

# Novel Concept of Enhancing Solar Efficiency using Solar Tree and Shockley-Queisser approach

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**Abstract:** Sun oriented essentialness is a totally versatile imperativeness advancement: it might be filled in as circled age (arranged at or near the purpose of use) or as a central station, utility-scale sun-oriented force plant (like conventional force plants). The proposed work centered over the effective use of the sunlight-based vitality utilizing the idea of the sun-oriented trees which utilizes the space in the better way and the utilization of the A-300 cells in the trees will additionally augment the effectiveness. The sun based tree will deliver the better productivity when contrasted with the institutionalized boards and the figuring of the sunlight based effectiveness is finished utilizing the Shockley-Queisser approach and found the utilization of the A-300 cells and the basic development of the sun based tree not just spared the region for planting or establishment yet in addition gives progressively sun oriented proficiency in the space gave.

**IndexTerms** – Solar Energy ,Solar Efficiency , Shockley-Queisser approach, Solar Tree.

## I. INTRODUCTION

Sun oriented vitality is that the most extravagant vitality resource on Earth. It will in general be gotten and used during a couple of elective ways, and as a practical force source, might be a huge bit of our immaculate vitality future. The sun achieves very for our planet than essentially give light during the daytime – each particle of sunlight (called a photon) that lands at Earth contains vitality that powers our planet. sun oriented force might be a conclusive source accountable for everything of our atmosphere frameworks and vitality sources on Earth, and enough radiation hits the outside of the earth each hour to theoretically fill our overall vitality prerequisites for about a whole year. [1]

Our sun, practically like any star inside the astronomical framework, takes after a major nuclear heap. Some place down inside the Sun's middle, nuclear mix reactions produce gigantic proportions of vitality that transmits outward from the Sun's surface and into space as light and warmth. sun based vitality is frequently harnessed and changed over to usable vitality using photovoltaics or sun based warm specialists.

The sun gives vitality in two particular ways:[1]

- It gives heat tapped by mirrors that emphasis light on an authority that contains a fluid which lands at temperatures up to 1,000 °C. the warmth changes the fluid in steam which moves a turbine in conclusion conveys power.
- It gives light that is changed over into power through photovoltaic sun oriented sheets. Photovoltaic sheets are encircled by social events of cells or sun based cells that convert light (photons) into power (electrons).

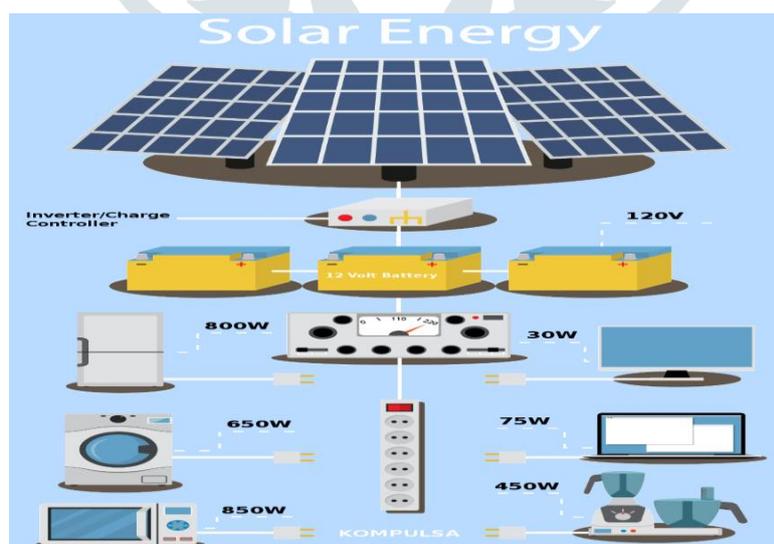


Figure 1. STPI Centers

## II. LITERATURE SURVEY

H. Aoki, [1] In this assessment, a creamer sun based gatherer was been planned to simultaneously deliver warm water and air using finned tubes for the glow ingestion plane. Finned tubes are much of the time used in heat exchangers. An assessment was driven both in the examination office using a phony sunlight based light source and the outside which uses direct sunshine. The outside preliminary conveyed similar characteristics. Most prominent the general sun based combination efficiency was 74-79%. Both the water and air temperatures extended by about 5degC. So this creamer sun oriented gatherer would wind up being a sensible water warming and supply contraction for generally populace use.

S. P. Filippov and M. D. Dilman, [2] Large scale introduction of sunlight based and wind parks into power cross sections realizes negative results. That is generally a result of the stochastic thought of the force made by the parks. Directly, creators have reviewed the negative impacts of the sun based and wind park introduction into the force grid of the South of Russia.

J. Dąbrowski, E. Krac and K. Górecki [3] In the paper another littler model of the sun based cell is proposed. This model is given for SPICE and it considers electrical and warm ponders saw at the present time and the effect of the point between the outside of this cell and the light emission on its properties. The kind of the clarified model is depicted. The estimation set-up used for affirmation of this model is shown. A couple of outcomes of estimations and figurings gained with the usage of the proposed model are showed up.

S. N. Darovskikh, N. V. Vdovina and D. S. Piskorskiy [4] The article shows the main hypothesis of conspicuous verification of darken parameters of low-repeat fluctuations of the cosmic microwave establishment. Its essence contains in the manner that during the time spent advancement of animals influenced by microwave radiation of the sun traits of its low-repeat fluctuations are reflected in the crucial properties of the neural arrangement of rule of the body and the individual, explicitly.

E. N. Polyakhova, V. N. Starkov and N. A. Stepenko [5] Solar cruising is an exceptional kind of transport drive that uses the free and vast stock of photons from the Sun. The assessment of close the-Sun space properties is of the remarkable sensible interest. It will in general be recognized by the help of sun oriented cruising.

K. Cho et al [6] In this paper, creators investigate the effect of the phosphoric destructive obsession with the presentation of laser oped specific maker sun based cells with Ni/Cu plated contacts made at Shinsung Solar Energy. Through an improvement, the phosphoric destructive center apparently diminishes cell efficiency, and using a gathering of 20%, an independently insisted viability of 19.4% is practiced..

## III. PROPOSED WORK

To depict the viability of a sun-based cell, it isn't adequate to measure what voltage and current it produces without load. While assessing the voltage with a voltmeter authentically over the sunlight-based cell connects with, you measure VOC, which is the voltage of the purged circuit.

In that capacity, this voltage is the most outrageous voltage the sunlight-based cell is prepared for passing on. At a higher weight, the voltage will drop until the store is immensely high. The condition came to by boundless weight is a short out of the system and is certainly the state you measure when you partner an ammeter to the sun oriented cell to evaluate the current. [3]

Thusly, conditions under which proficiency is evaluated must be carefully controlled in order to differentiate the introduction of one contraction with another. Terrestrial sun based cells are evaluated under AM1.5 conditions and at a temperature of 25°C. Sun powered cells expected for space use are evaluated under AM0 conditions. Progressing top proficiency sun based cell results are given in the page Solar Cell Efficiency Results.

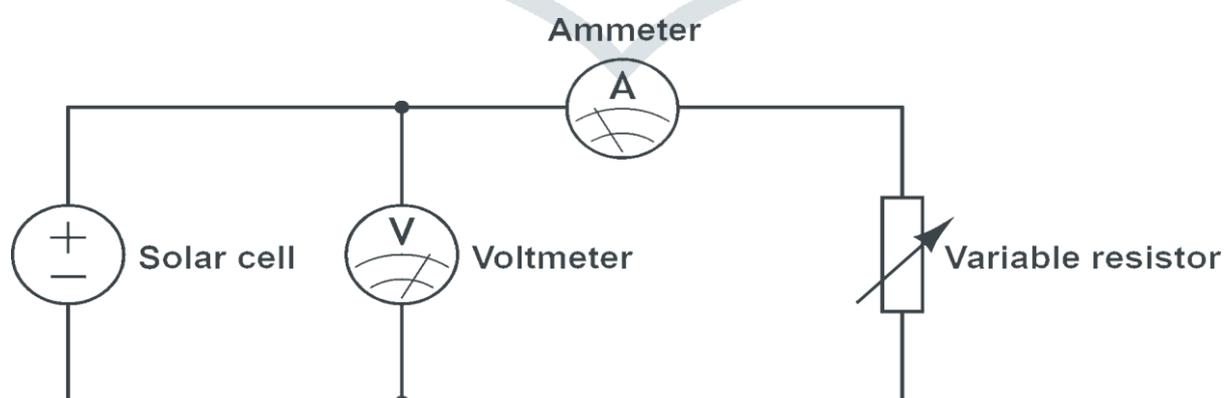


Figure 2. STPI Centers

Sunlight based SPV methodology is apparently the primary viable strategy for tapping sun for practical purposes anyway it eats up enormous proportion of land surface. Land is the best crisis of Earth today. Turning Solar Power Tree is the perfect response for the subject of availability of the land later on - It consumes only 1% of room ate up by normal frameworks. The "Sun powered Power Tree" Technology made in CSIR-CMERI for auto following of sunlight based force expending least land space.

Table 1. Efficiency Evaluation

Component	Description of component	Capacity
Load Estimation	Total Estimated Load	1.75kWh/day.
PV Array	Capacity of PV array	4.15kW
	Number of modules in series	2
	Number of modules in parallels	6
	<b>Total number of modules</b>	12
Battery Bank	Battery bank capacity	325Ah
	Number of batteries in series	0

Shockley–Queisser limit

In material science, the Shockley–Queisser limit (otherwise called the point by point balance limit, Shockley Queisser Efficiency Limit or SQ Limit, or in physical terms the radiative efficiency limit) alludes to the most extreme hypothetical efficiency of a solar cell utilizing a solitary p-n intersection to gather power from the cell where the main misfortune component is radiative recombination in the solar cell. It was first determined by William Shockley and Hans-Joachim Queisser at Shockley Semiconductor in 1961, giving a most extreme efficiency of 30% at 1.1 eV.[1] This first count utilized the 6000K dark body range as an estimate to the solar range. Ensuing estimations have utilized estimated worldwide solar spectra (AM1.5G) and incorporated a back-surface mirror which builds the most extreme efficiency to 33.7% for a solar cell with a bandgap of 1.34 eV,[2]. The breaking point is one of the most crucial to solar vitality creation with photovoltaic cells, and is viewed as one of the most significant commitments in the field.[3]

The point of confinement is that the most extreme solar transformation efficiency is around 33.7% for a solitary p-n intersection photovoltaic cell, accepting normal daylight conditions (unconcentrated, AM 1.5 solar range), and subject to different provisos and presumptions talked about underneath.

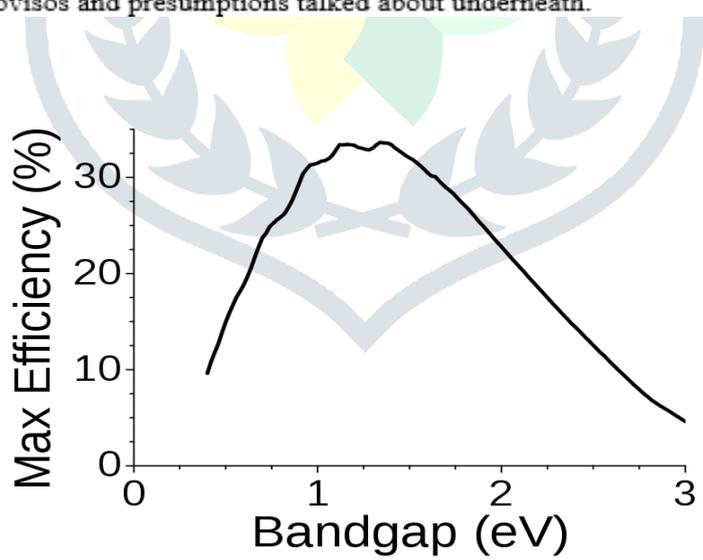


Figure 3. Shockley–Queisser limit

## IV. IMPLEMENTATION AND RESULT ANALYSIS

The execution work is performed on the Matlab r2011a. The reenactment of the base managerial work and the proposed work is done by organizing the GUI. The GUI part of the matlab just let us to make the screens by pulling the controls on the workspace. The structures which we make in the matlab are known as the figures. MATLAB® applications square measure autonomous MATLAB programs with interface front finishes that automate an errand or count. The interface regularly contains controls, for instance, menus, toolbars, gets, and sliders. Diverse MATLAB things, for instance, Curve Fitting Toolbox™, Signal system Toolbox™, and structure Toolbox™ unite applications with custom UIs. You'll have the choice to in like way develop your own one of a kind custom application, together with their relating UIs, for others to utilize.

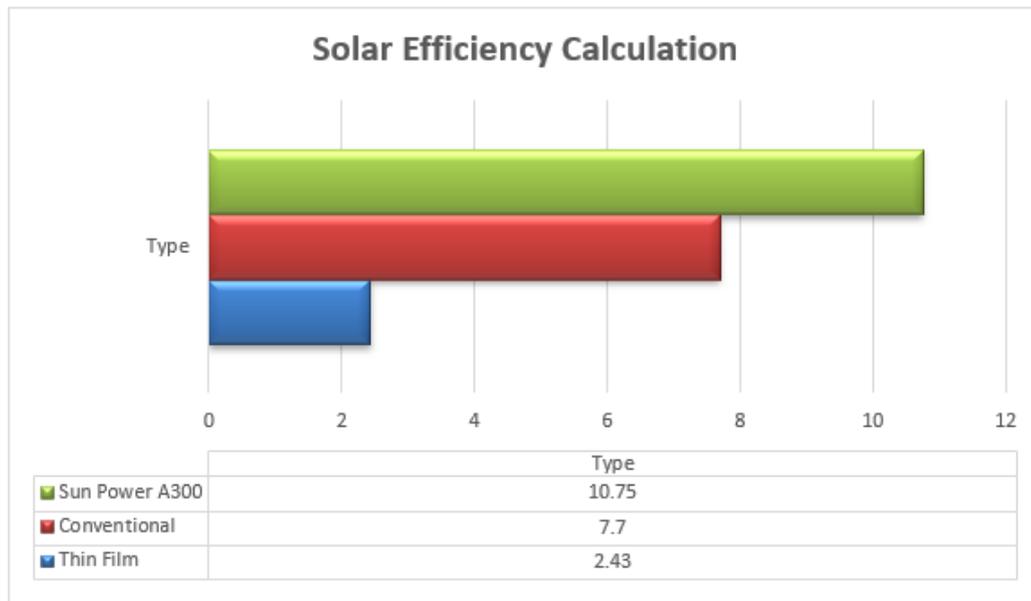


Figure 4. A-300 Solar Efficiency

## V. CONCLUSION

With the occasion of the decrease in the wellsprings of the non-renewable energy sources, its essential to move over the elective assets. The sun-oriented vitality is the prime wellspring of the sustainable power source and using that in the compelling way will take care of the issues related on the vitality prerequisites. The proposed work centered over the effective use of the sun based vitality utilizing the idea of the sun oriented trees which utilizes the space in the better way and the utilization of the A-300 cells in the trees will additionally expand the effectiveness. The sun based tree will deliver the better effectiveness when contrasted with the institutionalized boards and the estimation of the sun oriented productivity is finished utilizing the Shockley-Queisser approach and found the use of the A-300 cells and the auxiliary development of the sun based tree not just spared the territory for planting or establishment yet in addition gives increasingly sunlight based proficiency in the space gave

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