Review on "Performance analysis of Photovoltaic Solar Panel for Central Indian Weather Condition"

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Abstract- **The extensive growth has seen in PV manufacturing industry and installed capacity of solar power plants in the last few years. Hence, the investors seek reassurance of their investments by the long-term performance of PV power plants. The performance of PV modules and balance of systems are gradually reduced with time. But, the PV module manufacturers guarantee against this power loss at 80% of nameplate Pmp after 25 years by assuming 0.5% efficiency loss per year.**

The main goal of this review paper is to study of the PV module degradation under the open circuit and close circuit condition on the basis of previous research.

Index Terms- Photovoltaics, Solar panel degradation, IV curve, Visual inspection, fill factor, module temperature.

I. INTRODUCTION

1.1 General

All the renewable energy sources start totally from the sun. The sun's beams that achieve the external climate are subjected to ingestion, reflection, and transmission forms through the environment before achieving the world's surface. Then again, contingent upon the world's surface geography, as clarified by Neuwirth (1980), the sunlight based radiation demonstrates distinctive appearances. The rise of enthusiasm for sun oriented energy usage has occurred since 1970, basically because of the then increasing expense of energy from ordinary sources. Sun oriented radiation is the world's most bottomless and lasting energy source. The measure of sun based energy gotten by the surface of the earth every moment is more noteworthy than the energy use by the whole populace in one year. For the present, sun based energy, being accessible all over the place, is appealing for remain solitary frameworks especially in the rustic parts of creating countries.

Events of sunlight based energy progressively everywhere throughout the world in the types of wind, wave, and hydropower through the hydrological cycle give capacities to contemplate about their use, if conceivable in a split second or as stores by different transformation offices and innovations. It is likewise conceivable that in the long haul, individuals may look for the transformation of sea flows and temperature contrasts into apparent amounts of energy with the goal that the plain finished result of sun oriented radiation on the earth will be valuable for economical advancement.

1.2 Photovoltaic solar energy (solar electricity)

1.2.1 Introduction to photovoltaic solar energy

The energy of solar radiation is directly applied in mostly two procedures:

i) Direct conversion into electricity that takes place in semiconductor devices called solar cells

ii) Accumulation of heat in solar collectors.

Along these lines, don't mistake sunlight based cells for sun powered gatherers. The immediate transformation of sun oriented radiation into electricity is regularly portrayed as a photovoltaic (PV) energy change since it depends on the photovoltaic impact. When all is said in done, the photovoltaic impact implies the age of a potential contrast at the intersection of two distinct materials in light of noticeable or other radiation. The entire field of sun powered energy change into electricity is thusly indicated as the "photovoltaic". Photovoltaic truly signifies "light-electricity", since "photograph" is a come from the Greek word "phõs" which means light and "Volt" is a contraction of Alessandro Volta's (1745-1827) name who was a pioneer in the investigation of electricity. Since a layman frequently does not know the significance of the word photovoltaics, a mainstream and normal term to

allude to PV sun oriented energy is sun powered electricity.

The preferences and downsides of the PV sun oriented energy, as observed today, are abridged:

Advantages:

- Environmentally friendly
- No noise, no moving parts
- No emissions
- No use of fuels and water
- Minimal maintenance requirements
- Long lifetime, up to 30 years
- Electricity is generated wherever there is light, solar or artificial
- PV operates even in cloudy weather conditions
- Modular or "custom-made" energy, can be designed for any application from watch to a multi-megawatt power plant

Drawbacks:

- PV cannot operate without light
- high initial costs that overshadow the low maintenance costs and lack of fuel costs
- large area needed for large scale applications
- PV generates direct current: special DC appliances or inverters are needed in off-grid applications energy storage is needed, such as batteries

1.2.2 Photovoltaic (PV) system

The sun- oriented energy transformation into electricity happens in a semiconductor gadget that is known as a sun-based cell. A sun-oriented cell is a unit that conveys a specific measure of electrical power that is described by a yield voltage and flow.

In outline, the PV nearby planetary group comprises of three sections:

1) Solar panels or solar arrays,
2) Balance of system,
3) Load.

1.2.3 Photovoltaic technologies

The primary down to earth utilization of sun oriented cells was the age of electricity on the circling satellite Vanguard 1 of every 1958. These first sunlight based cells were produced using single gem silicon wafers and had effectiveness of 6 %. The space application was for quite a while the main use of sun oriented cells. The energy emergency in the seventies of the twentieth century quickened a scan of new energy hotspots for earthbound applications.

1.3 Photovoltaic applications and market

Figure 1.1 presents an outline of the diverse sun oriented cell advancements that are utilized or being produced for two primary sun oriented cell applications, in particular space and earthly applications. The change effectiveness of sun powered cells utilized in space applications is the underlying productivity estimated before the sun based cells are propelled into the space. This change effectiveness is likewise alluded to as the start of-life productivity. The present business PV frameworks in earthbound applications convert sunlight into electricity with effectiveness running from 7% to 17%. They are exceedingly solid and most makers give something like 20 years ensure on module execution. If there should be an occurrence of the thin-film sunlight based cells the best change productivity that has been accomplished in research facility is demonstrated together with the transformation effectiveness that is common for business sun oriented cells.

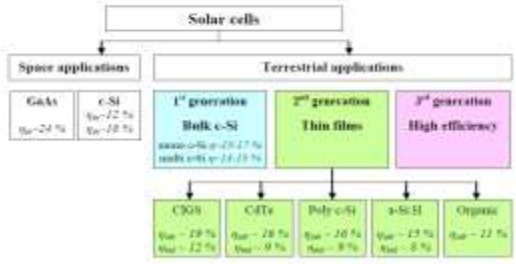

Figure 1.1 solar cell applications and of several types of solar cells used in different applications.

At present, there are four primary market areas for photovoltaic terrestrial applications:

1. Consumer products, such as watches, calculators, and lanterns.
2. Off-grid, also called stand alone, residential power systems, such as solar home systems for individual households.
3. Off-grid industrial power systems for water management, lighting, and telecommunication.
4. Grid connected PV systems that are integrated in roofs and outer walls of buildings or in noise barriers along the motorways.

1.4 Basic Operational Principles

The working rule of all today sun powered cells is basically the equivalent. It depends on the photovoltaic impact. By and large, the photovoltaic impact implies the age of a potential contrast at the intersection of two distinct materials in light of obvious or other radiation.

The basic processes behind the photovoltaic effect are:

1) generation of the charge carriers due to the absorption of photons in the materials that form a junction,
2) subsequent separation of the photo-generated charge carriers in the junction,
3) collection of the photo-generated charge carriers at the terminals of the junction.

In this case the terminals of the solar cell are short circuited and a current flow through the external circuit. This current is denoted as the short-circuit current, Isc. The Isc is also an important parameter that characterizes the performance of solar cells.

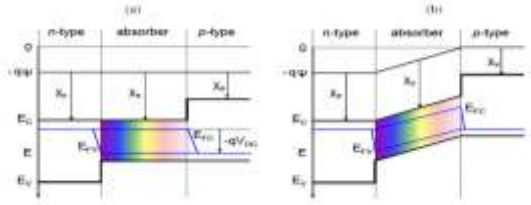

Figure 1.2. Band diagram of an idealized solar cell structure at the a) open-circuit and b) short-circuit conditions.

1.5 Faults in PV Panels

There are three main common faults that occur to PV panels. The faults are:

1. interconnect and connection faults,
2. bridge and
3. Earth fault, or shunt path development.

II-LITERATURE REVIEW

2.2 Previous Researches

Information on long haul execution and debasement of field-matured sun based photovoltaic modules is broadly perceived as vital for proceeded innovative enhancement and market certainty. It is likewise vital that such research should cover different topographical areas of the globe.

Regardless of ceaseless crusade and endeavors huge scale selections of sun based boards are yet to be appeared, basically because of absence of certainty on potential energy reserve funds. Monzur Alam Imteaz and Amimul Ahsan; 2018 shows genuine efficiencies accomplished from four houses in two Australian urban communities; Melbourne and Adelaide.

The dependability of sun based cells is an essential parameter in the structure of photovoltaic frameworks and especially for cost estimation. Sun powered cell debasement is the aftereffect of different working conditions; temperature is one of most critical components. Introduced PV modules in desert areas are subjected to different temperature changes with huge slope prompting quickened corruption. M. Boussaid et al; 2016 exhibit the impact of open-circuit condition on the debasement of PV modules. The investigation is done in the desert district of ADRAR (southern Algeria) utilizing two modules IJISEL of single-precious stone silicon.

Ahmed Bouraiou et al 2016 gives an exploratory examination of the impact of climatic conditions on the execution and debasement of crystalline silicon photovoltaic modules under Saharan condition in Adrar district in the south of Algeria. The initial segment of this investigation is centered around the examination and appraisal of UDTS 50 PV modules debasement after a long haul open air introduction to these conditions (over 12 years).

George Makrides et al; 2014 presents an examination of the yearly execution misfortune rate (PLR) of twelve diverse network associated photovoltaic (PV) advances dependent on outside field estimations. The yearly DC execution misfortune rates of the introduced PV innovations are acquired by utilizing straight relapse and established arrangement disintegration connected on the month to month DC execution proportion (PR) time arrangement more than five years (June 2006– June 2011). The PLR esteems got over the five-year time frame contrast by up to 0.65% every year relying upon the determination of the connected investigation strategy. Too known, boosting the effectiveness of photovoltaic plants is critical to expand their aggressiveness. Maturing and nearness of residue on the board surface emphatically diminishes the vitality generation, which results in huge financial misfortune. In this paper a streamlined technique for

assessing the effect of both maturing and residue testimony will be introduced.

The proposed methodology permits recognizing the misfortunes of vitality creation because of maturing of the photovoltaic boards from the misfortunes because of the nearness of residue at first glance. The technique can be executed utilizing data given by an open climate station or utilizing a reference board. Thusly an appropriate and financially savvy support procedure can be actualized. The strategy and its approval are accounted for. (Loredana Cristaldi et al; 2014)

To manage the business achievement of photovoltaic (PV) innovation it is essential to know how control yield diminishes with time. Sadly, it can take a very long time to precisely gauge the long haul corruption of new items, yet past experience on more seasoned items can give a premise to expectation of debasement rates of new items. A broad hunt brought about in excess of 2000 announced debasement rates with in excess of 1100 revealed rates that incorporate a few or all IV parameters.

Dirk C. Jordan et al; 2012 examine how the points of interest of the debasement information give pieces of information about the corruption systems and how they rely upon innovation and atmosphere zones and in addition how they influence current and voltage in an unexpected way.

In this paper, C.R. Osterwald et al; 2006 present a correlation of greatest power debasement rates of individual modules under open air conditions in Golden, Colorado. Test modules incorporate single- and polycrystalline-Si (x-Si, poly-Si), shapeless Si (a-Si, single, double, and triple intersection), CdTe, Cu-In-Ga-Se-S (CIS), and c-Si/a-Si hetero-structure, from nine distinction producers

III-CONCLUSION

The output power of PV systems deployed under field condition always degrades with time. The various stress factors experienced by PV system under outdoor condition such ageing, long term exposure, soiling, high temperature, corrosion etc. The degradation of PV systems can also be a location specific, as the stress factors experienced by the system can vary from location to location such as weather condition, humidity, moisture content, UV light exposure, thermal cycling etc.

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