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Solar Roadways

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ABSTRACT
The intention of the study is to investigate the possibility of solar roads around the world. Solar road is a strained project in terms of constraint used. Solar roads are basically the roads made of high tensile strength material.Smart highways should be enhanced to develop the Nation and make the world go greener in a way that theconsumption of fossil fuels would be totally eradicated Solar roadways use solar panels, PV effect LED"s and microprocessor chips with circuitry boards. It has already been implanted in some parts of the world commencing with Netherland. The idea is to make multi-functional, self-sustainable roads that require in substantial upkeep.

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I. INTERODUCTION

ROADWAYS are the roads made up of mainly asphalt. Solar roadway is a newly developed concept that made to search innovatively to enhance its construction and usage. Solar roadways or smart roadways or solar highways are roads which produces electricity made of silicon wafers, its perfect honeycomb structure like array ,gives the durability and can easily replaced. A single layer panel of highway space could generate 61 MW of electricity. With the minimum 15% efficiency, solar roadways would generate around three times the present electricity demand. If there are two layers of solar panels one over the other, the annual energy generation of same highways, can be increased to 229 GWH and 140 GWH are respectively

II. LITERATURE REVIEW

As impact studies are the major focus of this research, detailed literature review to assess existing studies that have been undertaken to impacts associated with solar highways and PV deployment. In addition, national and international projects experiences that correlate with motorists,,safety and ROW operations and maintenance are researched. The potential topics identified in the literature assessment are as follows: The working principle and background of solar array system Administrative controls over ROW management Exploring existing solar highways implemented within the US and the rest of the world Glare from solar panels Current practices and soft wares used to analyze sun glare vision impairment hazards Operations and Maintenance activities associated with PV deployment Operations and Maintenance activities associated with high way management Safety during solar array maintenance Snow drifting and deposition In addition to the literature review, several interviews with key personnel from the industry as well as site visits to existing solar array systems along highways were. The impact-related data and mitigation approaches are the key inputs to model the framework development.

III. CONSTRUCTION OF SOLAR ROAD PANELS

Solar road panels consists of three layers
Electronic layer: This layer contains a microprocessor board with circuitry embedded for sensing loads on the surface and controlling a heating element.
Base plate layer: With the electronic layer collects energy from the Sun, it is the base plate layer that distributes power collected from the electronics layer and data signals.
Solar panel: Solar panel is a collection of solar cells. Although each solar cell provide a relatively small amount of power. [1,15]

IV. CONCLUSION OF STUDY

To cover the asphalt surface in the U.S. alone that is roughly will take five billion 12 by 12 solar road panels. Power from road is three times more energy than U.S. used as a nation and also enough to power the entire world. There are over 25,000 square miles of impervious surfaces not including actual buildings. [6,8]

Assumptions
*Solar cell use have a 15% efficiency.
*Only 4 hours of peak daylight hours per day (4 x 365 = 1460 hours per year) Solar panel offers a 200 Watt model rated at 15% efficiency. Its surface area is 15.16 square feet. If solar panels are use to covered the entire 25,000 square miles of impervious surface, we had get: ((25,000 mi2) x (5280 ft / mi)2) / (200W/15.16 ft2) = 9194722955145.118 Watts ~9.19 Billion kilowatts

If we calculate only 4 hours of peak daylight hours (1460 hours per year) this gives us: 9.19 Billion Kilowatts x 1460 hours = 13424295514511873.350 Kilowatt-hours (or) ~ 13,424 Billion Kilowatt-hours of electricity. [8]According to the Energy Information Administration, the U.S. used just over 4,372 Billion Kilowatt-hours of electricity in 2003, while the entire world used approximately 14,768 Billion Kilowatt-hours of electricity total. On each day, hypothetical 4-lane, one mile stretch of solar roadway would produce at least 13,376 kWh of electricity. That‟s enough to power 500 homes completely "off grid". The solar roadways is designed in such a way that it will be three time more cost than asphalt road and will last for atleast 21 years. The total investment would be around $48 ft2. First solar road officially opened in the small town of Tourouvre-au-Perche in Normandy, France. The cost of one kilometer long (about 0.6 miles) and took $5.2 million to produce. The double layer laminated glass used as a solar panel can withstand the weight of 250,000 lb, which is four times the weight of semi-truck. [8]

V. FUTURE SCOPE OF SOLAR ROADWAYS

USA, the department of transporation (DOT) granted $0.1 million to solar roadways for a small business innovation research (SBIR) in 2011.In India the road network is of over 5472,144 Km, it is the second largest network in the world. As per report, India will need to invest US $1.7 billion on infrastructure projects before 2020. [1,6] .Our hon‟ble PM Narendra Modi has promised to start building hundred smart cities in India during his tenure 2014-2019. If we could start implementing solar roadway in these cities it would be far easier to test where viability instead of laying asphalt road first and solar road later and can also check their sustainability. The solar road way alternative could be made at less cost with an energy return while phasing out the old system. Whenever fiscal dilemmas become the primary motivating factor for a state, the option of solar roadway should be encouraged and opened. [6]Solar roadway will answer our nation problem in the field of
* Transport pollution
* Waste pollution
* Coal pollution
* Transportation funding and energy
We could also embed some type of sensor in some of the panel which could aid the scientist in data collection and prediction of earth quake
Generally the solar roadway will
* Create a high tech infrastructure that pay for itself.
* Create decentralized, self healing power grid.
*Eradicate the need for coal fired or nuclear plant.
*End our sub ordinance on oil and other fossil fuel.
* Cut our green house gas emission by over 50%.
* Protection of wild life.
* National security.
* Provide safer driving conditions.

VI. CONCLUSION

In order of depleting the coal, patrol and other fossil fuels, solar roadways is a boon for developing and the growing countries like India. India, instead of exploring in terms of road connecting to cover the geographical area should start implementing the higher target roads and develop solar roads so they can improve the economy with infrastructure. Its implementation not only provide us with electricity but with green energy which in turn help in reducing global warming. Solar Roadways co-founder Scott Brusaw thinks his project has such broad resonance because it ticks off so many boxes: Once installed, his smart panels will be able to generate clean energy, communicate safety and traffic information to drivers in real time, reduce the visual pollution of ugly signage and clutter, prevent accidents by melting snow and ice and even treat and transport fresh water

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