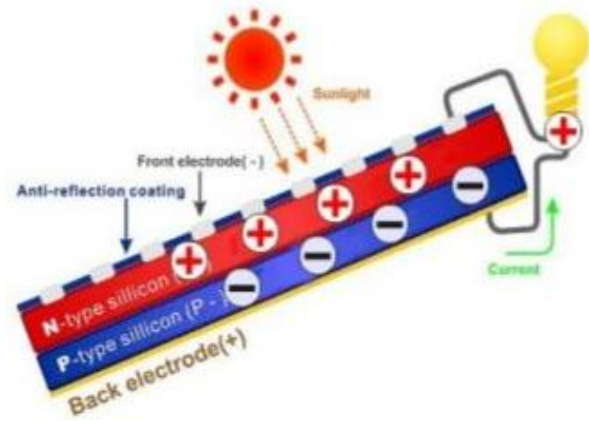


Figure 5: Structure of Photo voltaic cell

Source: www. google.com

Sun light falls on solar panel which generates electricity. This is at same time is transferred to nearby houses and power stations. LEDs controlled by microprocessors display information on the surface of the road. The anti-icing layer clears the road and also senses changes in weight. Solar road ways also replaces traditional ugly power lines. As the power lines will be located in the solar roadways it will also prevent power outages from snow and ice accumulating on lines. This makes a city much safer.

Solar Cell
(Photovoltaics)

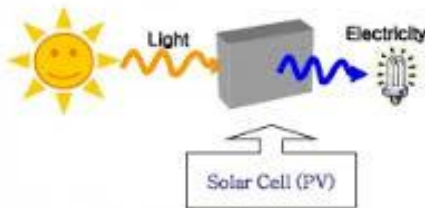


Figure 4: A typical photo voltaic cell

Source: www. google.com

Photo voltaic power generation employs solar panels composed of a number of solar cells containing a photo voltaic material. Main stream material presently used for photo voltaic includes mono crystalline silicon, poly crystalline silicon, amorphous silicon, cadmium telluride, sulphide etc.

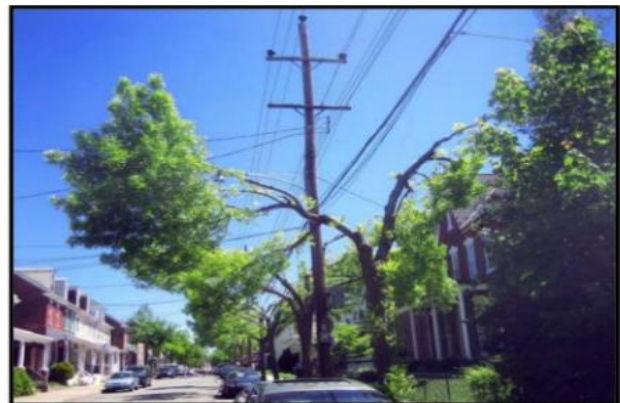


Figure 6: Traditional power lines.

Source: www.google.com

Solar roadways also replace hacking the trees up to make room for power lines. Solar roadways provide illuminated roads where the accidents are drastically reduced.



Figure 7: Illuminated roads

Source: www.google.com

Unlike the dark roads the vehicles drive on at night, the solar roadways will have LEDs which will paint the lanes and can be instantly customized as needed. With the illuminated highways accidents will be reduced and night time driving will be safer for all. The solar roadways make the highway more intelligent.

It provides clean renewable energy while providing safer driving conditions along with power and data delivery. The solar roadway will pay for itself through the generation of electricity. The same money that is being used to build current roads can be used to build the solar roadways.



Figure 8: Intelligent highway implementing the solar roadway technique

Source: www.google.com

The solar roadways will tell the LEDs to light up when it senses car on its surface. So the drivers will know an oncoming car is ahead when they see lights on the other side of the road begin to light up ahead.

The LEDs can also be programmed to move along with

cars at the speed limit, warning drivers instantly when they are driving too fast. The LEDs will be used to paint words into the roads, warning drivers of an animal on the road, an accident or construction work.



Figure 9: The solar roadway alerting the drivers

Source: www.google.com

3. CONCLUSION

The solar roadway has the technology to solve the problem of oil dependency in a relatively short period of times. Generally the solar roadways will create an intelligent and secure highway infrastructure that pays for itself. It eliminates the need for coal-fired or nuclear power plants. It ends our dependency on oil and fossil fuels. It provides safer driving conditions and traffic management.

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