

STUDENT RESEARCH MINOR PROJECT

IMPORTANCE OF SOLAR PANELS

By

III Bsc Students



Under the guidance of

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(Accredited By NAAC with 'A' Grade)

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WGD.AP

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DECLARATION

I hereby declare that the work describe in this student Minor Research Project has been carried out entirely by B.SC Students in the Department of Physics Sri Y N College Narsapur and further that it has not been submitted earlier either wholly or in part to any University or Institution .

III BSC STUDENTS

Name of the students

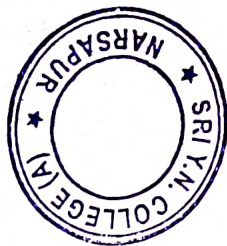
Signatures

1. M.Durga Prasad
2. M.L.Vara Prasad
3. P.Koteswara rao
4. P.Vijay
5. CH.Rohith
6. N.P.Chandra Shekhar
7. K.Sai Manikanta
8. N.Satish
9. A.Sravani
10. K.Bhavani
11. K.Jyothika
12. P.Kalyani
13. K.Durga Bhavani
14. G.Reni Shameera
15. M.A.N.Srinadh

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CERTIFICATE

This student Minor Research Project described in this Project has been carried out by 3rd Bsc students under the guidance of Department of physics . I certify that it is a bonafied work .The work is original and has not been submitted for any other institution .



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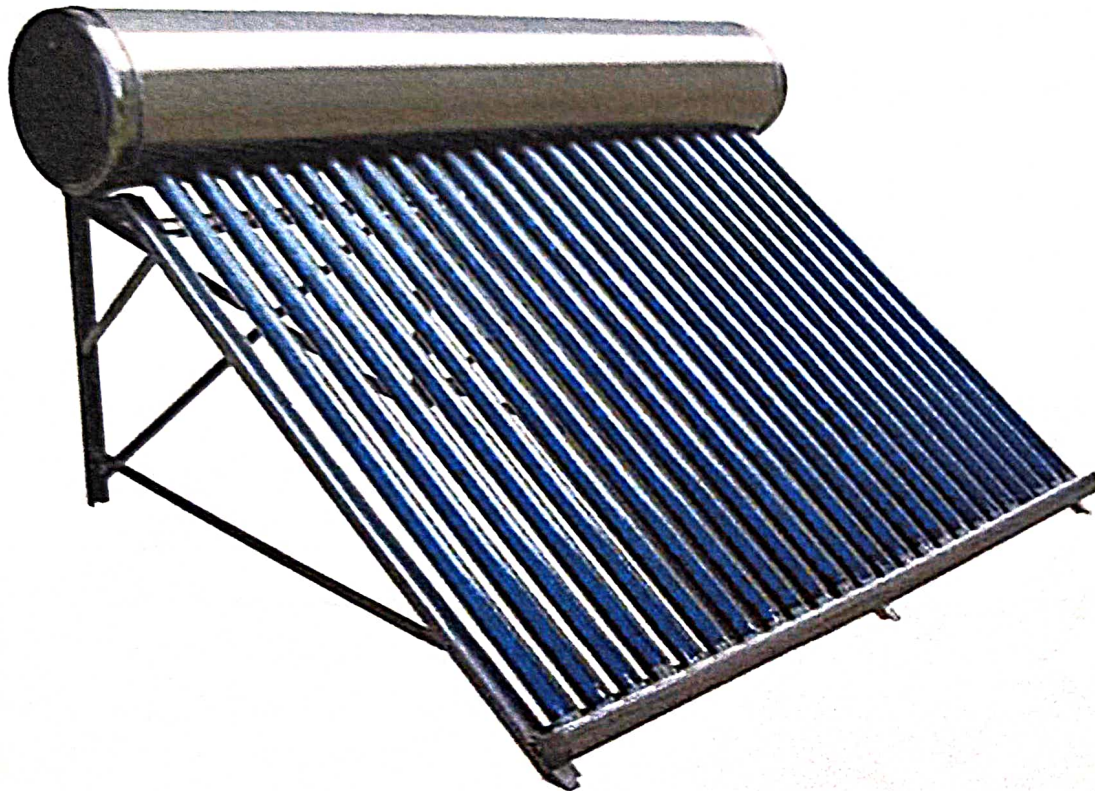
4.USES OF SOLAR ENERGY

Solar power

Solar power is the conversion of renewable energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Photovoltaic cells convert light into an electric current using the photovoltaic effect.^[1] Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight to a hot spot, often to drive a steam turbine.



(A) SOLAR WATER HEATING:



A solar water heating unit comprises a blackened flat plate metal collector with an associated metal tubing facing the general direction of the sun. The plate collector has a transparent glass cover above and a layer of thermal insulation beneath it.

The metal tubing of the collector is connected by a pipe to an insulated tank that stores hot water during cloudy days. The collector absorbs solar radiations and transfers the heat to the water circulating through the tubing either by gravity or by a pump.

This hot water is supplied to the storage tank via the associated metal tubing. This system of water heating is commonly used in hotels, guest houses, tourist bungalows, hospitals, canteens as well as domestic and industrial units.

(B) SOLAR HEATING OF BUILDINGS:



Solar energy can be used for space heating of buildings in many ways namely:

(a) Collecting the solar radiation by some element of the building itself i.e. solar energy is admitted directly into the building through large South-facing windows.

(b) Using separate solar collectors which may heat either water or air or storage devices which can accumulate the collected solar energy for use at night and during inclement days.

When the building requires heat then from these collectors or storage devices, the heat is transferred by conventional equipment such as fan, ducts, air outlets, radiators and hot air registers etc. to warm up the living spaces of a building.

When the building does not require heat, the heated air or water from the collector can be moved to the heat storage device such as well insulated water tank or other heat holding material. For inclement days, an auxiliary heating system using gas, oil or electricity is required as a backup system.

(B) SOLAR-DISTILLATION:



In arid semi and or coastal areas there is scarcity of potable water. The abundant sunlight in these areas can be used for converting saline water into potable distilled water by the method of solar distillation. In this method, solar radiation is admitted through a transparent air tight glass cover into a shallow blackened basin containing saline water.

Solar radiation passes through the covers and is absorbed and converted into heat in the blackened surface causing the water to evaporate from the brine (impure saline water). The vapors produced get condensed to form purified water in the cool interior of the roof.

The condensed water flows down the sloping roof and is collected in the troughs placed at the bottom and from there into a water storage tank to supply potable distilled water in areas of scarcity, in colleges, school science laboratories, defense labs, petrol pumps, hospitals and pharmaceutical industries. Per liter distilled water cost obtained by

D) SOLAR-PUMPING:



In solar pumping, the power generated by solar-energy is utilized for pumping water for irrigation purposes. The requirement for water pumping is greatest in the hot summer months which coincide with the increased solar radiations during this period and so this method is most appropriate for irrigation purpose. During periods of inclement weather when solar radiations are low then the requirement for water pumping is also relatively less as the transpiration losses from the crops are also low.

(E) SOLAR DRYING OF AGRICULTURAL AND ANIMAL PRODUCTS

This is a traditional method of utilising solar energy for drying of agricultural and animal products. Agricultural products are dried in a simple cabinet dryer which consists of a box insulated at the base, painted black on the inner side and covered with an inclined transparent sheet of glass.

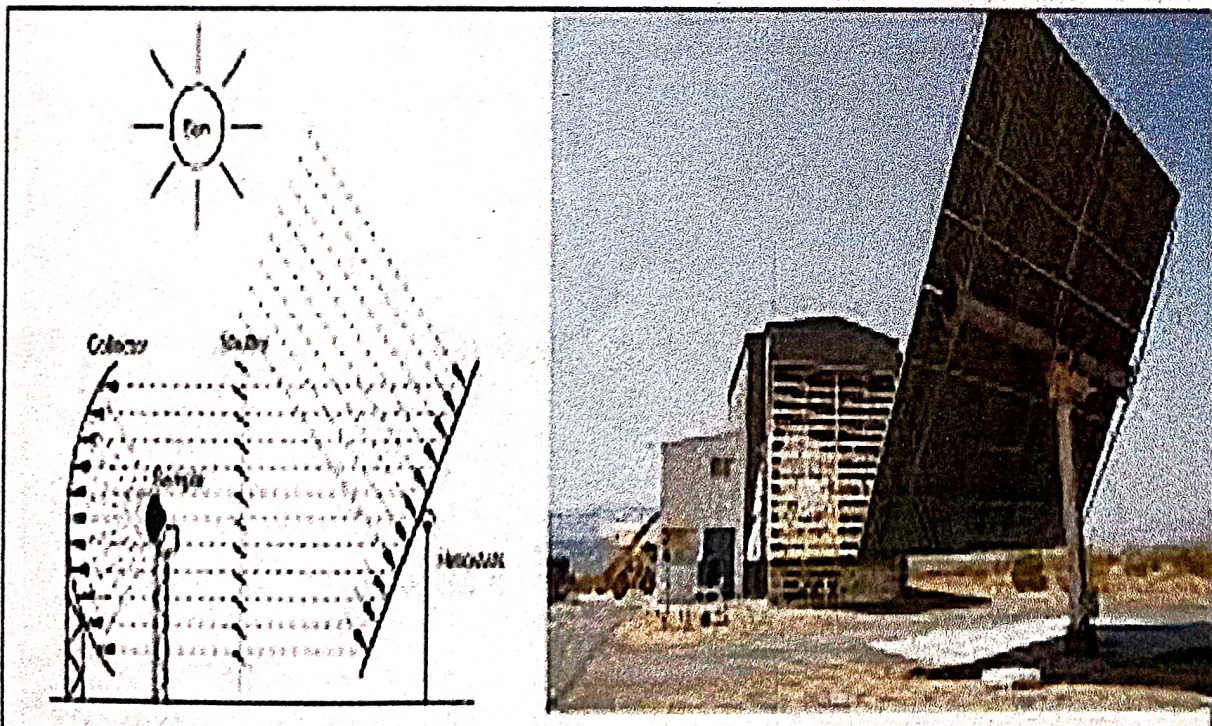
At the base and top of the sides ventilation holes are provided to facilitate the flow of air over the drying material which is placed on perforated trays inside the cabinet. These perforated trays or racks are carefully designed to provide controlled exposure to solar radiations.

Solar drying, especially of fruits improves fruit quality as the sugar concentration increases on drying. Normally soft fruits are particularly vulnerable to insect attack as the sugar content increases

on drying but in a fruit dryer considerable time is saved by quicker drying —minimizing gap the chances of insect attack.

The present practice of drying chilies by spreading them on the floor not only requires a lot of open space and manual labour for material handling but it becomes difficult to maintain its quality and taste unless drying is done in a controlled atmosphere. Moreover, the products being sun dried very often get spoiled due to sudden rains, dust storms or by birds. Besides, reports reveal that it is not possible to attain very low moisture content in the sun-dried chilies

(F) SOLAR FURNACES:



In a Solar furnace, high temperature is obtained by concentrating the solar radiations onto a specimen using a number of heliostats (turnable mirrors) arranged on a sloping surface. The solar furnace is used for studying the properties of ceramics at extremely high temperatures above the range measurable in laboratories with flames and electric currents.

Heating can be accomplished without any contamination and temperature can be easily controlled by changing the position of the material in focus. This is especially useful for metallurgical and chemical operations. Various property measurements are possible on an open specimen. An important future application of solar furnaces is the production of nitric acid and fertilizers from air.

(G) SOLAR COOKING:



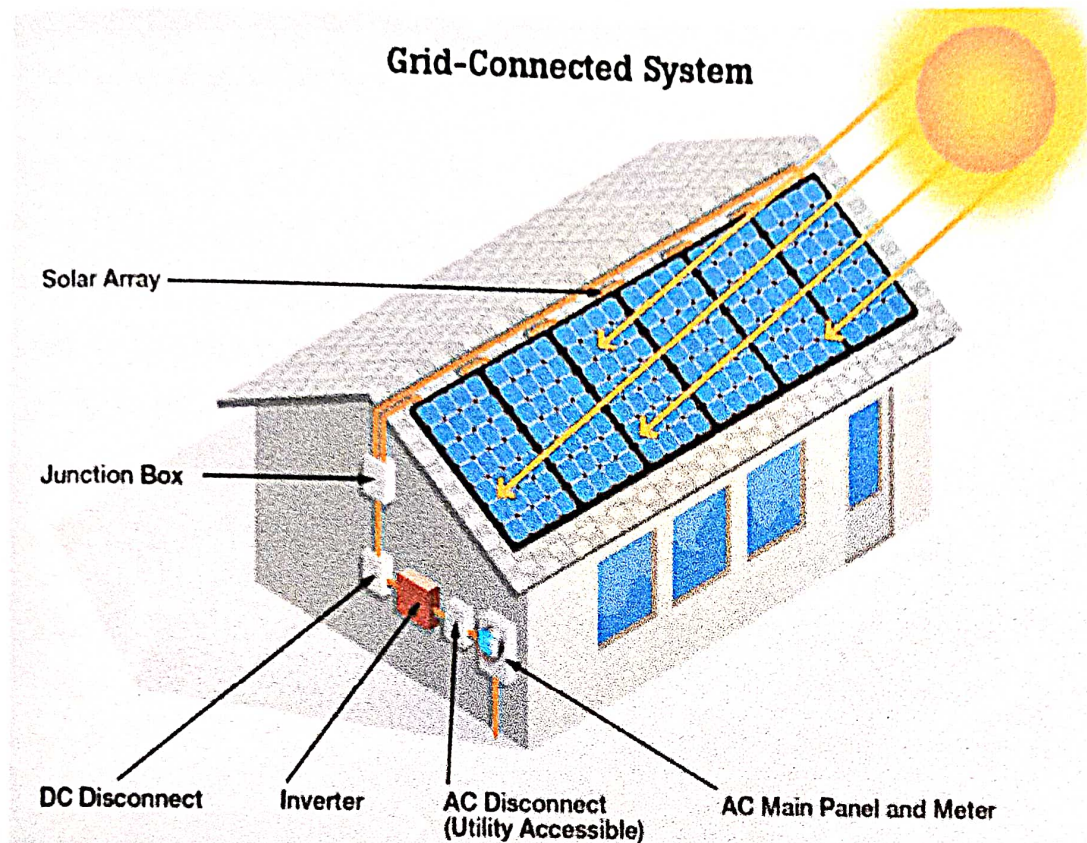
A variety of fuel like coal, kerosene, cooking gas, firewood, dung cakes and agricultural wastes are used for cooking purposes. Due to the energy crisis, supply of these fuels are either deteriorating (wood, coal, kerosene, cooking gas) or are too precious to be wasted for cooking purposes (cow dung can be better used as manure for improving soil fertility). This necessitated the use of solar energy for cooking purposes and the development of solar cookers. A simple solar cooker is the flat plate box type solar cooker.

It consists of a well insulated metal or wooden box which is blackened from the inner side. The solar radiations entering the box are of short wavelength. As higher wavelength radiations are unable to pass through the glass covers, the re-radiation from the blackened interior to outside the box through the two glass covers is minimised, thereby minimising the heat loss.

The heat loss due to convection is minimised by making the box airtight. This is achieved by providing a rubber strip between the upper lid and the box for minimising the heat loss due to conduction, the space between the blackened tray and outer cover of the box is filled with an insulating material like glass wool, saw-dust, paddy husk etc.

When placed in sunlight, the solar rays penetrate the glass covers and are absorbed by the blackened surface thereby resulting in an increase in temperature inside the box. Cooking pots blackened from outside are placed in the solar box.

(H) SOLAR ELECTRIC POWER GENERATION:



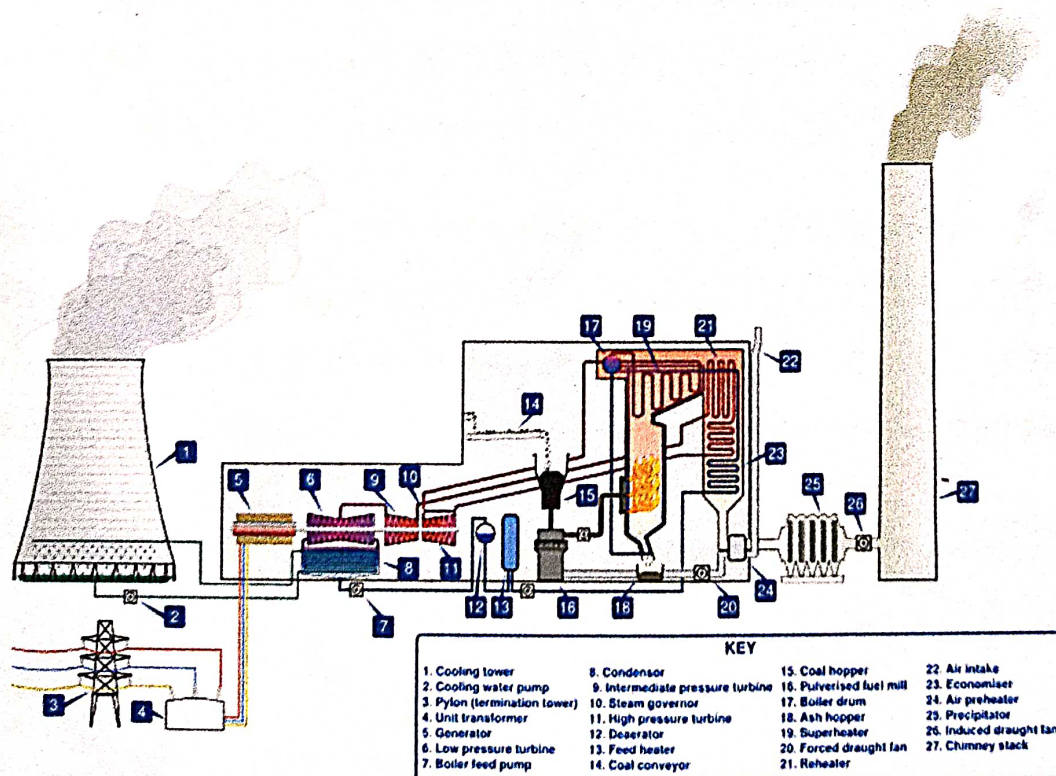
Electric energy or electricity can be produced directly from solar energy by means of photovoltaic cells. The photovoltaic cell is an energy conversion device which is used to convert photons of sunlight directly into electricity. It is made of semi conductors which

absorb the photons received from the sun, creating free electrons with high energies.

These high energy free electrons are induced by an electric field, to flow out of the semiconductor to do useful work. This electric field in photovoltaic cells is usually provided by a p-n junction of materials which have different electrical properties. There are different fabrication techniques to enable these cells to achieve maximum efficiency.

These cells are arranged in parallel or series combination to form cell modules. Some of the special features of these modules are high reliability, no expenditure on fuel, minimum cost of maintenance, long life, portability, modularity, pollution free working etc.

(I) SOLAR THERMAL POWER PRODUCTION:



Solar thermal power production means the conversion of solar energy into electricity through thermal energy. In this procedure, solar energy is first utilised to heat up a working fluid, gas, water or any other volatile liquid. This heat energy is then converted into mechanical energy in a turbine. Finally a conventional generator coupled to a turbine converts this mechanical energy into electrical energy.

Production of Power through Solar Ponds:

A solar pond is a natural or artificial body of water utilised for collecting and absorbing solar radiation and storing it as heat. It is very shallow (5-10 cm deep) and has a radiation absorbing (black plastic) bottom. It has a curved fibre glass cover over it to permit the entry of solar radiation but reduces losses by radiation and convection (air movement). Loss of heat to the ground is minimised by providing a bed of insulating material under the pond.

Solar ponds utilise water for collecting and storing the solar energy which is used for many applications such as space heating, industrial process heating and to generate electricity by driving a turbine powered by evaporating an organic fluid with a low boiling point.

(J) SOLAR GREEN HOUSES

A green house is a structure covered with transparent material (glass or plastic) that acts as a solar collector and utilises solar radiant energy to grow plants. It has heating, cooling and ventilating devices for controlling the temperature inside the green house.

Solar radiations can pass through the green house glazing but the thermal radiations emitted by the objects within the green house cannot escape through the glazed surface. As a result, the radiations get trapped within the green house and result in an increase in temperature.

As the green house structure has a closed boundary, the air inside the greenhouse gets enriched with CO_2 as there is no mixing of the greenhouse air with the ambient air. Further, there is reduced moisture loss due to restricted transpiration. All these features help to sustain plant growth throughout the day as well as during the night and all year round.

50 uses of solar energy

- Post author: Amos Gikunda
- Post published: July 19, 2020
- Post category: Energy
- Post comments: 0 Comments

1. Heating water

Solar energy heats water efficiently, and homeowners do not need to use electricity.

2. Solar cookers

Instead of using coal, charcoal as fuel, solar energy cooks, and it is environmentally friendly and cheaper.

3. Recreational use

With modern technology, there are recreational vehicles that use solar energy as a source of energy.

4. Remote industries

Light industries located in remote areas can use solar energy to provide light and run some tools.

5. in the waters

Solar energy is used in lighthouses, to signal structures and offshore navigation buoys.

12. Outdoor lighting

6. Traffic signals

Solar energy is a cheaper source of power for running road traffic signals.

7. Pumping water

In remote areas, solar energy used to draw water from wells using solar water pumps.

8. Roof Shading

In commercial buildings, semi-transparent glass modules are used to allow lighting by solar energy.

9. Security lights

In a bid to minimize operational costs, towns install solar-powered lights.

Solar energy is a cheaper source of power for running road traffic signals.

10. Ventilation fans

Ventilation fans help with the cooling of the house. Solar energy can be used to run these fans thus reducing the cost of power.

11. Swimming pools

Solar blankets are used to warm the water in a swimming pool. This helps fix the problem of swimming in cold water.

12. Outdoor lighting

13. Charging batteries

You can use solar energy to recharge a device that uses batteries. Such devices include cell phones and laptops. This is achievable with the provision of portable solar.

14. Boats

The planet solar is a boat that uses solar energy to run all the operations onboard making it eco-friendly and cheap to run.

15. Plants

Plants rely on solar energy during photosynthesis.

16. in drying clothes

Solar energy dries clothes and is effective when you cannot access dry cleaning services.

17. Solar-distillation

Solar energy is used when separating salt from seawater.

18. Drying cereal

Solar energy dried cereal produce and reduces the risk of aflatoxin.

19. Solar oven

They use solar energy as a source of power and achieve up to 350 degrees. It is sufficient for camping and during trips.

20. Heating tubes

These tubes are filled with water and use solar energy to heat rooms.

21. Solar furnaces

These furnaces have concentrated heat that can be used in various ways in industries.

22. in thermal power production

To achieve this, solar energy is used to heat a gas or a fluid. The heat energy generated is converted into mechanical energy which is, in turn, convert into electrical energy.

23. in solar ponds

Solar ponds produce power; this is a water body used in the collection and absorption of radiation which is stored as heat.

24. Greenhouses

A solar greenhouse is covered using a transparent material that acts as a solar collector. It then uses

25. Solar transportation

With increased technological growth, solar energy is being harnessed in the operating of trains, buses, and even trams in many countries.

26. Water treatment

In areas where water is unsafe for drinking, solar energy can be used to disinfect the water by leaving it in the sun for about six hours.

27. Drying of animal products

Solar energy is used to dry animal products such as hides. This helps them to last longer and reduce losses during processing.

28. Camping gear

During camping, you can utilize solar energy rather than your vehicle. This is achieved using solar-power tents and lanterns.

29. Flashlights

There are flashlights fitted with small solar panels that use solar energy to power the flashlights.

30. Solar sign

Billboards and other signs can utilize solar energy hence saving power and reducing the cost of production and operation.

31. Running of cottage industries

Cottage industries that use small machines can utilize solar energy in the running of these machines. All you require is a photovoltaic panel a lead-acid battery and an inverter.

32. Solar lanterns

Instead of using kerosene lamps, solar lanterns are a cheaper source of light as they only require sunlight to recharge.

33. Vaccine refrigerators

There are solar-powered refrigerators that are used in hospitals found in remote areas.

34. Solar pasteurization

Solar energy can be used to help preserve milk from rural areas hence reducing losses. It also helps kill bacteria.

35. Solar electric fences These fences that utilize solar energy to protect homes and farms, hence reducing theft and destruction.

36. Solar wifi

For easy access to the latest news in remote areas, solar wifi is the best option. All you need is a solar panel, a battery charge controller, and a wifi router.

37. Solar phones

With the growth in technology, there are cell phones that utilize solar energy as a source of power. You can use these phones as long as there is sunlight.

38. Surveillance systems

Monitoring and surveillance systems utilize solar energy to ensure smooth running even when the power supply is tampered with.

39. Satellites in orbit

Satellites in orbit utilize solar energy. They convert sunlight into electricity which runs all its operations.

40. Pocket calculators

Some calculators are fitted with miniature inbuilt solar panels which use sunlight to provide the energy needed to run the calculators.

41. Dyeing

In the textile industry, solar thermal energy is used in the dyeing process.

42. Drying

Solar thermal energy is used as an excellent drying agent in the textile industry.

43. Synthetic rubber

In the making of chemicals, photovoltaic energy is used in the processing of synthetic rubber.

44. Sterilization

In the processing of flour, photovoltaic energy can be used in the sterilization process.

45. Drying of plastics

Solar thermal energy dries of plastics.

46. Making Money

In some countries, homeowners can sell excess solar energy to their neighbors.

47. Reduces carbon print

Using solar panels reduces carbon footprint, unlike fossil fuels, solar doesn't produce greenhouse gas.

48. Helps you save money

If you want to cut down the cost of power bills, solar energy is the best alternative.

49. Solar umbrellas

Though little known, solar umbrellas are placed on tables and have batteries that get charged by sunlight. At night, they light up and are mostly used in beach hotels and by the poolside.

50. Outdoor Fountains

These outdoor fountains that use photovoltaic panels and the water run beautifully just like any other electrically powered water fountain.

ADVANTAGES OF SOLAR PLANT

1. Solar power is pollution-free and causes no greenhouse gases to be emitted after installation
2. Reduced dependence on foreign oil and fossil fuels
3. Renewable clean power that is available every day of the year, even cloudy days produce some power
4. Return on investment unlike paying for utility bills
5. Virtually no maintenance as solar panels last over 30 years
6. Creates jobs by employing solar panel manufacturers, solar installers, etc. and in turn helps the economy
7. Excess power can be sold back to the power company if the grid is tied
8. Ability to live grid free if all power generated provides enough for the home/building
9. Can be installed virtually anywhere

DISADVANTAGES OF SOLAR PLANT

1. High initial costs for material and installation and long ROI (however, with the reduction in the cost of solar over the last 10 years, solar is becoming more cost feasible every day)
2. Needs lots of space as efficiency is not 100% yet
3. No solar power at night so there is a need for a large battery bank
4. Some people think they are ugly (I am definitely not one of those!)
5. Devices that run on DC power directly are more expensive
6. Depending on geographical location the size of the solar panels vary for the same power generation
7. Cloudy days do not produce as much energy
8. Solar panels are not being massed produced due to a lack of material and technology to lower the cost enough to be more affordable (this is starting to change)
9. Solar-powered cars do not have the same speeds and power as typical gas-powered cars (this too is starting to change)