SOLAR ROAD WAY: THE SMART HEIGHWAY

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Abstract: Hearing the concern about global warming and knowing our dependency on fossil fuels the solar roadway imagined to develop roadway with solar panels. The solar roadway can save the world from the energy crisis and climate change. This technology will replace all current petroleum-based asphalt road , parking lots, and driveways. As the day by day the price of petroleum products are getting huge hike, and resources are very less there will be no longer feasible material such as asphalt for our road surface. when solar panels are refurnished , and solar cells will be upgraded the new nearest technology.
Solar roadway system might a present, cost about three times what it costs to install an asphalt road. Important element of the solar roadway technology is that its power-generation capacity demonstrates the base load viability of renewable energy source. Our dependency on oil would come to an abrupt end.

Keywords: Global warming, renewable energy, power generation, less cost, elimination of fossil fuels.

I. INTRODUCTION

Solar energy is the light and radiant heat from the sun that influences earth's climate and weather and sustains life. By using this energy electricity can be produced with help of solar technology. Solar energy is preferable as compared to another energy source due to following reasons; reduce dependence on fossil fuels, environment friendly and flexible locations. A solar roadway is a road surface that generates electricity by solar power photovoltaic cell embedded below a tough transparent surface which provides sufficient traction.

The inventors of solar roadways are Julie and Scott brusaw. Solar roadways incorporated are Startup Company based in Sandpoint, Idaho, founded by Julie and Scott in 2006. The company envisioned in replacing asphalt road with solar panels. The proposed system would require the development of strong, transparent, and self-cleaning glass. That has the necessary traction and impact resistance properties. Their technology includes a transparent driving surface with underlying solar cells, electronic and sensors to act as a solar array with programmable capacity.

Solar roadway is basically made up of solar panels. Made up with glass but not a ordinary glass. Its carry 25000 pounds, i.e. more than the weight of three times the fully loaded semi-truck. Each panel cover 4.39 sq. Feet area.

- Transparent layer made with textured layer . and we can drive on that and walked upon.
- Load transmits around solar cell by optical layer.
- Further use to transmit the load to the pavement, subgrade by base layer.

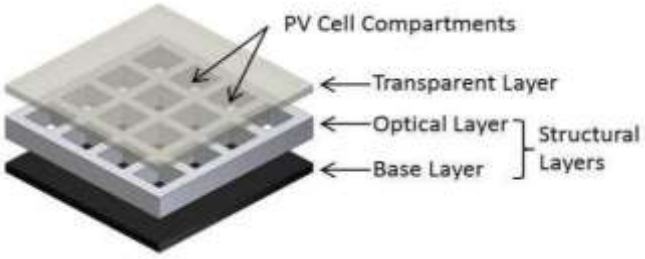

Figure 1 ***Design of Solar Panel***

- **Classification of solar layer of solar roadway**

1. **The solar panels are mainly classified into three basic layer:**
   1.road surface layer
   2.electronic layer
   3.base plate layer

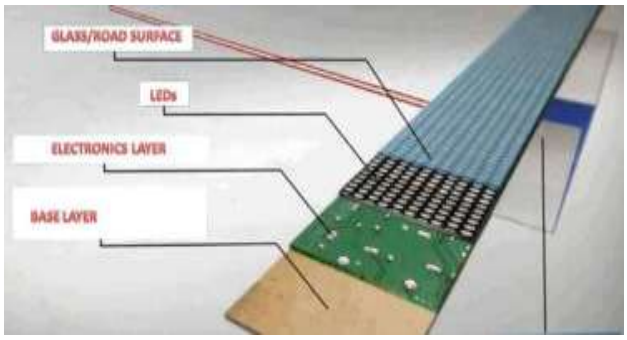

Figure 2 ***Construction of solar roadway***

2. Road surface layer:

This forms the top most layer of the solar road panel and also form this layer the solar rays will reach up to the photovoltaic cell so they should be translucent and of high strength. Also it is made rough enough to provide good traction in order to avoid the skidding of vehicles. The sunlight is passed through it to solar collector embedded within it, along with LEDs and a heating element. Ti is made water proof so that it can prevent electronic layer beneath it.

Figure 3 ***Road surface layer***

3. Electronic layer:

It contains photovoltaic cell which absorbs solar energy and converts it into electricity. It also contains a microprocessor with support circuitry for sensing load on the surface and for controlling a heating element, intended to keep the temperature above 32°F (0 °C). Microprocessor control the temperature of the road surface that prevents the accumulation of snow/ice. It is also contains load cells. Electrical components are placed on a circuit board that is enclosed between two pieces of glasses and hermetically sealed to protect the sensitivity electronics. Each panel can sens road conditions and can communicate it to drivers.

Figure 4 ***Electronic layer***

4. Base plate layer:

While the electronic layer collect the energy from sun, it is the base plate layer that distributes power(collected from the electronic layer) and data signals (phone, TV, internet, etc) to all homes and business connected to the solar roadway via cable corridors. The base layer is made weatherproof so that it can protect the electronic layer above it. It is made up of 10% of aggregate which is recycled glass.

Figure 5 ***Base plate layer***

- **Solar roadway functioning**

In order for solar roadway to be successful, the three layer of solar road panels needs to work in unison. The road surface layer needs to be clear enough to let the sunlight pass through it to the electronic layer. The electronic layer collects solar energy. It consists of photovoltaic cell which converts this energy into electricity. This energy received is transmitted to the base plate layer and also it keeps the road functioning properly, and the base plate layer determines where the energy is supposed to go and distributes power(collect from the electronic layer) and data signals (phone, TV, internet, etc.) to all homes and business connected to the solar roadway. Due to the fact that the road lines on solar roadway are actually LEDs, the base plate layer needs to ensure that the roadway has enough energy needed before sending the rest of the energy out to words the grid. Solar cells produce DC energy. Homes and business currently use AC energy, so that the DC energy is converted to AC energy by a DC- to- AC converter or solar micro inverter and then is fed to the homes and other places.

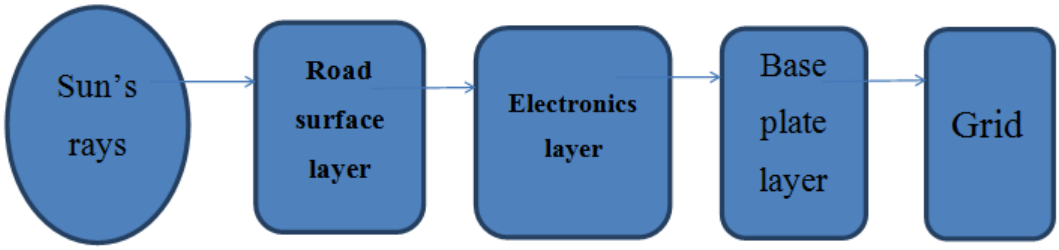

Figure 6 ***Block diagram to representing of solar roadway functioning.***

➢ **Advantages and Disadvantages**

5. Advantages:

- ✓ It is environment friendly and causes no pollution, produce no greenhouse gases.
- ✓ It provide electricity to all business and homes.
- ✓ It has greater life span, for around 20-30 years while the life span of an asphalt road is 7-8 years only.
- ✓ Utilizes renewable sources of energy o produce electricity.
- ✓ Solar roadway is modular, so repair will be much quicker and easier. In case of defect the panel could be swapped out and reprogrammed in a few minutes and then can be inserted back.
- ✓ It can replace our current centralized power stations and become the smart grid for each nation.
- ✓ Reduces dependency on conventional energy sources such as coal, petroleum and other fossil fuels.

6. Disadvantages

- ✓ It has very high initial and maintenance cost.
- ✓ The average efficiency of the solar panels is currently 20%.
- ✓ Due to high initial cost, it cannot be constructed in the poorest developing nations.
- ✓ Due to fewer amounts of sun rays, it becomes less efficient in winter season.

➢ **Other beneficial applications**

7. **There are following some additional and beneficial applications.**

- ✓ **Illuminated road:**
  Accidents drastically reduced unlike that dark road we drive on by night today, the solar roadways will have LEDs which will "paint" the lanes, and can instantly customized as needed. By implementation of these illuminated roads, the country can over come from this problem & also accidents at night time will get reduces henceforth the night-time driving will be safer for all.
- ✓ **Electric vehicles:**
  A solar roadway can recharge electric vehicles (EVs) anywhere. EV owners will be able to charge EVs with clean renewable energy at solar parking lots, at restaurants. EVs will then be charged by the road while driving. This means that they won't need large batteries, which will lighten their load and require less power to go the same distance.
- ✓ **Oil idendepence:**
  Solar roadways reduce the dependency on oils. Demand of oil is also increasing with number of vehicles. And so the sources of fossile fuel are not sufficient to supply such a huge demand. By replacing oil driven vehicles by electric vehicles, dependency on oil can be reduced.
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  vehicles. And so the sources of fossil fuel are not sufficient to supply such a huge demand. By replacing oil driven vehicles by electric vehicles, dependency on oil can be reduced.
- ✓ **Smart grid:**
  The energy produced from solar roadway can be transferred to the grid. With sufficient installed in infrastructure, solar roadways can replace all current centralized power stations and become the smart grid for each nation. The cable corridor can replace the poles needed to run the overhead lines. Power lines, telephone lines, etc. van be placed within the cable corridor and significantly reduce outages(a period when a power supply or other services is not available) from storm events. Much of the is utilized near the power source.

➢ **Future scope**

The normal road can be replaced by solar roads in the near future. As it requires huge initial investments, it would be difficult to install solar roadway in developing countries. In developed countries like U.S, if the entire US were surfaced with solar panels, it would produced more than three times the amount of electricity currently used nationwide which is almost enough to power the entire world. Solar roadways will also solve the problems of usage of fossil fuels and energy consumption.

➢ **Conclusion**

The solar roadway is an intelligent highway infrastructure and can be decentralized power grid that pays for itself. The idea is to replace the road with solar roadways on our streets, highways parking lots and sidewalks that collect solar energy to be used by our homes and businesses. The renewable energy generated by solar roads panels will replace the current need for fossil fuel which is used for generation of electricity which in turn can reduce the greenhouse gases nearly to half.

- **References**

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