SMART SOLAR POWERED TENT

Rahul Sridharan, Maruti Sriram, Rajkumar.E
1,2 Under Graduate Students, SMEC, VIT Vellore, India
3Associate Professor, Department of Design and Automation, SMEC, VIT Vellore, India Email :- rahul.sridharan2017@vitstudent.ac.in, sriram.ayyagari2017@vitstudent.ac.in, rajkumar.e@vit.ac.in

Abstract: Many Engineering Technologies and day to day applications are now moving towards a eco friendly and environment free solutions for the routine processes. This paper investigates on how the environment friendly products which doesn’t hinder the day to day activities done by the humans without causing any harm to the nature by involving unique engineering technologies which can help the product to be sold in the market and helping the humans to utilize the nature’s resource and fulfilling the daily activities. This main objective of the regular tent existing in the market are based on different needs and specifications but it isn’t able to fulfill the purpose either it isn’t long lasting or not portable to carry for long distance travelling or on tough mountains for hiking. Therefore, to put an end to this everlasting issue this product is developed to cater all the needs of a traveler irrespective of the place he goes. The unique part of this tent is that it is completely powered by solar energy as it will provide in and around electricity in the tent as it has solar panel and LED lights are stuck around it to provide light. Researchers have compared with regular tents with the solar powered tents and notice that apart from lighting the place it can kill the bacteria by ultraviolet rays and keeping the place clean and can be used for necessary chores done during travelling. The Optimized form of product is that it’s a multifunctional and can be used in any sort of place and any sort of travelling.

Keywords:- Solar Panel, Batteries, LED lights, Energy storage element, miniaturized

1. INTRODUCTION
The idea is to introduce perovskite and flexible solar panels to produce maximum solar energy in our tents, to power our smart and safety devices. We foresee to produce enough power to provide users with lighting, heating, Wi-Fi (if permissible in that area), cooking, an IOT device and many other such safety features too. Our goal is to produce green power and ultimately be able to produce such large tent at cost effective rates, allowing it to be used in rural areas which have scope for solar energy.

2. LITERATURE REVIEW
Kevin bulls [1] proposed a material that could make solar power dirt cheap Perovskites have been known for over a century, but no one thought to try them in solar cells until relatively recently. That particular material is very good at absorbing light. While conventional silicon solar panels use materials that are about 180 micrometers thick, the new solar cells use less than one micrometer of material to capture the same amount of sunlight. Satoshi Uchida [2] paper on material challenges for cells in twenty-first century progress in materials and production processes has played an important part in this development. Yet, there are many challenges before photovoltaics could provide clean, abundant, and cheap energy. We review this research direction, Next PV working on promising solar cell technologies. The cooperation was focused on efficient photovoltaic devices, such as multifunction, ultrathin, intermediate band, and hot-carrier solar cells, and on printable solar cell materials such as colloidal quantum dots. Istiak Hussain [3] paper on functional materials, device architecture and flexibility of perovskites solar cells Photovoltaic solar cells work by converting the energy of incident photon’s directly to electricity the development of different photovoltaic technologies can be roughly classified into three discrete generations advanced techniques and research trends related to this emerging photo novel PSC architectures, methods that increase overall cell efficiency, and substrates that allow for enhanced device flexibility.

3. WORKING PRINCIPLE
The perovskite will be embedded with nylon to make the main part of the tent, we will use medium carbon steel for the frames on the tent, above the tent will be placed three flexible solar panels. The
electricity produced by these components will power all our smart features on the tent. The perovskite used gives us scope to create much more electricity required to run our smart components without any problems.

4. METHODOLOGY

Steps are shown in figure 1.

**Step1:** Manufacture tent frame

**Step2:** Cover the frame with the perovskite fabric

**Step3:** The flexible solar panel is placed over the perovskite material

**Step4:** The panels and the perovskite are connected to the battery

**Step5:** All appliances are finally connected to the battery.

Figure 1: Methodology
4. CALCULATIONS AND POWER CONSUMPTION

Flexible cells or PV devices are translucent they use little brittle materials and they require low light and can generate electricity. A lithium ion battery with a high capacity and a low power rating would deliver a low amount of electricity which is enough to run a few crucial apparatus. They can degrade in high heat and humidity. It give an efficiency of 22% Lead and Tin advance the technology and it runs on DC Current It can produce up to 300-400 watts in a good sunlight for a size of 46 square meters

Electricity Generation Calculation:

1) Upper Bound – 18,400 Watts
2) Lower Bound - = 46 x 30 = 13,800 Watts

Total Electricity can be used for 8-10 hrs. as it is completely proportional to the weather conditions as it can generate electricity in low light conditions as well. As it runs on DC Current now the perovskites cells can produce from 13,800 to 18,000 watts of electricity. From the electricity generated the here are the basic products which are installed in the tent This is an estimated calculation of each device / Product of how much electricity is consumed per product.
1) IOT Device :- 2 – 4 Watts
2) LED Lights – 60 Watts
3) Charging Ports – 2.5 Watts each
4) Induction Stove - 300 Watts
5) Wifi ( Router )- 2 to 60 Watts

Solar cells give an attractive option for directly photo-charging lithium-ion batteries, the use of perovskite solar cell packs with four single CH3NH3PbI3 based solar cells connected in series for directly photo-charging lithium-ion batteries assembled with a LiFePO4 cathode and a Li4Ti5O12 anode. Our device shows a very high photo-electric conversion and storage efficiency of 7.80% and very good cycling stability, which can do better than other reported lithium-ion batteries, lithium–air batteries, flow batteries and super-capacitors integrated with a photo-charging component. The newly developed self-chargeable units based on integrated perovskite solar cells and lithium-ion batteries hold promise for various potential application.

5. PRODUCT ARCHITECTURE

Flexible Solar Panels
Specification Flexible solar panel:
1. This contains back contact solar panels for both on and off grid
2. 19%-23% high efficiency.
3. Flexible and light weight

Features Flexible solar panel:
An efficiency of upto 23% has been held by this solar PV module, which has also been recorded as the world’s highest efficiency for a cell. While compared with the traditional models, the above has a higher average efficiency of 25-30%.

Figure 4. Flexible Solar panel
Figure 5. Layers in the solar panel

Place of Origin: Guangdong, China  
Brand Name: SHINE SOLAR OR OEM  
Model Number: SN-H110W  
Type: Standard Solar  
Panel Size: 1060*540*3mm  
Certificate: TUV/IEC61215/IEC61730/CE/ISO  
Color: Black and white/ black  
Connector: MC4  
Weight (Kg): 1.6  
Efficiency: 19.9%  
Solar cell: SunPower from USA  
Voltage: 12V/24V  
Application: Solar Home System  
Cell type: Monocrystalline  
Max Power: 110W  
Price: $100

Perovskite Fabric

Figure 6. Perovskite fabric deconstruction

The perovskite fabric is embedded into the nylon of the tent which provides instant electricity. The efficiency of the tent is much higher, over 25%. It also provides instant lighting. This material is yet to be integrated and mass produced so it’s exact specifications yet to be determined. Nevertheless, it is indeed promising.
Battery

Can store up to 1800 watt of power and provide electricity for up to 24hrs on 100 watt load.

Google Home Mini
The IOT device used here is the google home mini. It is a wireless smart speaker with inbuilt google assistant with a highly advanced voice UI. Price: Rs 2799
[ MOVING HEAD DESIGN ]: With a moving function, the heater can shake the head left and right, letting the warm hot air blow to every corner.

[ MULTIPLE SAFETY PROTECTION ]: Safety first, our heater body is made of high quality materials with no bad chemical odor. Space heaters for indoor use worrying about scorched floors is avoided thanks to the built in tip-over protection switch. Even when it is tipped over, the switch automatically turns it off.

[ CUSTOMIZE YOUR COMFORT WITH 2 MODES ]: This space heater air cooler electric has cool Fan and hot mode to choose, so it is available for four seasons. It has an indicator light which depicts the temperature mode it is on. Price Rs 2699.
6. MAIN FEATURES

The solar-powered tent contains photovoltaic fabric to generate solar energy, heater, wireless hub and magnetic induction charging pouch. Whenever you will active the feature, the tent dome will glow gently, pointing you back to your tent. In case of any emergency the tent will shoot out a flare into the sky to notify people around. There is a basic lock mechanism in the lock for safety of the things inside the tent. If signal catching is possible in the area Wi-Fi will work No need of extra cooking equipment an electric pan can be used. Lighting in and around the tent is taken care of.

7. CONCLUSION

We believe we have made a smart, eco-friendly and sustainable tent and with further research and resources we would be able to develop this to much higher levels with the ultimate goal of implementing this technology at large scale in rural areas to the less fortunate as homes.

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