SOLAR PANEL

AN INVENTION THAT REVOLUTIONIZE THE SOLAR ENERGY

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- SUN FROM THE VERY BEGINNING IS ENORMOUS SOURCE OF ENERGY FOR ALL THE EARTHIANS .
- WE ALL HOMO SAPIENS OBSERVED THAT WE DON'T HAVE ANY MECHANISM BY WHICH WE CAN USE THE ENERGY OF SUN FOR OUR DESIRABLE WORK .
- PLANT USE ENERGY OF SUN IN THE FORM OF SUNLIGHT IN THE PROCESS OF PHOTOSYNTHESIS AND MADE FOOD FOR US .
- ALONG WITH THAT SOME ANIMALS ALSO ABLE TO USE THE SUN LIGHT AS THE DESIRED FORM OF ENERGY .

THIS GIVES A SETBACK TO THE MOST INTELLIGENT RACES ON THE EARTH THAT IS US AND ENQUIRES US TO FOUND A SOLUTION OF THAT.

THIS POPULAR THOUGHT OF INQUISITION OF THE WAY BY WHICH WE CAN EXTRACT THE SOLAR ENERGY DIRECTLY AND TRANSFORM INTO OUR DESIRABLE FORM OF ENERGY LAST FOR CENTURIES AND THIS PURSUIT OF HOMO SAPIENS CAME TO TRUE IN 1881 BY ONE OF US KNOWN AS CHARLES FRITTIS. THESE ALL INQUISITION OF CENTURIES FOR DEVELOPING THE MECHANISM AND THE FURTHER ADVANCEMENT TILL NOW KNOWN AS "HISTORY OF SOLAR PANEL- AN INVENTION THAT REVOLUTIONIZE THE SOLAR ENERGY.

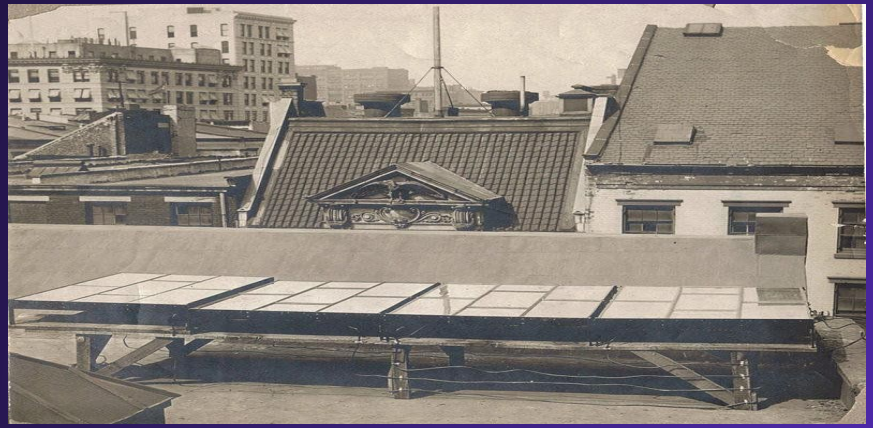
HISTORY OF SOLAR PANEL

It all began with Edmond Becquerel, a young physicist working in France, who in 1839 observed and discovered the photovoltaic effect— a process that produces a voltage or electric current when exposed to light or radiant energy.

A few decades later, French mathematician Augustin Mouchot was inspired by the physicist's work. He began registering patents for solar-powered engines in the 1860s.

IN 1883 New York inventor Charles Fritts created the first solar cell by coating selenium with a thin layer of gold. Fritts reported that the selenium module produced a current "that is continuous, constant, and of considerable force."

This cell achieved an energy conversion rate of 1 to 2 percent. Most modern solar cells work at an efficiency of 15 to 20 percent. So, Fritts created what was a low impact solar cell, but still, it was the beginning of photovoltaic solar panel innovation in America and the world.



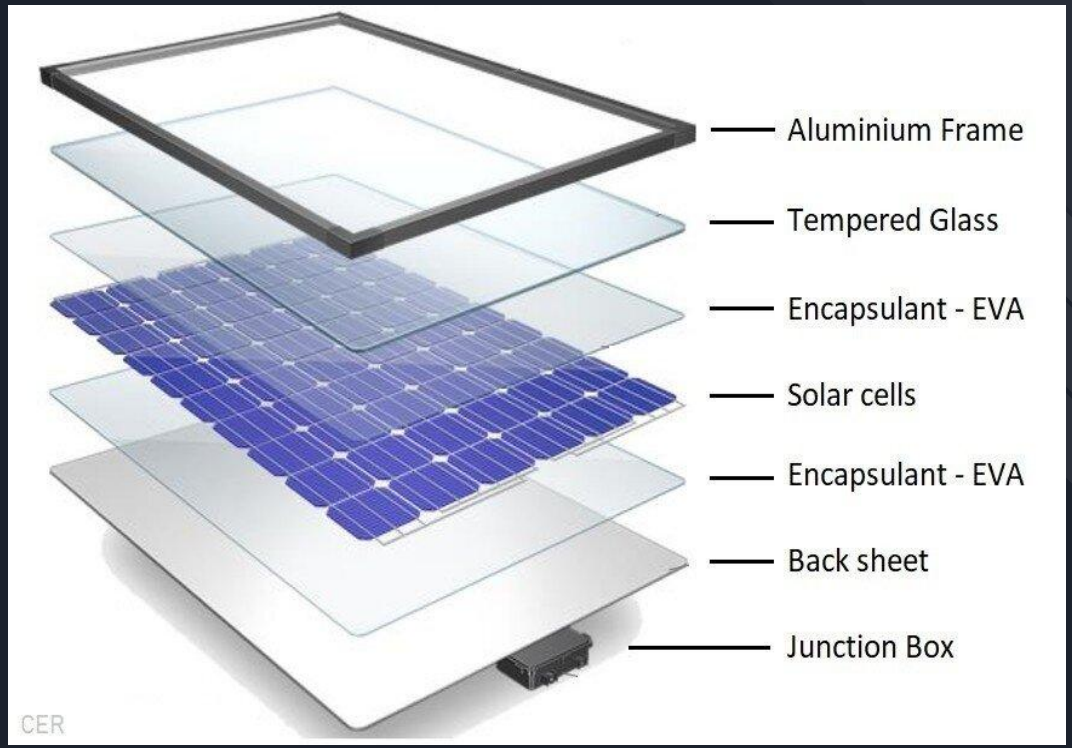
CHARLES FRITTS INSTALLED THE FIRST SOLAR PANELS ON NEWYORK CITY ROOFTOP IN 1884.

ADVANCE FORM OF SOLAR PANELS IN THE PRESENT SCENARIO.

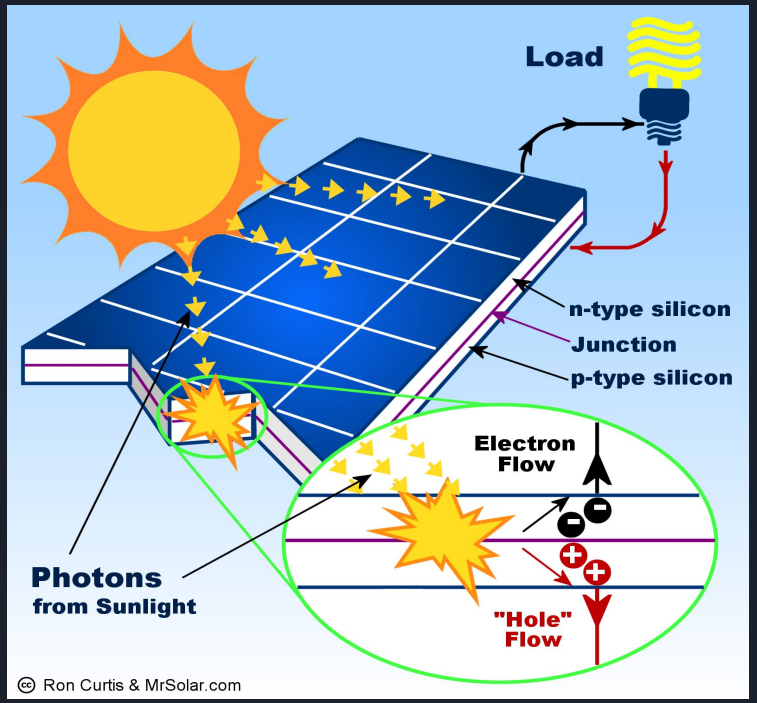
SOLAR PANELS DESIGN

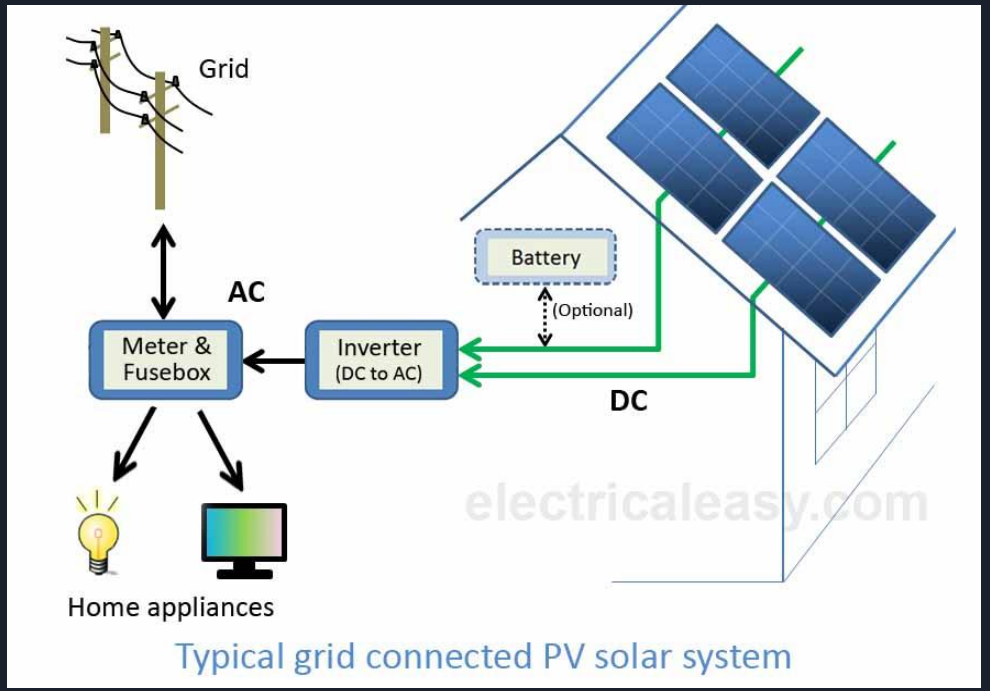
- Most solar cells are a few square centimetres in area and protected from the environment by a thin coating of glass or transparent plastic.
- A solar, or photovoltaic (PV), module generally consists of 36 interconnected cells laminated to glass within an aluminum frame.
- The back of each solar panel is equipped with standardized sockets so that its output can be combined with other solar panels to form a solar array.
- The simplest deployment of solar panels is on a tilted support frame or rack known as a fixed mount.
- Another factor in solar panel design is the ability to fabricate cells in “thin-film” form on a variety of substrates, such as glass, ceramic, and plastic, for more flexible deployment.

SOLAR PANELS CONSTRUCTION



HOW DOES IT WORKS?





WORKING PRINCIPLE OF SOLAR PANELS

A photovoltaic cell is also called a solar cell. Practically, all solar cells are photodiodes made of semiconductor material like silicon. A solar cell works in three steps:

- Photons in the sunlight hit the solar cell and are absorbed by the semiconductor material.
- Negatively-charged electrons are knocked off from their atoms and start flowing in the same direction to produce electric current.
- A typical silicon solar cell can produce up to 0.5 V and current up to 6 A. Thus, its maximum power is 3 W.

Since the output of a single solar cell is very small, **a large number of solar cells are interconnected to form a solar module, combination of solar modules is called panel and combination of panels is called solar array.** It is done to get the required power output from a PV system.

TYPES OF SOLAR PANELS

There are mainly 5 types of solar panels are there -

1. Mono crystalline solar panel

- These solar cells are made out of high quality/pure single crystal silicon.
- Because of highly pure silicon these solar panels are little bit expensive.
- This panel is best in sense of efficiency.

2. Polycrystalline solar panel

- This type of panel is made of number of silicon which are then melted and formed as silicon wafers.
- This is cheaper than mono crystalline solar panel.
- This solar panels are less efficient as compared to mono crystalline solar panels because of some impurities in raw silicon

3. Mono PERC solar panel

- PERC stands for passivated emitter rear cell.
- In this type of solar panel an additional reflective layer is added on the back of solar panel which allows part of photons passing through the cell to be reflected back to the cell.
- Therefore a mono PERC solar panel is comparatively more efficient than other solar panel.

4. Thin film solar panel

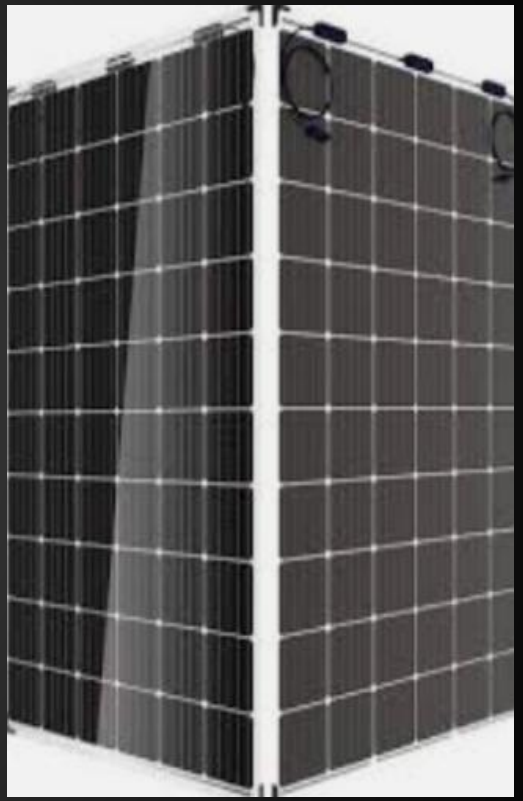
- It is made by placing several films of photovoltaic material which mainly include amorphous silicon , cadmium or copper.

- These solar panels are easy to manufacture and because of this they are less expensive or cheaper than poly and mono crystalline solar panel.

5. Bi-facial solar panel

- This panel is equipped with mono/poly cells on both the front and back side of the panel.

- It is double sided solar panel that captures sunlight from both the front and back side of the panel.



ADVANTAGES OF SOLAR PANELS

- **Save lots of money -** Switching to solar electricity, aids in decreasing your dependence on the grid based electricity because the solar panels directly allow you to generate electricity with the help of the sun.
- **Increase property value -** solar panels can increase your property value by 3-4%.
- **Freedom from centralized grid -** decrease your dependency on centralized private or government grids.
- **Contributing to a better environment -** Solar power is completely clean, it produces no air pollution, no water pollution, and no greenhouse gas effects. It is also carbon-free, no harmful emissions are released when electricity is being produced by solar panels. It also reduces the need for finite resources.
- **It is not that costly -** Solar panel systems are extremely durable and require little to no maintenance over their productive lifetime, which can span 25 years or more.

DISADVANTAGES OF SOLAR PANELS

- **It's Not 100% Reliable -** This means that when the sun is not shining, there is no generation of energy. The generation of power is mostly affected at night and during winter months.
- **Complications When Moving -**The solar contracting company will switch the lease agreement to the new user if you decide to move out. These companies do not want to incur any further cost of taking the solar panels down.
- **Materials Used to Make Solar Panels Can Cause Pollution -** There is no up-to-date information on the possibility to recycle PV panels. Although solar panels have a remarkable lifespan of about half a century, disposing of these materials can have severe impacts on the environment.

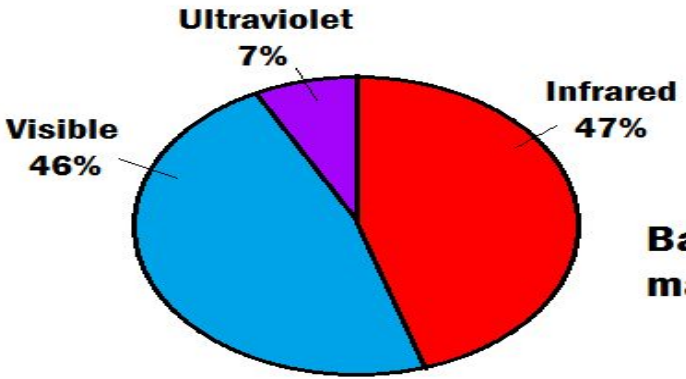
SOLAR PLATES EFFICIENCY

- Efficiency in solar panels is simply the measurement of energy output in a given surface area.
- Present time most of the solar panels provide an energy efficiency rating btw 11 and 15 percent, which is the percentage of solar energy that is being converted into useable electricity.

WHY SOLAR PLATES EFFICIENCY IS LOW?

- Theoretical efficiency of Si PV cells is about to 33%.
- For Silicon, the band gap energy is 1.12 eV.
- ~1/4 of the light from the sun is not sufficient enough to create electricity.

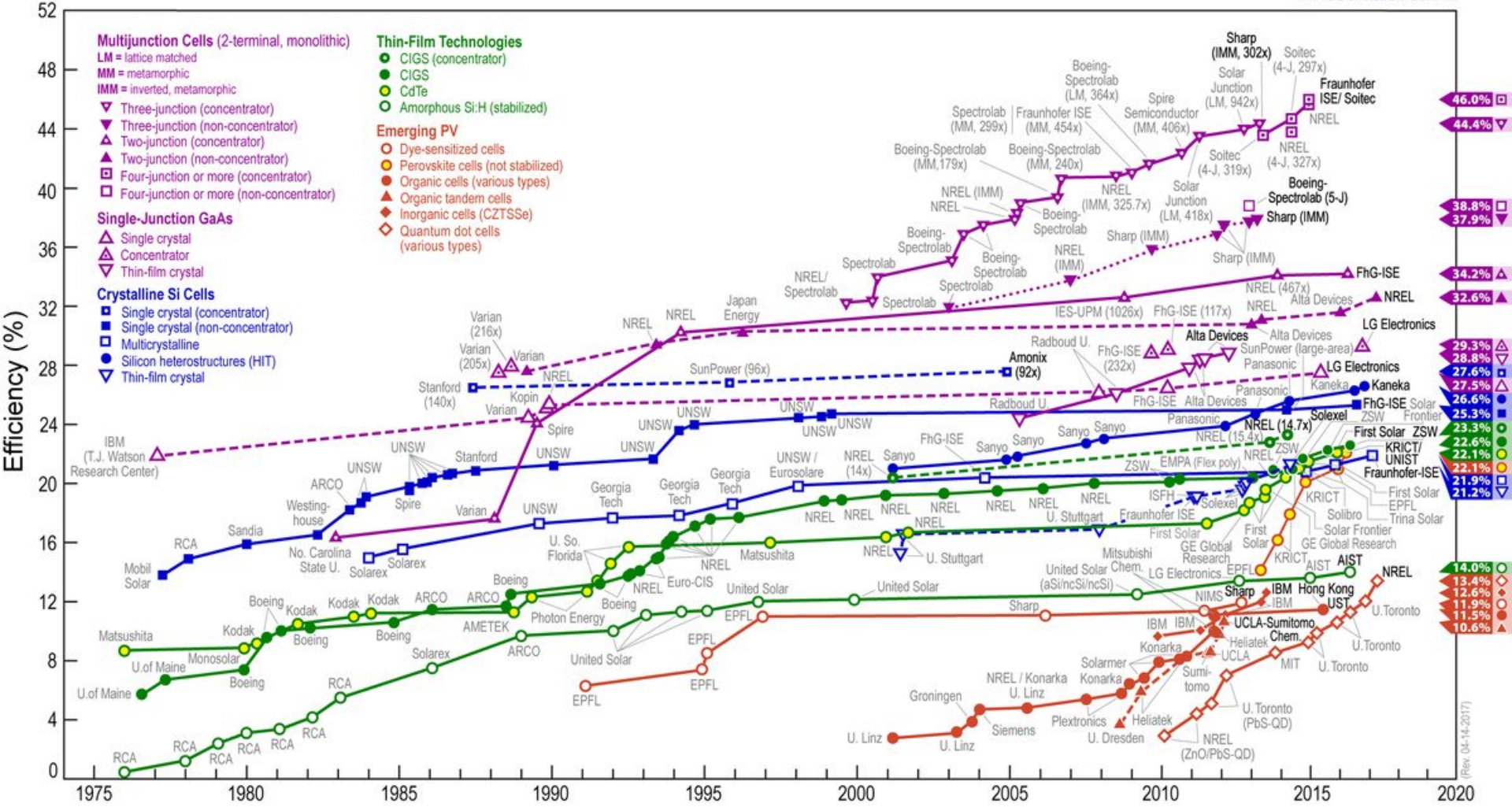
Solar Energy from the Sun



Wavelength		Energy	
IR:	1 mm - 700 nm	IR:	0.001 eV - 1.77 eV
Visible:	700 nm - 400 nm	Visible:	1.77 eV - 3.11 eV
UV:	400 nm - 100 nm	UV:	3.11eV - 12.4 eV

Band-gap energy for Silicon is 1.12 eV, meaning that the majority of the infrared range cannot produce electricity.

Best Research-Cell Efficiencies



FACTORS THAT CAN IMPACT EFFICIENCY

- PANEL DESIGN AND CONSTRUCTION - Most of the panels are designed with a layer of a protective glass over the solar cells, which sunlight must pass through. The amount of energy harnessed is dependent on the angle in which light is passing through, as well as the reduction of reflectivity of the glass. so that design and construction of panel is very important.
- PITCH OF ROOF - For roof mounted panels, the slope of the roof also impact how much sunlight is hitting the panels throughout the day.
- TEMPERATURE - Temperature can impact the overall output of a solar cell. Higher temperatures can reduce output and lower efficiency.
- ANGLE OF PANEL INSTALLATION - The angle of the panel and the amount of light hitting it are both important factors that will help you maximise the efficiency.

Thankyou:)