

Sustainable Roadways

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ABSTRACT

The Solar Roadway is a series of structurally-engineered solar panels that are driven upon. The idea is to replace all current petroleum-based asphalt roads, parking lots, and driveways with Solar Road Panels that collect energy to be used by our homes and businesses. The renewable energy generated by solar road panels will replace the current need for fossil fuel which is used for generation of electricity as also oil used for driving the vehicles which in turn reduces the greenhouse gases nearly to half. 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 solarroads are also discussed in this paper. At end the study has been summarized.

INTRODUCTION

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 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.

Asphalt works, in many ways, and is convenient to lay-down, compared to other methods. It has carried our automotive infrastructure into the 21st century. But there are hidden costs that are making it increasingly difficult and expensive to continue favoring asphalt as the predominant road-paving model for the entire nation.

That's why asphalt is not ideal for road construction. Solar power sources are rapidly becoming cheaper and more ephemeral, making it feasible to talk about solar PV becoming the leading cost-reducing trend in the energy sector. Clean energy jobs are also expanding rapidly and have still more potential for major long-term growth. They are paying significantly higher wages than the national average, and are built into local economies. Solar Roadways is one way to capitalize on and expand this trend, and shows how quickly we can make the shift to an economy rooted in abundant, domestic, clean energy resources. Solar roadways consist of structurally designed solar panels. Each solarroad 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.

CONSTRUCTION OF SOLAR PANELS

The construction of solar panel roads is very simple. First of all one base layer of concrete is prepared on level ground. One duck is provided in base layer so that it will help at the time of maintenance. On the base layer solar panels are placed. Solar panels will collect energy from sun. Above it layer of LED is provided. At last the layer of toughen glass is provided. The toughen glass have texture structure on it so that it is easy to drive vehicle over it. The question may arise that don't the glass will break due to high temperature. The toughen glass is also use by all vehicles. So no need to worry.

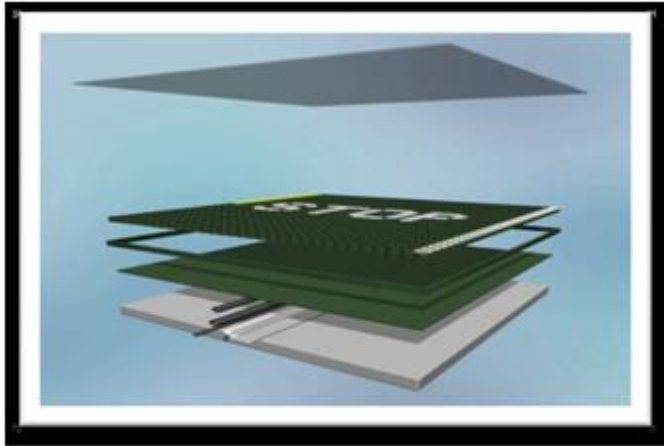


Fig: 1 Different layers of a distinct Solar panel

INTELLIGENT HIGHWAY

Every country tries to barely keeping up with the costs of maintaining the roads and bridges as it is, and the cost of construction materials is skyrocketing. New materials and technologies have to be found to replace these current archaic systems.

The Solar Roadway is an intelligent road system that 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 along with other forms of revenue. The same money that is being used to build and resurface current roads can be used to build the Solar Roadways. Then, since coal-fired and nuclear power plants will no longer be needed, the costs of all electricity generation plants can also be rolled back into the Solar Roadways.

A steady rise in congestion and ongoing deterioration of decades-old roads and bridges, funding agency of government is failing to keep up with the need to maintain existing infrastructure and increase capacity. And the cash shortfall is only going to get worse.

There is a much better way. Imagine a highway infrastructure that relieves the financial obligations of funding agency of government and instead pays for itself. The Solar Roadways will generate electricity. The

electricity generated pays for the Solar Roadways. Additional revenue can be acquired by leasing the conduit within the Solar Roadways to service providers such as the telephone, cable TV, and high-speed internet industries.

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 over come from this problem & also accidents at night time will get reduced henceforth the night-time driving will be safer for all.

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%. There is no need to expend energy lighting desolate roads when no cars are traveling, so the intelligent roadways will tell the LEDs to light up only when it senses cars on its surface - say 1/2 mile ahead and 1/4 mile behind the vehicle as it travels. This way, drivers will know an oncoming car is ahead when they see the 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 and it gives warning to the drivers instantly when they are driving too fast or the speed of the car increases beyond the speed limit. 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 as well as safer.



Fig: 2. Illuminated Highway at Night



Fig.3. roads protecting against animals

HOW THE SOLAR ROADWAYS FUNCTIONS AS A WHOLE

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 towards the grid.

HOW IT WORKS FOR ACCIDENTS CAUSE DUE TO ANIMALS

In many regions the accident is cause due to crawling animals. Driver losses their control as any animal crosses their path. Solar panel road is provided with load cell. Let us consider a driver is driving his vehicle. The crawling animal came on the road. Load cell will detect the animal and give indication to driver at some distance before. The road will directly give you indication like 'GO SLOW'. In this way the road will help to avoid accidents caused by crawling animals.

ADVANTAGES & DISADVANTAGES

ADVANTAGES

DURABILITY OF ROAD IS INCREASE

The life of bituminous roads is low. It requires maintenance regularly. And can be affected by water quickly. In short the life of bituminous roads is very short. The life of solar panel roads is approximately 25-35 years more than the bituminous roads. The solar panel road uses the energy from sun which is renewable source of energy.

EVs CAN BE CHARGED

In foreign countries most of the people uses Electric Vehicles. This vehicle requires charging time to time. So the people using EV can stop their vehicles at their free time and can charge their vehicles. As EVs charge on renewable energy, the fuel requires for charging EV is also saved. So solar panel road is best solution for those who use EV.

DISADVANTAGES THE INITIAL COST

The major disadvantage of this project is the cost. As we all know that the cost of solar panels is much high, and we required numbers of solar panels which will increase the cost of roadways.

EARTHQUAKE

Earthquake can occur any time. It is observed that earthquake is dangerous natural calamities which causes financial loss and death of many people. At the time of earthquake it will affect solar panel road a lot.

HEAT GENERATION

Heat generated by solar panel roads is a lot. Animals living in cold weather may get attracted by the heat generated. So, they may come and sit on roads which will create obstruction for vehicles.

CONCLUSION

The idea of using solar panels in roadways is awesome and outstanding. These types of roads are not implemented widely. The energy created by the solar panels is much high. This energy can also be used for street lamps, EVs etc. The energy may be used by nearby village. These roads will provide proper guidance for night driving. Solar roads use energy emitted by sunlight so it reduces use of fossil fuel. If once the proper care taken for earthquake then it can also be used in areas of earthquake. The rate of accidents on roads is more as comparative to other. This problem is solved by solar roadways.

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