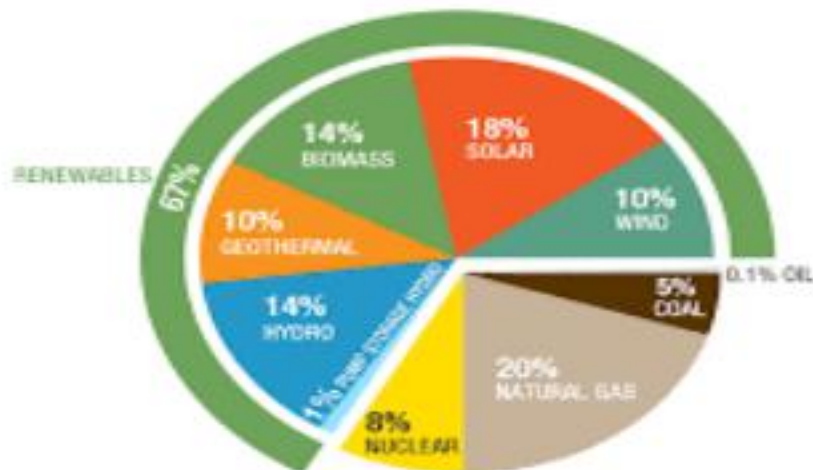


Question 1

Answer: Solar Photo voltaic (PV) is a technology that converts sunlight (**solar** radiation) into direct current electricity by using semiconductors. When the sun hits the semiconductor within the **PV** cell, electrons are freed and form an electric current. **Solar PV** technology is generally employed on a panel (hence **solar** panels).

Availability of solar energy in the world country wise

Shift to renewable energy by 2050 as proposed by the Institute for Sustainable Energy Policies



Advantages and disadvantages of solar energy

Advantages

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 grid intertied
8. Ability to live grid free if all power generated provides enough for the home / building
9. Can be installed virtually anywhere; in a field to on a building
10. Use batteries to store extra power for use at night
11. Solar can be used to heat water, power homes and building, even power cars
12. Safer than traditional electric current

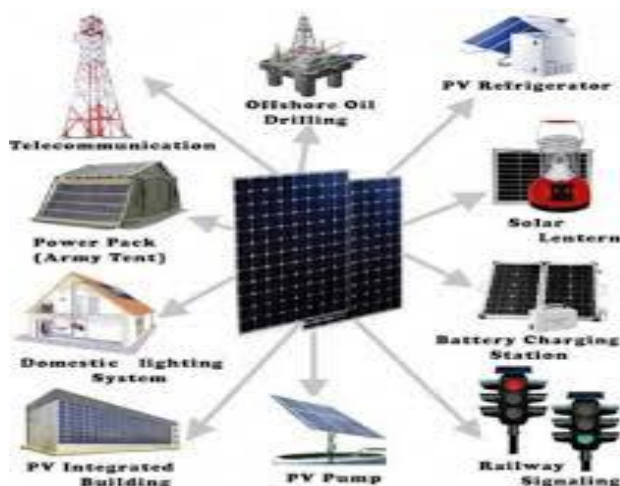
13. Efficiency is always improving so the same size solar that is available today will become more efficient tomorrow
14. Aesthetics are improving making the solar more versatile compared to older models; i.e. printing, flexible, solar shingles, etc.
15. Federal grants, tax incentives, and rebate programs are available to help with initial costs
16. No trenching is needed since the solar can be close to or at the place of installation

Disadvantages

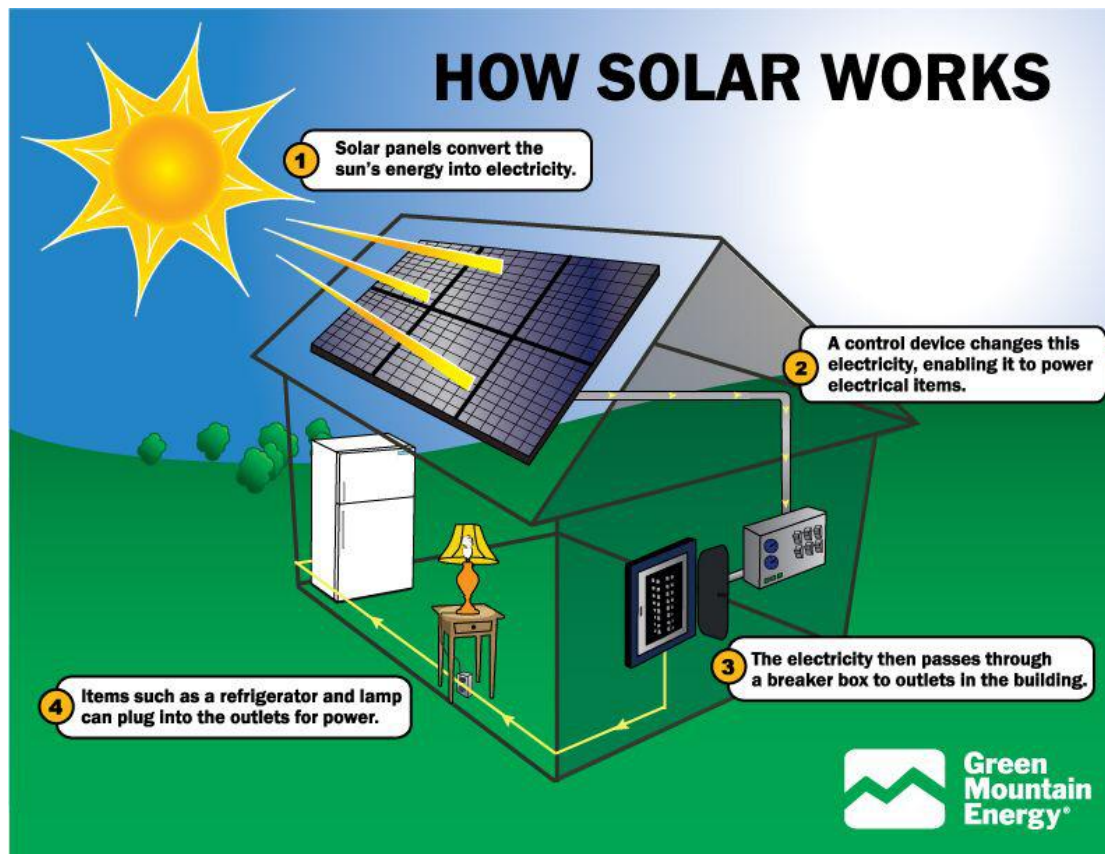
1. High initial costs for material and installation and long ROI (however, with the reduction in cost of solar over the last 10 years, solar is becoming more cost feasible every day)
2. Needs lots of space as efficiency is not 100% yet
3. No solar power at night so there is a need for a large battery 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 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)
10. Lower solar production in the winter months

Application and uses of solar energy or photo voltaic

Some of the major application of solar energy are as follows: (a) Solar water heating (b) Solar heating of buildings (c) Solar distillation (d) Solar pumping (e) Solar drying of agricultural and animal products (f) Solar furnaces (g) Solar cooking (h) Solar electric power generation (i) Solar thermal power production (j) Solar green houses.



How the solar panel works



Question No 2

Answer: The large-scale change in the climate of the world translates to increased energy use. If the temperatures rise, more and more energy will be needed for running cooling devices. ... And as photo voltaic panels work best under direct sunlight, the global warming can actually be beneficial for the solar energy

Location: swat

In swat most of the day are sunny and cold weather.the average temperature are 27 celcius to 36 celcius in the whole year .panel work more efficient and reliable.because

The cold might actually help your solar panels produce more energy. Solar panels are most efficient when it's cold and sunny outside, so they'll still be able to produce energy as long as you're not living in the Arctic Circle or somewhere else that gets very little sun in the winter Cold weather prevents solar panels from heating up Thus, a solar panel will do its job as long as there is sunlight and cold temperature will not impact electricity production. In fact, overly hot climates can cause solar panels to overheat.

Do solar panels work better in summer or winter?

There is a common misconception that solar panels generate more energy in summer because of the heat associated with the season. However, the real reason for this seasonal energy boost is that summer days are longer, not hotter. Solar panels actually work more efficiently in cooler winter temperatures

Are solar panels less efficient in winter?

The longer answer of course is, yes solar panels work in winter weather, but for obvious reasons, their output is lower than during the height of summer—days are shorter and snow can temporarily reduce or shut down output. That said, solar panels are actually more efficient in colder temperatures!

25 °C

According to the manufacture standards, a **25 °C (77 °F)** temperature indicates the peak of the optimum temperature range of solar panels. It is when solar photo voltaic cells are able to absorb sunlight with maximum efficiency and when we can expect them to simply work the best

The following method are used to reduces losses and improve efficiency

1. Make an Informed Decision.
2. Use a Solar Concentrator.
3. Correctly Install Your Photo voltaic Panels.
4. Avoid Shaded Areas. ...
5. Keep Your Solar Panels Clean.
6. Prevent an Increase in Temperature.

Sun Power produces the highest efficiency mono crystalline solar panels available. Our X22 has a record-breaking efficiency of up to 22.8 percent, making it the best performing panel on the market today. Poly crystalline panel efficiency typically ranges from 15 to 17 percent.so used Mono crystalline solar panel for higher efficiency.

Using of Mirror



Panel should be clean from the dust



Thus we can improve the efficiency and reduces the losses.

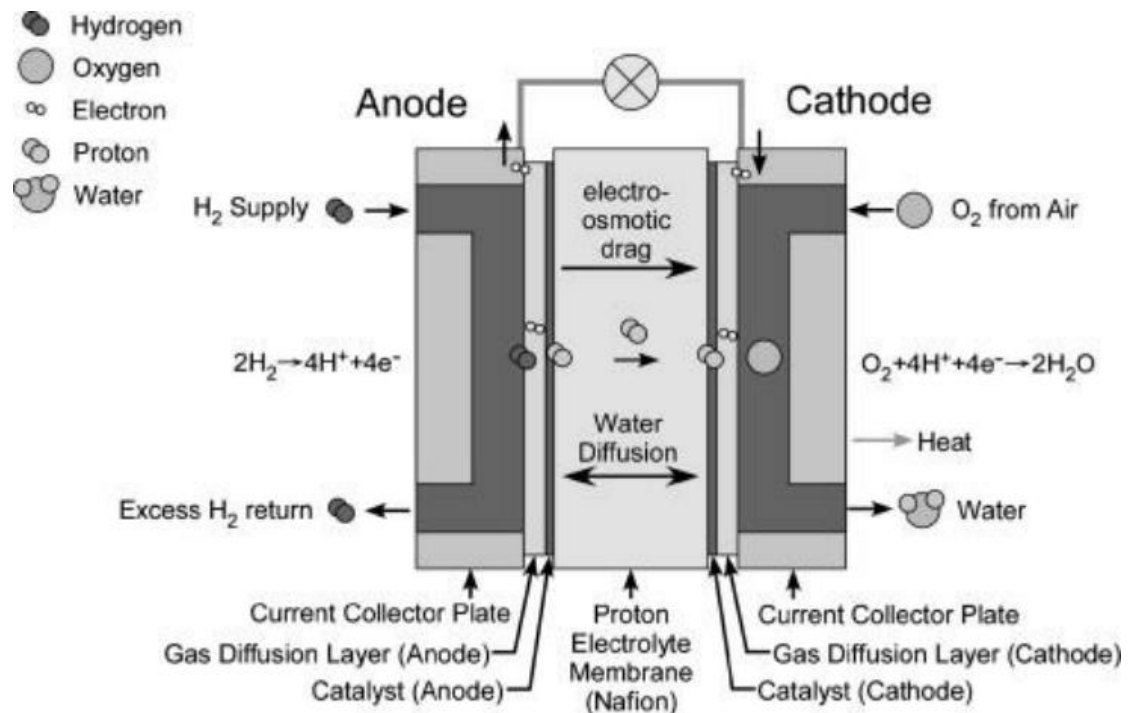
Question No 3

Answer: Load of University= 92kw

We have two choices polymer electrolyte membrane (PEM) and Alkaline (AFC)

Polymer Electrolyte membrane

It consist of perfluoro sultonic electrolyte and operating at temperature between 50-100c But typically in 80C'.and have ability to take load of 100kw.and its efficiency is 60% and transportable.The proton exchange membrane fuel cell (PEMFC) uses a water-based, acidic polymer membrane as its electrolyte, with platinum-based electrodes. ... The protons pass through the membrane to the cathode side of the cell while the electrons travel in an external circuit, generating the electrical output of the cell.



Application

- 1) Backup power
- 2) Portable power
- 3) Distributed generation
- 4) Transportable
- 5) Speciality vehicle type

Advantage

- 1) Quick start
- 2) Deliver high power density
- 3) Offer the advantages of low weight and volume compared with other fuel cells.
- 4) The only byproducts being electricity, heat and water

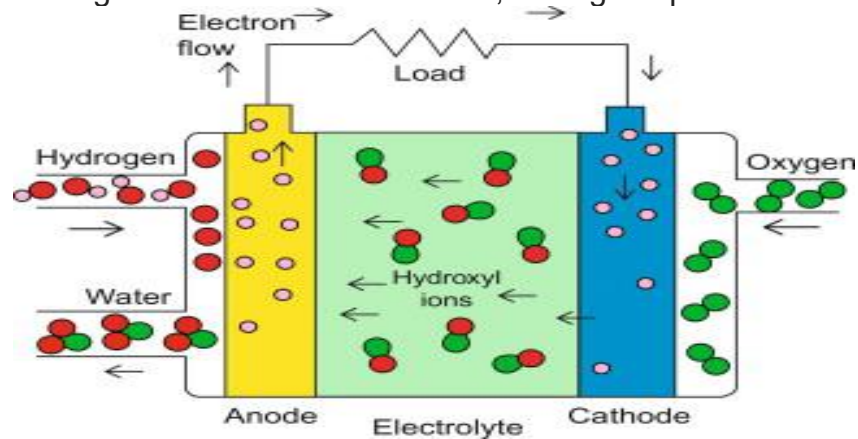
Disadvantages

- 1) Expensive catalyst
- 2) Very sensitive to fuel impurities
- 3) At low temperature waste heat

Alkaline(AFC)

Alkaline fuel cells (AFC) are the type developed by Bacon and refined for and used in the space program. This type of requires pure gas inputs, both hydrogen and oxygen. In space, these pure elements are already available and used for propulsion, so the adaptation of there use in the fuel cell was

natural. NASA has used alkaline fuel cells since the mid-1960s. They are among the most efficient fuel cells, having the potential to reach 70%.



Efficiency=50-60% and operating at 90 to 100 celcius

Application

- 1) Mostly used by military
- 2) Used in space

Advantages

- 1) Low cost component
- 2) Alkaline fuel cells have the advantage of allowing the use of non-precious catalysts based on nickel for the anode and activated carbon for the cathode.
- 3) Reduced greenhouse gas emissions

Disadvantages

- 1) It is sensitive to co₂ in fuel and air