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Benefits and Drawbacks of Photovoltaic Solar Energy

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ABSTRACT: The aim of this paper is to understand the state of the art of photovoltaic solar energy through systematic literature studies that address the following topics: ways of obtaining energy, its pros and cons, implementations, current markets, costs and techniques, in accordance with what has been addressed in the scientific published studies up to 2016.The study indicates that photovoltaic electricity is increasing and might even play an essential part in meeting the nation's elevated energy requirements. Increasing the involvement of photovoltaic energy in the renewable energy market requires, first of all, educating people of its advantages; increasing research and development of new techniques; and, secondly, implementing public policy programs that promote the generation of photovoltaic energy. Even though crystal silicon solar cells were prevalent, other cell types were established that could compete, either in terms of reducing costs or in terms of higher efficiency and effectiveness.Telecommunications, liquid pumping, public lighting, BIPV, agriculture, heating systems, grain drying, desalination, spacecraft and satellite systems dominate the potential uses. All the findings on photovoltaic solar energy are technical, thereby creating the need for future studies on commercial feasibility, the cooperation of supply chains, the analysis of barriers and incentives for photovoltaic solar energy, and deeper findings on the factors influencing the position in the market of these kind of innovations.

Keywords: Applications, Benefits, Drawbacks, Photovoltaic (PV), Solar Energy, Spacecrafts, Water desalination.

INTRODUCTION

With rapid urbanization and economic and technological advancement, humans also need power to achieve the best possible outcomes for their lives. Nevertheless, a number of environmental issues, like global warming, environmental damage and water pollution, are caused by combusting conventional fossil fuels.The advancement of renewable energy sources is thus urgently needed to address the political, financial and ecological difficulties involved in electricity generation. In recent years, the advent of these energies has largely motivated academics, policymakers and business leaders' curiosity in understanding the economic effectiveness of the new energy source[1].

In the field of renewable energy, the capture of solar energy by photovoltaic panels in order to generate electricity is regarded one of the most attractive opportunities. The photovoltaic market is now more controversial around the world, in particular in Europe, China and the United States, due to its rapid growth prospects and the elevated levels of productivity associated.Innovations are starting to be important in Brazil, particularly after the incorporation of solar energy into the Brazilian energy matrix and the start of solar energy auction at a time when the energy sector is facing difficulties due to the decrease of

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hydroelectricity, that is basically the major energy matrix of Brazil, and the rise in electricity costs[2].

In recent decades, solar photovoltaic power research has increased, as has the number of papers in journals. The goal of this review is to address the following questions based on what's been revealed: "How has photovoltaic solar energy been addressed in scientific studies published between 1996 and 2016?" We conducted systematic literature studies for this purpose, accompanied by organized content published on photovoltaic solar energy[3].Besides the continuing introduction, the article is organized from a division designed to show the analysis method followed in the review.

Photovoltaic Solar Energy

Photovoltaic solar energy (PV) is among the world's fastest growing industries, and recent innovations have been - in terms of material usage, power use in the manufacturing of such products, system design, manufacturing techniques, and also new ideas for improving global cell performance in order to maintain with this pace.Due to the photovoltaic effect, which Becquerel first observed in 1839, the transformation of solar radiation into electric power exists. This effect happens in structural materials called semiconductor materials, that have two energy bands; the existence of electron is permitted in one of them (valence bad) and there is no existence of electron in the other, i.e. the band is absolutely 'empty' (conduction band). Silicon, the second most abundant component on Earth, is the semiconductor material that is most widely used. Its atoms are distinguished by four electrons that bind to their neighbours, forming a network of crystals[4].

The role of sunlight on the photovoltaic effect is to provide the outer surface electrons with a quantity of energy to allow it to travel from the valence band to the material's conduction band, thus producing electric power. Especially, as in the case of silicon, 1.12 eV (electro volts) is required for electrons to surpass the Distance. In addition, the semiconductor material must be in a position to absorb a significant part of the solar spectrum.

In a semiconductor, which is formed by a picture voltage, nearly all photovoltaic devices incorporate a PN junction. Such devices are considered as solar cell or photovoltaic panels [6]. The PN junction is the main part of the cell where the N-type materials is the light receiving component of the part underneath this P-type component.

Benefits of Photovoltaic Solar Energy

1. Does not have effects on the environment / Eco-friendly
2. Dependable system
3. Noiseless
4. Small operational and maintenance costs
5. Potential for mitigating greenhouse gas emissions
6. Free Supply of Power

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7. High Accessibility
8. Lower Maintenance
9. Purified Electricity
10. It is possible to draw the generations closer to customers

Drawbacks of Photovoltaic Solar Energy

1. The geographic circumstances (solar irradiation)
2. Strong dependency on emerging technologies
3. Initial costsare large
4. Requires a reasonably broad installation area
5. Restrictions to the consumer accessibility of systems

APPLICATIONS OF SOLAR PHOTOVOLTAICS

Spacecraft

Photovoltaic energy is converted into electrical energy to be utilized by the spacecraft's on-board devices. Gallium arsenide cells are the leading technique included in this process that, while getting a greater price relative to silicon cells, demonstrates great performance [7].

Water pumping

Water pumping of reservoirs and channels that are used in agriculture for plantation irrigation, animals and household use.

Lighting Street

Used to illuminate parking lots, other open spaces or signs. In the illumination framework, photovoltaic cells are usually installed or built into the pole itself and hold a rechargeable battery that drives the bulbs. For implementation there is no need to clear ditches, wires and related preparation required for conventional light sources[5].

Building integrated photovoltaic systems (BIP)

It is a series of photovoltaic systems and technology that, like roofs and facades, are built into the structure, forming part of the exterior cover. They are viewed as a practical component of the construction of the building and are architecturally incorporated into the architecture of the building. At the same time, it acts as a building envelope component and power station.

Telecommunications

It is used in the production of energy for the service of equipment like communications antennas, radio telecommunications networks, telemetry stations, public facilities, PLCs, and

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video recorders in independent telephony stations. It promises durability and a low degree of maintenance.

Water desalination

Desalination (conversion of ocean water to drinkable water) is achieved utilizing photovoltaic panel battery charged throughout the day.

Satellites

The satellite solar panels are made of solar cells mounted on the outer parts of the satellite, which can be bound to the satellite body or open and oriented towards the Sun. Presently, three-junction solar cells are being used in sequence with a germanium base (called a triple junction). They are capable of absorbing more photon than the panel mounted on Land cos of their position and create much more electricity to keep the electrical appliances working on the spacecraft [9].

Weather monitoring

The solar panel supplies the electricity needed to fuel all measurement instruments, weather monitors, transmission and communications systems[6].

CONCLUSIONS

Photovoltaic solar power, a form of renewable energy, is seen as an option to solving the problems of energy scarcity created from conventional sources. Determined by the number of publications written on this topic, there was comparatively limited involvement from the scholarly community until the mid-2000s. This empirical situation has improved since the second half of the 2000s, with a substantial rise in the number of publications written. As regards the concept of photovoltaic solar energy, it is noted that the researchers utilize standard words such as "electricity" "sunlight" "direct generation" and "conversion". This paper introduced a consensual conceptual model between such concepts that states that the energy directly derived from solar radiation transformation is photovoltaic solar energy.

In many studies, it is claimed that widespread energy usage is rising each year, and renewable energy sources, specifically photovoltaic solar technologies, can be highlighted amongst these various applications challenging for electricity generation, which have been growing rapidly in recent decades and therefore can play a significant role in attaining maximum widespread energy requirements.The tremendous number of photovoltaic systems deployed annually provides a clear description & duty of each nation to save the Planet through the use of green energy.

In several papers, it is stated that we need to promote consciousness about both the advantages of growing discovery and development of new technology in order to improve PV involvement in the renewable energy market; introduce policies and initiatives that will promote PV generation; train more skilled practitioners for this market and that the photovoltaic industry needs to boost not just the PV industry.It is proposed that those involved in solar photovoltaics engage in potential theories pertaining to techniques for the management of inverters, network communication scenarios, descriptions of photovoltaic

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devices, economic feasibility, supply chain configuration, study of obstacles and opportunities for photovoltaic and enhancing the understanding on the factors affecting photovoltaic power.

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