Fact Sheet - Solar Power

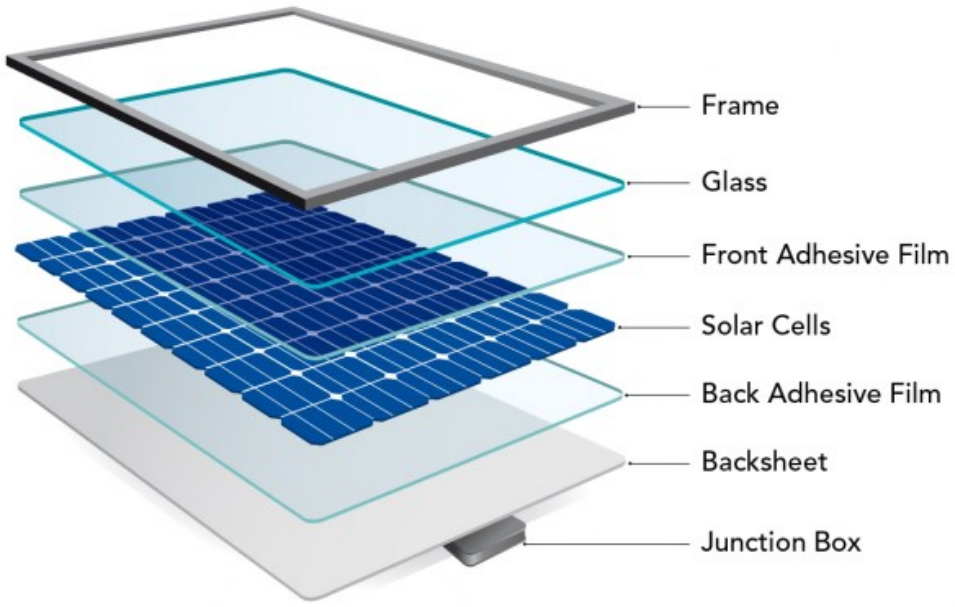

Figure 1: Photovoltaic Solar Panel Construction

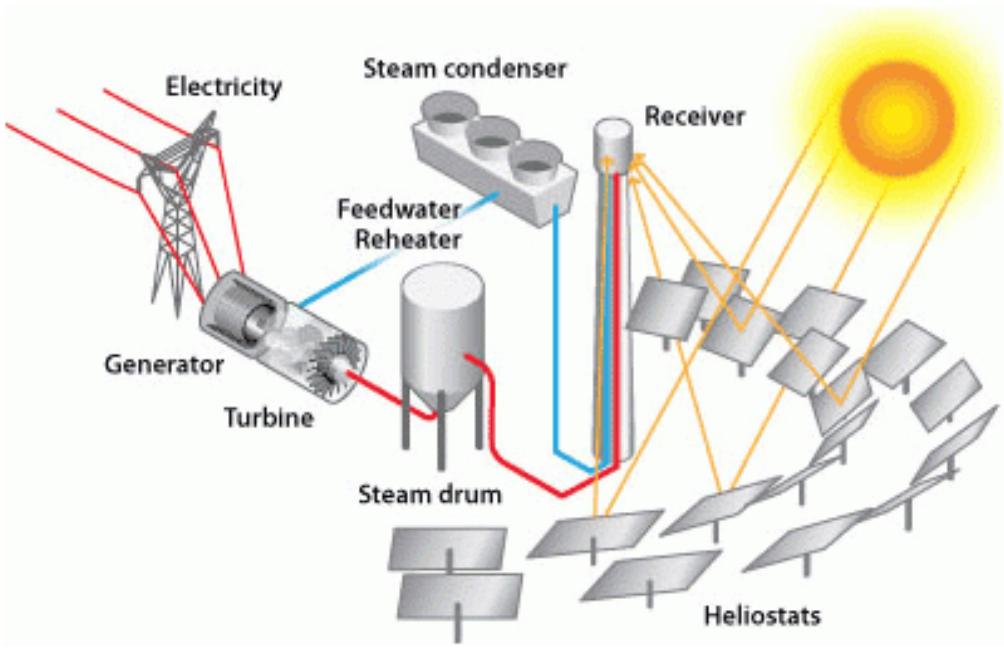

Figure 2: Concentrating Solar-Thermal Power diagram

What is Solar Power?

Solar power is when the energy from the sun is absorbed and converted to another form of energy. Humans have been using solar energy in various forms for thousands of years, the earliest known use comes from the 7th century B.C.E. when humans used the sun to start fires. Now solar power is mainly used for generating electricity or heat. This factsheet will explore some of the types of solar power we use today.

Types of solar power

Photovoltaic (PV):

These solar panels convert the solar energy from the sun into electricity. A solar panel is made up of multiple PV devices known as cells. Each cell is made from semiconductor materials that convert the sun's energy into electricity. These cells are sandwiched between layers of other materials to protect them from various environmental conditions. The individual cells produce a DC (Direct Current), this then usually needs to be converted to AC (Alternating Current) for use, for example powering home appliances. For more information on how a PV cell converts the suns energy into electricity follow this link: Photovoltaics and electricity - U.S. Energy Information Administration (EIA).

Concentrating Solar-Thermal Power (CSP):

This process is mainly used on large scale power generation facilities. The energy from the sun is directed using mirrors and concentrated to generate heat. This heat energy is then used to heat up water and generate steam which in turn is used to generate electricity using steam turbines. Depending on the system the steam may be generated directly from the heat of the sun, or indirectly from another fluid such as oil or molten salts. There are multiple arrangements that can be used depending on the location of the plant and its requirements, the three main types are:

- Linear Concentrator Systems– rows of mirrors that concentrate the sun's energy onto tubes running in front of them containing the fluid to be heated.
- Dish/Engine Systems– a mirrored dish is used to concentrate the sun's energy on a thermal receiver which heat's the fluid
- Power Tower Systems– A large field of flat, sun tracking mirrors concentrate the energy on a receiver at the top of a tower to heat the fluid (see diagram)

Benefits of Solar Power

- It's a renewable resource and once operating has minimal Carbon emissions
- Generally solar panels have very low maintenance costs
- They can be used in small scale installations to power individual homes
- Individuals that install them at their homes can reduce their energy bills and even profit by selling excess energy back to the grid
- This technology is continually improving and going forward the options available will only get better and more efficient, currently he majority of solar panels have an efficiency of 10-20% but some types are reaching efficiency's as high as 25%

Limitations/ Cons of Solar Power

- The most obvious downside is they rely on sunlight so only provide energy during daylight hours, if the energy is needed 24/7 a form of energy storage/ another energy source is required
- The initial setup costs of solar panels can be quite high– this can put off individuals installing them on their home
- Weather dependent– although they do still produce energy on cloudy days, output is significantly reduced
- For large scale energy generation solar panels require a large amount of space relative to their energy output

References

Briefing | Fact Checker (solarenergyuk.org)

What is Concentrated Solar Power and how does CSP work? - Brunel

History of Solar Energy: Timeline & Invention of Solar Panels | EnergySage

Solar Panels for Your Home (Complete 2023 Guide) | GreenMatch

Solar Panel Efficiency | Solar Guide

Concentrating Solar Power Basics | NREL

Figure 1- Generating Electricity: Solar Cells | Let's Talk Science (letstalkscience.ca)

Figure 2- Power Tower System Concentrating Solar-Thermal Power Basics | Department of Energy