

Smart Solar Roadway System

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ABSTRACT

The concept of solar energy leads to the development of solar road. Solar is renewable energy source. Solar road means use of solar panels in road constructions. Solar road replaced petroleum based asphalt road. The day by day the price of petroleum is increasing and resources are limited. The Solar roadway is the alternative solution to asphalt road. Solar roadway is the road surface that generates electricity by using photovoltaic cell. The construction cost of solar roadway is expensive as compared to asphalt road. The solar roadways are eco-friendly, feasible & reduce the 70% accident.

Keyword: renewable energy, solar roadway, fossil fuels, eco-friendly etc

1. Introduction

Solar energy is renewable energy source which lead to the development of solar roadway. The innovation in solar roadway is formed due to overused of fossil fuels. A company by the name of solar roadway was established in the U.S. which was awarded a contract by the federal.

Solar roadway is the smart road grid system. The solar roadway is generating electricity by using photovoltaic cells. Solar roadway able to fulfill the requirement of electricity and also reduces the use of fossil fuel. Transportations engineers looked various alternatives which burn less fossil fuel, and emit less carbon dioxide. Solar grid is the smart roadway system constructed in many regions of country.

Asphalt and concrete road increases the use of fossil fuel which leads to increase in pollution. The solar roadway is smart road grid system uses the natural resources and generates electricity and improves national infrastructures. Solar photovoltaic technology is getting cheaper, more resilient all the time. But it still does not constructed in many regions of country.

1.1 why solar road?

The problem of electricity arises day by day. Due to increase in populations many people still live in dark. The construction of asphalt road and concrete road increases the use of fossil fuel which creates pollutions and also in rainy season large amount of pot holes occurred in conventional road system which leads to the chances of accident. Due to larger use of fossil fuel leads to the shortage of that resources. This entire problem is overcome by constructing solar road. Solar roadway is able to fulfill the demand of electricity and also reduces the use of fossil fuel. Solar power generation has emerged as one of the most rapidly growing renewable sources of electricity. Solar power generation has several advantages over other forms of electricity generation:

1. Generate electricity

2. Contribute to decrease in global warming
3. Illuminate roads
4. Generated electricity can be used to recharge electric cars.
5. Enhance power lighting
6. Reduced dependence of fossil fuels

2. METHODOLOGY

The construction process consist of furnishing and wiring the base plate, placement and connection of solar photovoltaic cells with the previously placed layers, and finally, the positioning of the glass layer. A solar roadway is not suitable for heavy vehicles.

2.1. Working principle:

The solar roadway consists of base plate layer, electronic layer and road surface glass layer. The solar road uses natural resources. Sun rays fall on road surface layer consist of solar panels which is transmitted to electronic layer. Electronic layer consist of photovoltaic cell. These photovoltaic cells convert solar energy into electric energy. The electrical energy stored in base plate layer. The electricity is provided to nearby power station to light up the houses, streetlight, illuminate the roads, charge the electric based vehicles to reduce the use fossil fuel.

2.2 Components of Solar Roadways

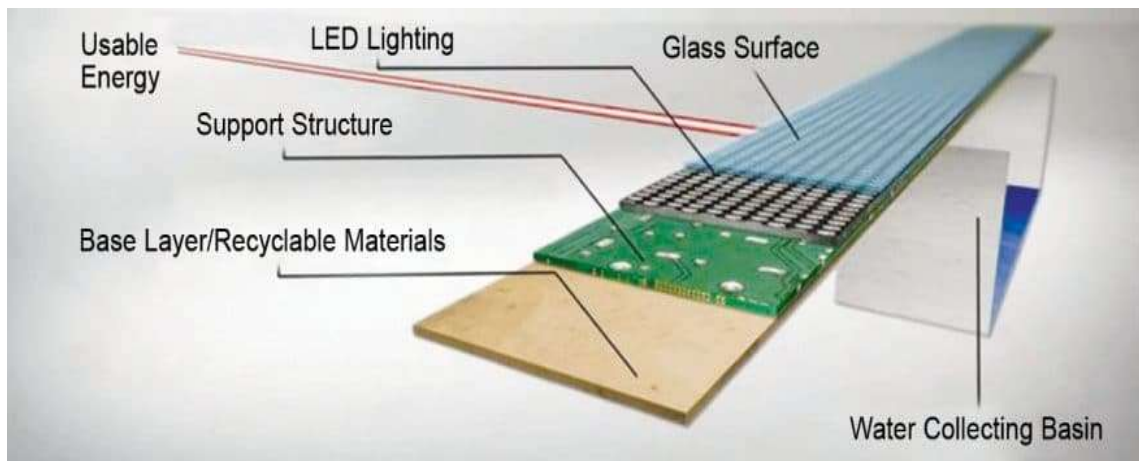


Figure-1: Components of Solar Roadway

2.2.1 Glass Layer

The glass layer should have good durability, fire resistance, and adequate strength to protect the layers underneath. Translucent and high strength, it is rough enough to provide great traction passes sunlight through to the solar collector cells. It is capable of handling today's heaviest loads under the worst of conditions. Weatherproof, it protects the electronics layer beneath it.

2.2.2 Electronic Layer

The electronic layer is placed below the glass layer and is composed of solar photovoltaic cells and chipboard. It contains a large array of cells, the bulk of which will contain the super or ultra caps that store the suns energy for later use.

2.2.3. Base Plate Layer

It is the bottom-most layer of a solar roadway that collects the electrical energy and transmits it to the power station. The base plate layer is manufactured from steel and supports the other layers while resisting the external weather conditions. Base plate layer that distributes power to nearby power station, homes and businesses. It protects the electronics layer above it.

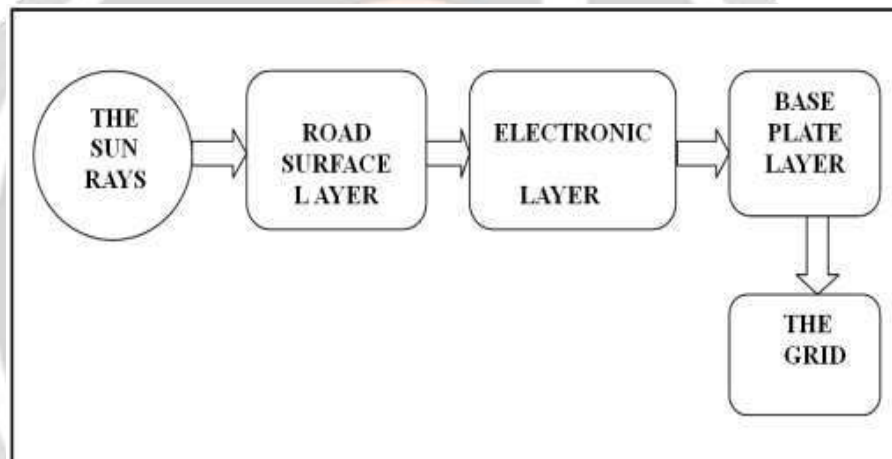


Figure 2: Path of Energy in Solar Roadways

3. Cost comparison of solar road and asphalt road

The average cost of asphalt roads is roughly per square foot. The cost does not include maintenance (pot holes repair, repainting lines, etc).

For solar panel is sized at 12x12 feet that is it covers an area of 144sq.ft. One panel costs \$6912.so the solar roads cost $6912/144 = \$48$ sq.ft. Whereas asphalt costs \$16sq.ft. Hence solar roads cost 3 times more than regular roads.

4. FUTURE SCOPE:

In India there is huge requirement of electricity due to high populations. It is great challenge for the Govt.as well as the electricity companies. The asphalt and concrete roads can be replaced by solar roads in the near future. but solar road construction huge initial cost is required. It is difficult for developing countries. But solar roadway is alternative solutions to generate electricity as well as problem of usage of fossil fuels and energy consumption



Figure3: Solar Roadways at Night Time on the Curved Road.



Figure 4: LED in Solar Roads

5. CONCLUSION:

The Solar Roadways are a new technology to solve the problem of shortage of electricity and dependency of fossil fuels. Solar roadway improves the national infrastructure. The technology is still in its primitive stage due to high initial investment in developing countries. Solar roadways are less polluted, solar roadways are eco-friendly and feasible and also reduces the 70 % accidents

6. REFERENCES:

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