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“A STUDY ON ELECTRICITY GENERATION FROM SOLAR PANELS TO SOLAR SKINS”

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ABSTRACT

Sun energy is the most plentiful energy that anyone could hope to find on the planet. Throughout the years with propels in innovation sun powered energy has arisen as most helpful sustainable wellsprings of energy. Sun powered energy has developed from ground mounted sunlight powered chargers to wearable sunlight powered chargers and sun based following mounts. Yet, there are presently a few energizing new sun powered charger innovations either ready to go or currently available. Large amounts of land or roof space are no longer necessary for solar, and it also doesn't have to look uninteresting. Every day, silicon panels get more affordable and effective. Experts claim that solar panels offer numerous advantages, including increased efficiency, when installed on reservoirs and other bodies of water. Solar technology innovation is getting better. efficiency, scale, and price, increasing its widespread use in society. More buildings are starting to use solar energy than just those with roof-mounted panels. Solar tiles, solar film, solar highways, and solar windows are some of the cool applications. Additional technologies under investigation include the solar orb, solar balloons, solar automobiles (available for purchase), nanowires, and infrared technology. As the supervisor of the Sun Club for Green Mountain Energy.

Keyword: *solar panels, photovoltaic, solar cells, sun energy, Green Mountain Energ.*

I. INTRODUCTION

Solar energy is the radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies, such as solar panels or photovoltaics (PV), to generate electricity or heat water for various applications. It is one of the cleanest and most abundant renewable energy sources available to us. Here are some key points about solar energy. Solar Panels: Solar panels, also known as photovoltaic (PV) panels, are made up of solar cells that convert sunlight into electricity. When sunlight hits the semiconductor material within the solar cells, it excites electrons, generating an electric current.

Types of Solar Energy Systems:

Grid-Tied Systems: These systems are connected to the local utility grid. Excess electricity generated by the solar panels can be fed back into the grid, often resulting in credits or payment from the utility company.

Off-Grid Systems: These systems are not connected to the grid and require battery storage to store excess electricity generated during the day for use at night or during cloudy days.

Hybrid Systems: These combine elements of both grid-tied and off-grid systems, typically incorporating battery storage but also having the ability to connect to the grid if needed.

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Advantages:

Abundant and Renewable: Solar energy is a virtually limitless resource, with the potential to meet global energy demands many times over.

Clean: Solar energy production generates minimal greenhouse gas emissions, making it environmentally friendly.

Low Operating Costs: Once installed, solar panels require minimal maintenance and have low operating costs compared to conventional energy sources.

Energy Independence: Solar energy reduces reliance on fossil fuels and foreign energy sources, promoting energy independence.

Challenges:

Intermittency: Solar energy production is dependent on sunlight, making it intermittent and less predictable than conventional energy sources.

Energy Storage: Storage solutions are necessary to provide electricity when sunlight is not available, adding to the overall cost of solar energy systems.

Land Use: Large-scale solar installations may require significant land use, which can be a concern in densely populated areas or ecologically sensitive regions.

Applications:

Residential: Solar panels can be installed on rooftops to power homes and reduce electricity bills.

Commercial and Industrial: Many businesses and industries utilize solar energy to offset their electricity consumption and reduce operating costs.

Utility-Scale: Large solar farms generate electricity for the grid, supplying power to communities and regions.

In recent years, advancements in technology and declining costs have made solar energy increasingly competitive with traditional energy sources, driving its widespread adoption around the world. Additionally, innovations in energy storage and grid integration are addressing some of the challenges associated with solar energy, further enhancing its viability as a key component of the global energy transition toward sustainability.

electric device for several hours for the first time in history. Then in 1959, Hoffman Electronics achieved 10 percent efficiency. Soon after, they beat their own record with 14 percent efficiency in 1960. These efficiency upgrades helped push solar panels into the space program. The use of solar panels in the space program through the 1960s increased production and slowly the price reduced to around \$100 per watt.

Currently, solar panels average between 15 and 18 percent efficiency and can cost as low as \$0.50 per watt. Since its inception, solar power technology has made constant progression. Advancements in photo voltaic (PV) and concentrated solar power (CSP) have produced a more effective hybrid technology for solar panel engineering, and have helped lower the cost significantly. In 2016, MIT researchers were able to produce ultra-slim, flexible solar cells that are only 1.3 microns thick. These lightweight cells are said to weigh the same as soap bubbles, allowing future opportunities for use in certain technologies like cell phones. According to MIT, “conventional silicon-based solar modules produce about 6.8 watts per pound, but these new devices can generate more than 2,720 watts per pound, <https://energy.gov/eere/videos/energy-101-solar-pv> 400 times as much.” While this advancement is still in early phases, it could help widen the use of solar technology. There have also been ongoing efforts to make solar energy even more affordable and efficient with an emerging technology called the “perovskite” solar cell. This crystalline material could ultimately replace silicon in solar panels and reduce costs using simpler production methods.

How do solar panels work

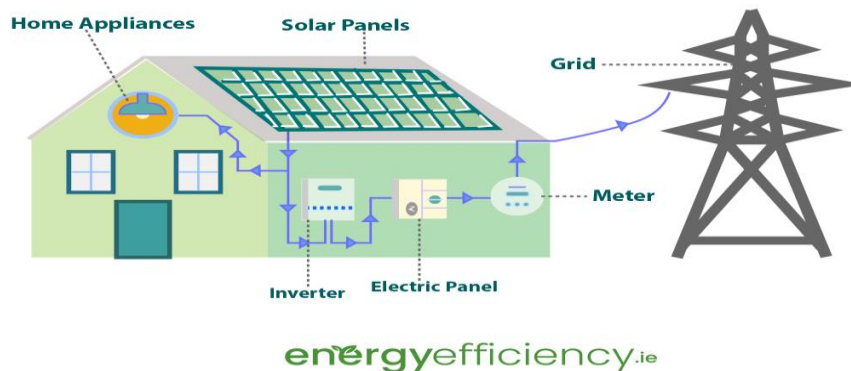


Fig- 1: Solar panel

II. LITERATURE REVIEW

SOLAR SKIN DESIGN

Solar skin design refers to the integration of solar panels into building materials or surfaces in a way that enhances aesthetic appeal while also generating electricity. Traditional solar panels are often installed on rooftops or as separate arrays, which may detract from the visual appearance of a building or landscape. Solar skin design seeks to overcome this limitation by incorporating solar technology seamlessly into architectural elements, such as windows, facades, or cladding.

Here are some key aspects of solar skin design:

Aesthetic Integration: Solar skin design aims to blend solar technology with the overall design and aesthetics of a building, rather than being visually obtrusive. This may involve using materials and colors that complement the building's architecture or incorporating solar panels into existing structures in a subtle and seamless manner.

Customization: Solar skin design allows for customization to suit the specific requirements and preferences of building owners, architects, and designers. This could involve designing solar panels in various shapes, sizes, and colors to match different architectural styles or meet specific design objectives.

Functionality: While prioritizing aesthetics, solar skin design does not compromise on functionality. Solar panels integrated into building materials are still capable of generating electricity from sunlight, contributing to energy efficiency and sustainability goals.

Versatility: Solar skin design can be applied to various building elements, including roofs, walls, windows, and facades. This versatility allows for greater flexibility in incorporating solar technology into both new construction projects and existing buildings undergoing renovation or retrofitting.

Innovation: As solar skin design evolves, researchers and developers are exploring new materials, technologies, and manufacturing processes to further improve efficiency, durability, and design possibilities. This includes the use of transparent solar cells for windows or glass facades, as well as flexible and lightweight solar panels that can conform to curved surfaces or irregular shapes.

Overall, solar skin design represents a creative approach to integrating renewable energy generation into the built environment while enhancing visual appeal and architectural innovation. By seamlessly blending solar technology with design aesthetics, solar skin solutions have the potential to accelerate the adoption of solar energy in both residential and commercial buildings, contributing to a more sustainable and aesthetically pleasing urban landscape..

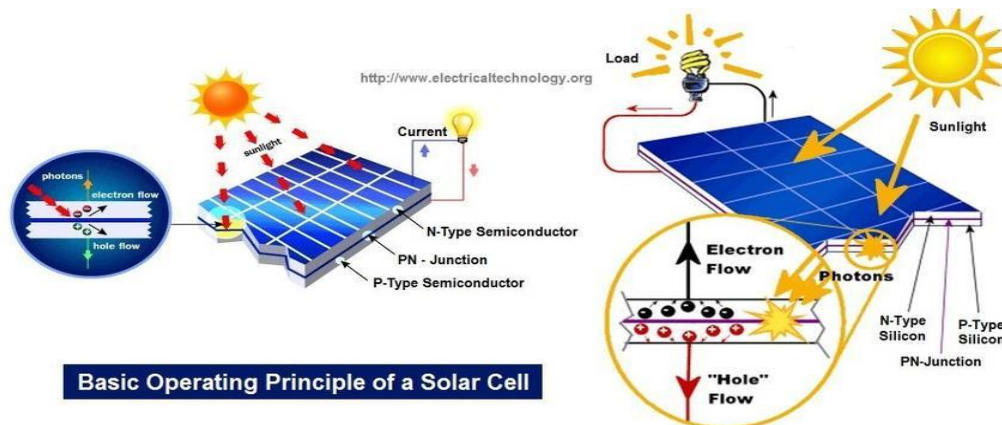


Fig- 2: Solar skin

SOLAR POWERED ROADS

The testing of solar-powered highways, an innovative new photovoltaic technology, was made possible last summer. The historic interstate highway in America, Route 66, has sidewalks. These areas were selected to test solar-powered pavement technology. In addition to being praised for producing sustainable energy, these roads also feature LED lights that can be used to illuminate the roads at night and heat up snow during the winter. Installing these roads on certain Route 66 stretches comes next, after sidewalk tests.



Fig- 3: Solar powered Roads.

WEARABLE SOLAR

Wearable solar technology involves incorporating photovoltaic (PV) cells into clothing, accessories, or wearable devices to harness solar energy for various purposes. This innovative approach enables individuals to generate electricity on the go, providing power for portable electronic devices, such as smartphones, smartwatches, fitness trackers, and other wearable gadgets. Here are some key aspects of wearable solar technology:

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Integration into Clothing and Accessories: Wearable solar technology can be seamlessly integrated into clothing items, such as jackets, hats, backpacks, and even shoes. Additionally, it can be incorporated into accessories like wristbands, bags, and sunglasses. These items are designed to capture sunlight while being worn, converting it into electricity to charge or power electronic devices.

Flexible and Lightweight Materials: To ensure comfort and mobility, wearable solar products often utilize flexible and lightweight materials that conform to the contours of the body. Thin-film solar cells or organic photovoltaic materials are commonly used, as they can be incorporated into fabrics or applied as coatings without adding significant bulk or weight.

Charging On the Go: Wearable solar technology enables users to charge their electronic devices while they are outdoors or exposed to sunlight. This is particularly useful for outdoor enthusiasts, travelers, or individuals who spend extended periods away from conventional power sources. By harnessing solar energy throughout the day, users can maintain the functionality of their devices without relying solely on grid electricity or portable battery packs.

Environmental Sustainability: Wearable solar technology aligns with the principles of sustainability by utilizing renewable energy sources and reducing reliance on conventional power sources that contribute to carbon emissions. By harnessing solar energy to power electronic devices, individuals can minimize their environmental footprint and promote eco-friendly lifestyles.

Challenges and Considerations: While wearable solar technology offers several benefits, there are also challenges to consider, such as limited charging capacity, efficiency, and durability. The amount of electricity generated by wearable solar panels may be relatively small compared to traditional solar installations, and it may not be sufficient to fully charge high-demand devices. Additionally, factors such as weather conditions, shading, and the orientation of the solar panels can affect their performance.

Despite these challenges, ongoing advancements in materials science, electronics, and energy storage are driving innovation in wearable solar technology, enhancing its efficiency, durability, and usability. As the technology continues to evolve, wearable solar products are expected to play an increasingly prominent role in the emerging field of wearable electronics, offering users a convenient and sustainable way to stay connected and powered up while on the move.



Fig- 4: Solar wearable.

SOLAR BATTERIES: INNOVATION IN SOLAR STORAGE

Solar producers have taken note of the growing popularity of off-grid solar and solar plus storage in U.S. markets. In terms of market share and brand awareness for solar batteries, the well-known Tesla Powerwall, a rechargeable lithium-ion battery product introduced in 2015, still commands the highest percentage of the market. The Powerwall 2.0 for home use and the Powerpack for business use are the two storage devices that Tesla offers. 2019 will likely see the release of far more cost-effective and efficient batteries due to a spike in demand from solar buyers. Despite this, solar storage is still a relatively pricey commodity.

SOLAR TRACKING MOUNTS

An increasing number of homeowners, even those with roofs that are not the best for solar panels, are contemplating solar as the technology begins to gain traction. This growth has made ground mounted solar increasingly attractive as a clean energy source, in part because of tracking mount technology. With trackers, solar panels may produce as much electricity as possible by tracking the sun's path across the sky. PV tracking systems adjust a solar array's tilt and angle during the day to optimally align it with the sun's position. Despite the fact that this panel accessory has been around for a while, solar manufacturers are genuinely adopting the technology. A new report released by GTM Research demonstrates a significant increase in the use of tracking systems. This year, GTM forecasts a 254 percent year-over-year growth in the PV tracking market. Nearly half of all ground mount arrays will have sun tracking capability by 2021, according to the analysis.

III. FUTURE OF SOLAR

Previously, the only ways to produce solar power were via rooftop or ground-mounted panels. However, solar technology is expected to progress further and become lighter, more flexible, more widely used. Assume you travel to a different city with access to all of this technology. You may charge your phone with solar-powered clothing, purchase food from a solar-powered food cart, and consume it while driving on a solar-powered highway. The near future appears like this! Furthermore, a plethora of additional cutting-edge residential solar solutions are either in development or are already being introduced in 2020.

IV. CONCLUSIONS

Previously, the only ways to produce solar power were via rooftop or ground-mounted panels. However, solar technology is expected to progress further and become lighter, more flexible, more widely used.

REFERENCES

- [1] Clear way community sola-understanding-community-solar evolution-solar-panels
- [2] vivintsolar.com/learning-center/history-of-solar-energy
- [3] energysage.com/solar-panel-technology-advances-solar-energy
- [4] solarreviews.com/solar-panel-technologies-that-will-revolutionize-energy-production
- [5] Shruti Sharma, Kamlesh Kumar Jain, Ashutosh Sharma a review on "Solar Cells: In Research and Applications", Materials Sciences and Applications, 2015, 6,1145-1155 Published December 2015 <http://dx.doi.org/10.4236/msa.2015.612113>
- [6] Askari Mohammad Bagher, Mirzaei Mahmoud Abadi Vahid, Mirhabibi Mohsen. "Types of Solar Cells and Application". American Journal of Optics and Photonics. Vol. 3, No. 5, 2015, pp. 94-113. doi: 10.11648/j.ajop.20150305.17
- [7] Book of "Wind and Solar Power Plants" by Mukund Patel, CRC Press
- [8] N. Gupta, G. F. Alapatt, R. Podila, R. Singh, K.F. Poole, (2009). "Prospects of Nanostructure-Based Solar Cells for Manufacturing Future Generations of Photovoltaic Modules". International Journal of Photo energy 2009: 1. doi:10.1155/2009/154059.

- [9] Book of “Solar Energy” by Dr. S. P. Sukhatme. Tata McGraw Hill Publication
[10] Gaurav A. Madhugiri, S. R. Karale, “High solar energy concentration with a Fresnel lens: A Review” Vol.2, Issue.3, May-June 2012 pp-1381-1385 ISSN: 2249-6645.