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USE OF SOLAR ENERGY IN ELECTRICITY GENERATION

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Abstract-The sunis considered as prime source of energy .The sun is a very large and extreme source of energy which is free of cost . Availability of the resource is subject to seasonal and geographical variation and is affected by climatic changes. Therefore, the use of solar energy involves the use of large area devices ,generally combined with energy storage systems . The presentation of gadgets relies upon the warm and optical properties of materials. Locales of the world which hold the biggest potential for the application of sun oriented energy are the distant provincial regions which are additionally economically underdeveloped. Therefore, a high proficiency and minimal effort of gadgets are two significant concerns to their application.

The adequacy of sun powered energy as a feasible fuel source is hampered by different elements including significant expense of segments and brought working productivity due down to incomplete concealing. Incomplete concealing lessens the yield of the concealed piece of the board as well as different boards associated with the equivalent photovoltaic (PV) cluster. This paper talks about the advantages of utilizing a detour diode based voltage drop estimation and most extreme force point following (MPPT) framework in the force age of a PV exhibit. A calculation to track down the worldwide most extreme force in limited ability to focus time is additionally introduced. MATLAB is then used to play out the recreation of the proposed calculation on a 3×3 photovoltaic cluster and the outcomes are checked against real open air tests to test the legitimacy of the proposed technique. The proposed strategy holds in any event, when reached out to any exhibit blends for commonsense applications. There are two types of solar energy devices: (i) the thermal devices which make use of solar energy in the form of heat energy and (ii) the photovoltaic (PV) devices which convert solar energy directly to DC electrical power. Both type of devices can either be concentrating or non-concentrating.ie .either the solar energy collected from a large area is focused on to a small area of the device or it is used as is received directly on to the device. The concentrating devices must generally track the motion of the sun and non-concentrating

ones are installed in a fixed position the orientation of which may or may not be adjusted periodically .The shadowing of devices effects their performance and efficiency adversely

Index Terms- Bypass diode , Maximum power point tracking (MPPT) , Photovoltaic (PV) , Partial shading , Algorithm , Concentrating , Direct Current (DC) Solar energy , Maximum power point tracking , Photovoltaic, Renewable energy

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I. INTRODUCTION

Nowadays, due to the decreasing amount of renewable energy resources and increasing amount of electricity ,the last ten years become more important for per watt cost of solar energy device. It is definitely set to become economical in the coming years and growing as better technology in terms of both cost and applications. Everyday earth receives sunlight above (1366W approx.) This is an unlimited source of energy which is available at no cost. The major benefit of solar energy over other conventional power generators is that the sunlight can be directly into solar energy with the use of smallest photovoltaic (PV) solar cells.
The measure of sunlight based arriving at the earth is in excess of multiple times the current energy utilization by man. This reasourse is bigger than all the elective force sources at present accessible. With the quickly developing populace of humanity, the expected exhaustion of petroleum derivatives, the perils related with contamination, for example, corrosive downpour and an Earth-wide temperature boost and the dangers related with utilizing atomic force age , this reasources can presently don't be disregarded.

The warming impact of sunlight based energy can obviously be utilized to straightforwardly warm water for homegrown applications and inactively heat structures. Aberrant differential warming of the earth delivers the breeze which thus can create wave energy.

There have been a lot of examination exercises to join the Sun's energy interaction by creating sun based cells/boards/module with high changing over structure. In this examination paper the immediate change of sun oriented energy into power utilizing 'photovoltaic (PV) sun based cells' is assessed. PV, the immediate discussion of the daylight into power is the most effective course of force age just in light of the fact that the quantity of steps required for discussion is a base. Additionally power is the most helpful type of energy accessible.

PV age enjoys numerous other upper hands over other type of force age. It is openly and helpfully accessible wherever requiring no primary stockpile, it is quiet in activity and can be outwardly subtle, it very well may be arranged and introduced surprisingly fast as opposed to requiring the at least ten years expected to fabricate a customary force plant , the innovation I snon dirtying (any harmful materials utilized in assembling can be controlled utilizing existing mechanical strategies) and it is moduler, with the end goal that the age limit can be extended effectively and any breakages handily supplanted.India is fortuitous in being blessed by an abundance of solar energy. It is also fortunatein having some of the best solar energy scientists in the world. India has an opportunity to use this vast potential to lead the world In supplying its population with clean, nonpolluting, affordable and renewable energy.
Professor Jayaramareddy is one of the best known, accomplished and inspiring scientists and teacher of PV solar systems in India. the mostadvantages of solar energy is that it is free reachable to common people and available in large quantities of supply compared to thatof the price of various fossil fuels and oils in the past ten years. Moreover, solar energy requires considerably lower manpowerexpenses over conventional energy production technology.
Solar energy comes from an abundant source, and is available in direct for as solar radiation and in indirect form as wind, biomass, etc. the sun deposits 120000 TW of radiation on the surface of earth. So, there is clearly enough solar power available if an efficient means of harvesting solar energy is developed. The total energy needed by the humans in 2020 is about 13 TWY and the average consumption per capita is about 2 KWY in

that also some receives large energy that's are US:11 KWY , EU:5 KWY , china:0.8 KWY , India:0.3 KWYThe richest 20% of the world population use 55% of the primary energy and their pro capita consumption is almost five times as much as for the rest of the world population.The current biggest drawback of wider usage of photovoltaic (PV) is the higher price of electricity produced about –for 10 KW solar system price is approx.. RS.10,00,000 in india . which is not competitive with commercial grid-electricity. However ,it is is expected to fall progressively and minimized further.
of nuclear power. Therefore nuclear energy, in spiteof its hune potential. is surrounded by some controversy though no scientific evidenceIf one considers the installation of power-related photovoltaic plants globally, around 80% of all large photovoltaic plants are installed in Europe (700 MWp). The share of the USA accounts for about 16% (142 MWp) and that of Asia for 4% (34 MWp). At present Germany hosts nearly 50% of the world's installed photovoltaic power, hut its market share was decreasing slowly very recently (Lenardic and Hug2008). Primary PV world markets are still Germany with about 45% of the installed power, followed by Spain (28%) and the USA with a 16% market share.

II. SOLAR ENERGY

The sun is considered as prime source of energy. The energy radiated from the sun can be focused on a small area by the reflectors can produce heat which is used for boiling the water for production of steam.
The generated steam is used for rotate the steam turbine which is connected to generator (mechanical energy converted into electrical energy), electricity is produced by the solar energy in this way.
We can also produce electricity by PV cells directly (solar energy converted into electricity) , solar cells are made of silicon and gallium arsenite this converts solar energy directly into the electrical energy but efficiency of this cells arevery less about 25%.
Solar collector's is a part of generation af electricity from sun radiation it is for concentrate solar radiation which should be converted in electric energy by solar collector.

2.1 TYPES OF SOLAR GENERATION PLANTS

Photovoltaic systems/solar cell system: which produce electricity directly from sunlight.The basic principle behind this technology is similar to what we see in clock or calculators that are powered by the sun! The semiconductor materials used in these solar energy systems absorb sunlight which creates a reaction that generates electricity. In this power plant there is installed capacity PV panels which directly generates electricity which is further stored in batteries and aiso given to DC loads , after that the remaining energy is converted to AC(alternating current) through inverters and pass on the grid, then grid through consumers.

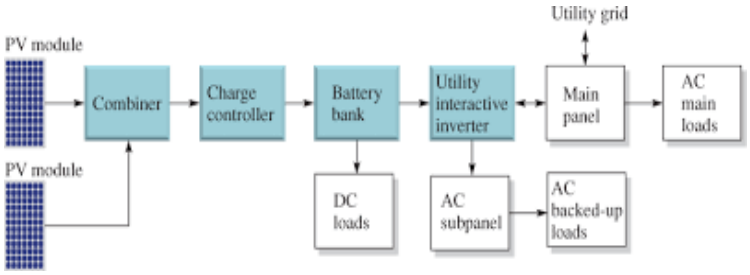


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Fig.1-Images of some PV(photovoltaic) panels.

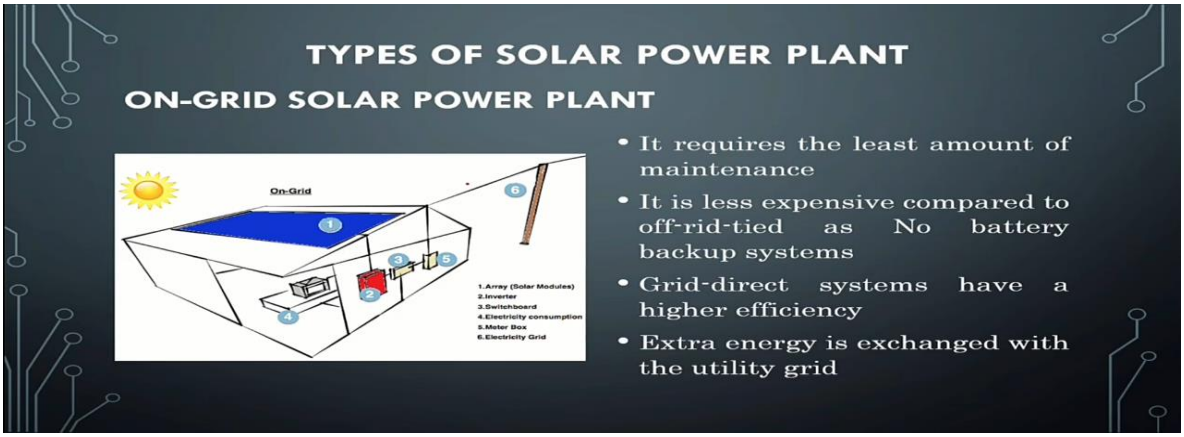
Block diagram of whole PV setup



Fact:
There have been major improvements in the efficiency of this technology particularly in terms of capturing and converting sunlight. For example, the first solar cells, built in the 1950s, had efficiencies of less than 4%. Today's technology, on average, offers efficiencies of around 15%

a) Types of grid connection of PV panels

1) On grid solar power plant : In this grid system the Photovoltic cells are converts sun rays/radiation's into electricity which is converted to AC(alternating current) by inverter and then required loads after that through masterbox electricity is send to electricity grid.



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Fig. 2- On-Grid solar power plant with it's advantages.

2) Off-grid solar power plant :In this system the solar module situated at the top of the house for the sun ray's/radation's which converts it into electricity and stored in batteries for night use, inverter is there for alternating current and supply the following loads. There is no connection with the electricity grid.

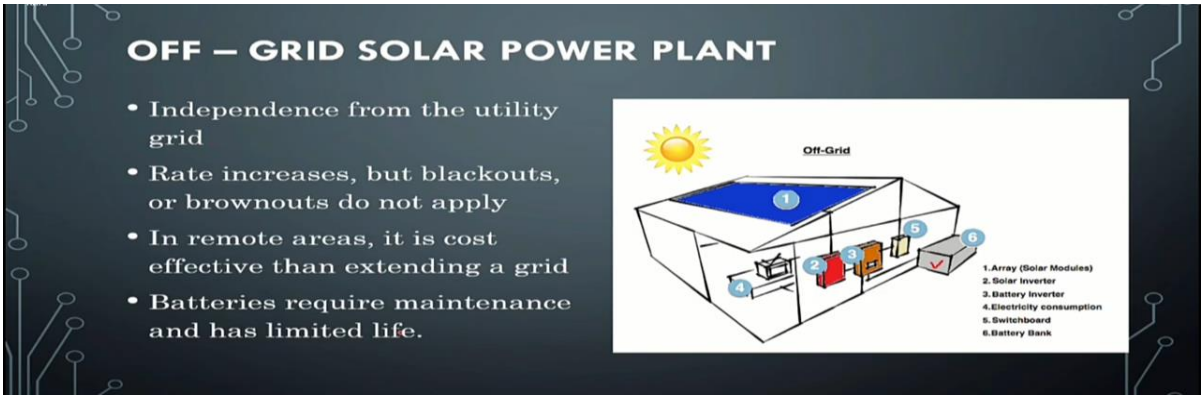


Fig.3- Off-Grid solar power plant with it's advantages.

3) Hybrid solar power plant : In this system there is solar PV module is arrange on roof top from which electricity is generated and which is stored in the batteries and also used it by inverting it to alternating current for required loads. further electricity is also given to the grid.

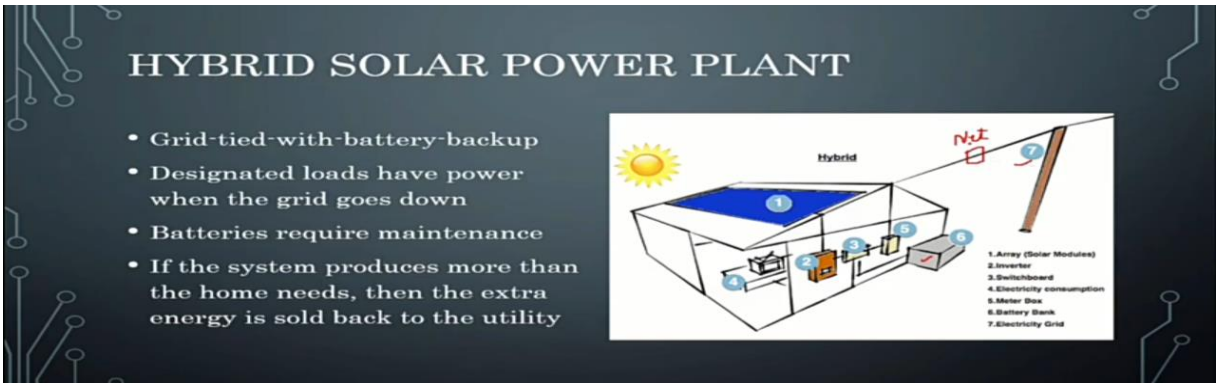


Fig.4- Hybrid solar power plant with it's advantages.

i. Solar power plantsAs most of us know, most power plants use non-renewable fossil fuels to boil water.The steam from the boiling water makes a large turbine rotate which in turn activates the

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generator to produce electricity. This way of generating electricity is bad for both the environment and our health given the emission of greenhouse gases and air pollutants from the burning of fossil fuels.However, the good news is that a new generation of power plants is being introduced which rely on solar power! These plants use the sun as a heat source, and they can do so in three different ways:

a. Parabolic-trough systems capture the sun's energy through long rectangular, curved mirrors that are tilted toward the sun. In this way, they help focus sunlight on a pipe that contains oil. The oil is heated and used then used to boil water in a conventional steam generator to produce electricity.

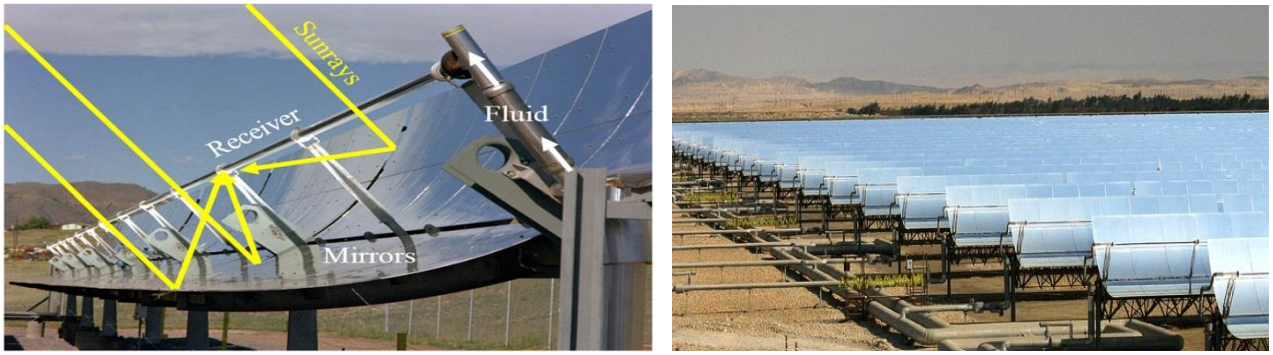


Fig5.-Parabolic trough solar power plant.

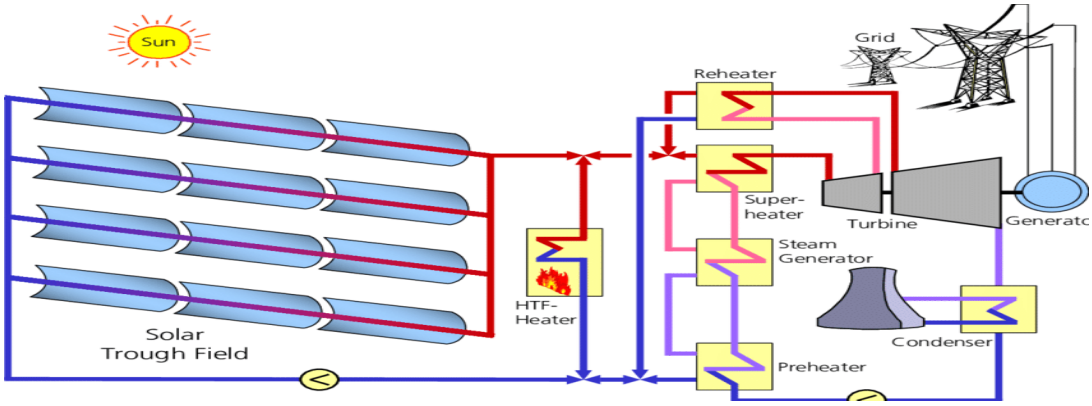
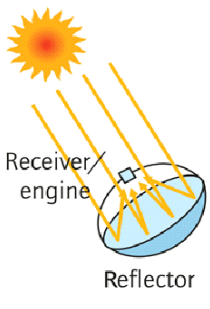


Fig.6-Principle of parabolic trough solar power plant/block diagram.

b. A dish/engine system uses a mirrored dish resembling in shape a very large satellite dish which collects and concentrates the sun's heat onto a receiver. This receiver absorbs the heat and transfers it to the fluid within an engine. The heat causes the fluid to expand against a piston or turbine and produces mechanical power. This power is used to run a generator or alternator to produce electricity.





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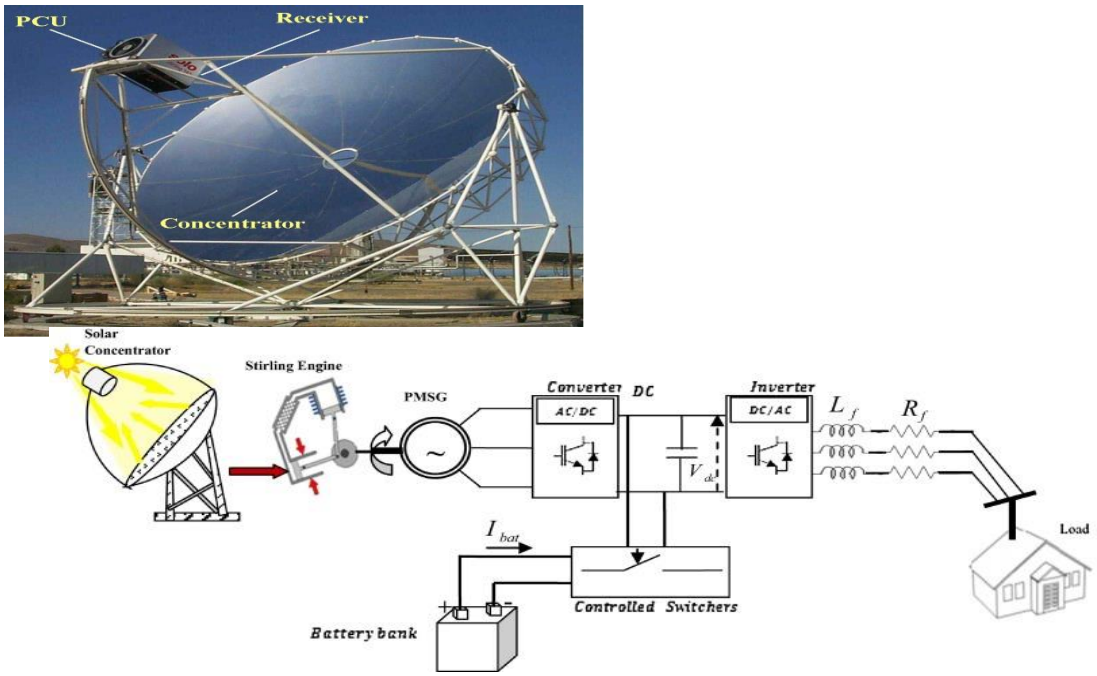
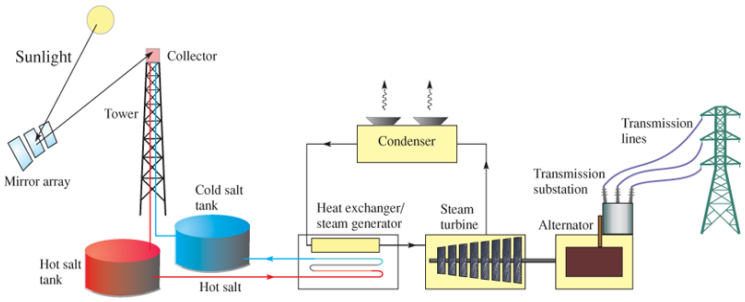


Fig.7-.Dish/engine type concentrating solar power plant and block diagram.

c. A power tower system uses a large field of mirrors to concentrate sunlight onto the top of a tower, where a receiver containing molten salt sits. The salt's heat is used to generate electricity through a conventional steam generator. Molten salt retains heat efficiently, so it can be stored for days before being converted into electricity. That means electricity can be produced on cloudy days or even several hours after sunset.





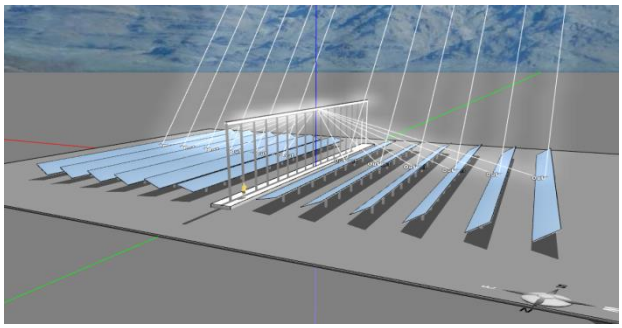


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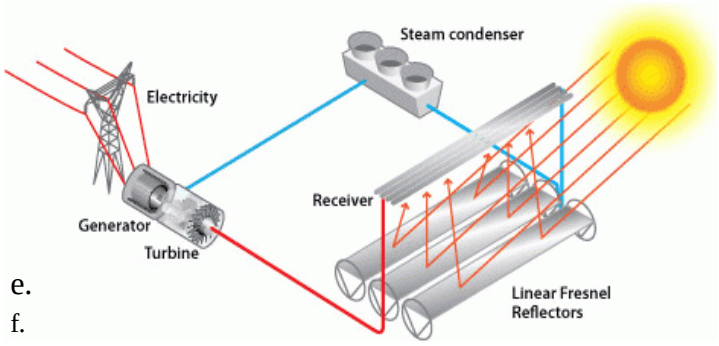
Fig.8- Concentrating tower solar power plant / Central receiverpower system and block diagram.

d. Fresnel type solar collector:The Fresnel Collector is a linear concentrating, solar thermal collector optimized for industrial applications. It can provide heat at up to 400°C and operate with pressures of up to 120 bars. Besides being operated with water, thermal oil or high-temperature glycol, it can also generate steam directly. Due to its modular design, the system can be scaled up from a 500 kW to 30 MW.

Direct solar radiation is reflected on several rows of single-axis tracking mirrors on to a stationary receiver. This consists of a highly efficient vacuum tube with selective coating. The heat is collected in this absorber tube and fed to the application by means of a heat transfer medium. A part of the sun light reflected by the primary mirrors hits one of the secondary mirrors positioned above the absorber and is reflected from there on to the absorber.







e.



f.

Fig 10-.Fresnel lens of light house.

Fig.11-.Fresnel type concentrating solar power plant.

ii. Active and Passive solar heating : It is generally uses in houses, These materials heat up during the day and slowly release the heat at night when heat is most needed. Other design features such as a sunspace, which resemble greenhouses, concentrate a lot of warmth which with the right ventilation can be used to heat an entire building Passive solar heating A further way that solar power can be harnessed is through the method of passive solar heating and daylighting. This is not

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a new concept – indeed, ancient civilisations such as the Anasazi Indians in Colorado had developed passive solar design in their dwelling . The impact of the sun is easy to understand: step outside on a warm sunny day and you can feel the sun. With proper design, buildings can also "feel" the sun's energy. For example, south-facing windows will receive more sunlight while buildings can also incorporate materials such as sunlit floors and walls that absorb and store the sun's heat.



Fig 12-.Active and Passive solar heating.

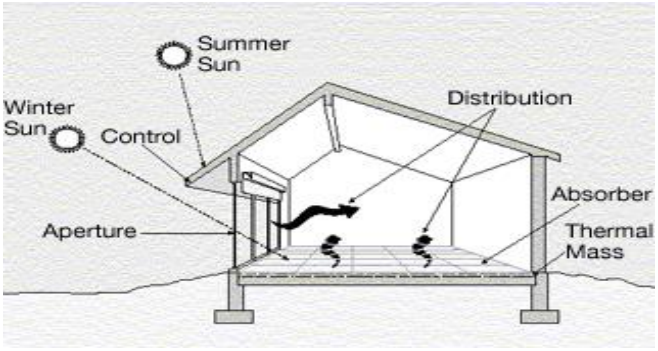
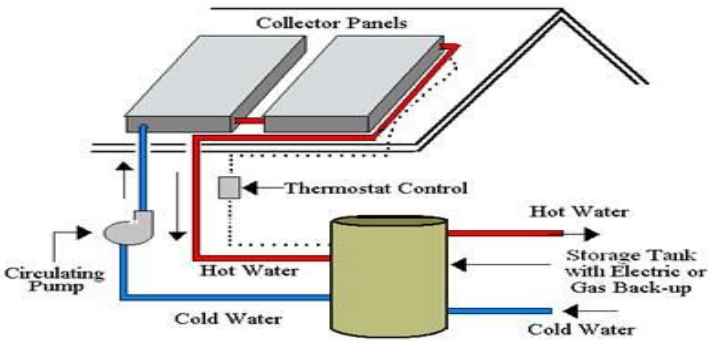


Fig 13.-Principle of Passive Solar heating.



Active Solar Water Heating System

III. THERE ARE SOME UPGRATED VERSIONS OF SOLAR PANELS

1. Features of standard c-silicon cells
2. Progress in cell efficiency
3. Mono-crystalline Si solar cells

   Buried contact solar cells ,Passivated emitter, rear locally diffused (PERL) cell ,HIT solar cell, Interdigitatcd back contact (IBC) solar cells, Industrial mono-Si solar cells
4. Multi (poly)crystalline silicon solar cells

EWT and MWT polycrystalline Si cell, Polycrystalline buried contact solar cells , EFG and SRG techniques, PLUTO multi-crystalline Si ¡nodules

5. Materials and processing
6. Amorphous silicon solar cells

   Overview of technology deveIomenta-Si:H thin film solar cells, Microcrystalline (iic-)Silicon thin film solar cells, Tandem and multi-junction a-Si:H cells, Fabrication oía-Si thin film modules ,a-Si/iic-Si tandem solar cell, Turnkey systems for a-Si solar cell module production

7. Future for crystalline silicon solar cells
8. Polycrystalline CIGS and CdTe thin film solar cells

   Highlights of CIGS and CdTe technologies, CIGS thin film solar cells, Absorber layer deposition, State-of-the-art technologies, Band gap engineering of absorber (CIGS) layer, Novel absorber layers, Alternative buffer layers, Fabrication of CIGSS modules, Flexible CIGS solar devices, Vacuum-free deposition, CdTe thin film solar cells, CdTe cell structure elements, Standard module fabrication, Industrial CdTe modules, Flexible CdTe solar cells, Challenges to be addressed, Polycrystalline TF multi junction solar cells

IV. CONCLUSION

From this research we can conclude that we should go for renewable energy source that is solar energy for the fulfillment of electricity. For the every human being in a affordable price. we have to take care of our environment from destroying it by replace it in a clean energy.

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