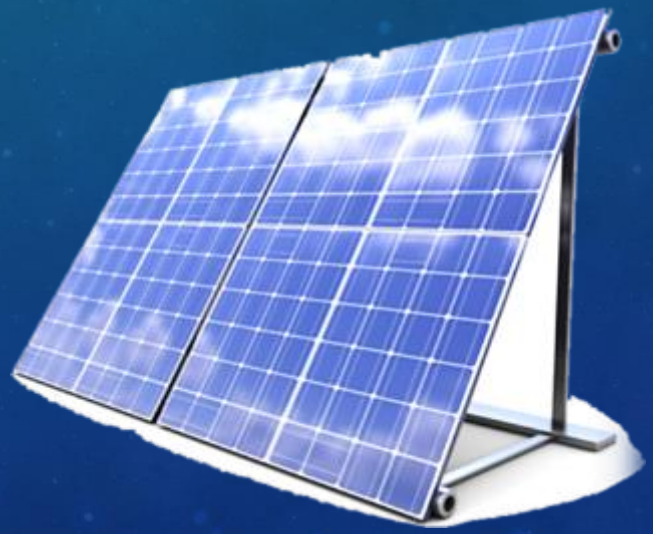
SOLAR ENERGY

POE B5 KAI VOGEL

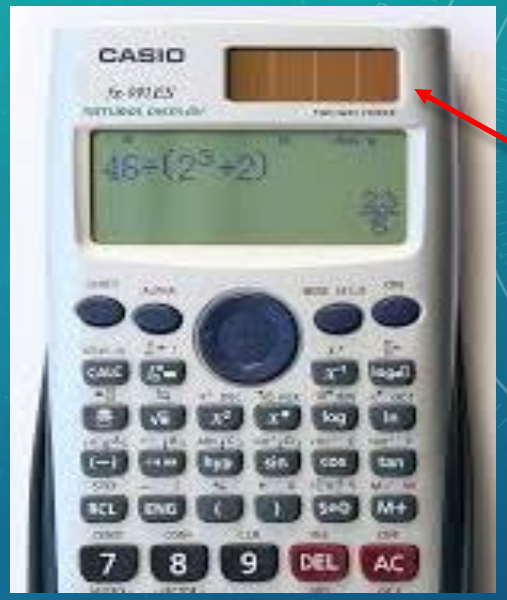


SOLAR ENERGY

- Solar energy is the most abundant renewable energy source available for us, and also U.S. is one of the country with rich solar resources in world.
- Modern technology can make this energy for a variety of uses, including generating electricity, providing light or a comfortable interior environment, and heating water for domestic, commercial, or industrial use.
- There are three main ways to use solar energy, which are the photovoltaics (solar electric), solar heating & cooling, and by concentrating solar power.

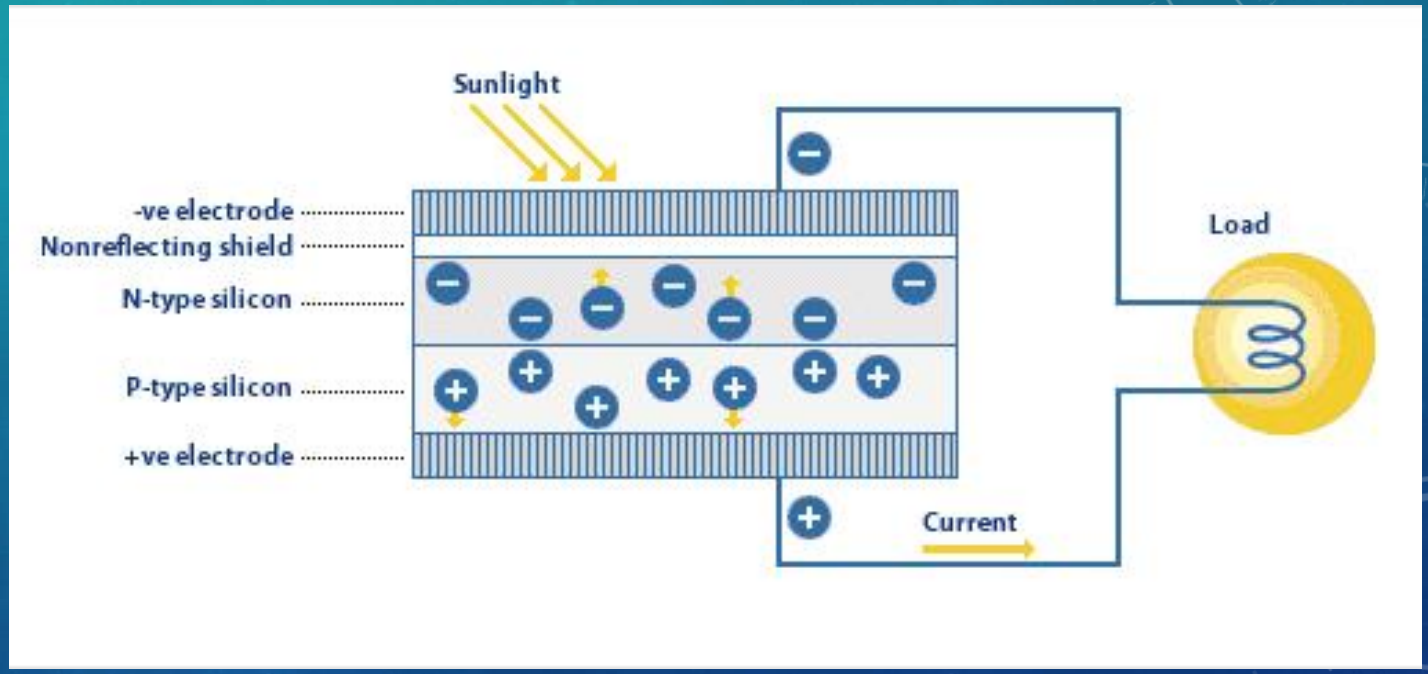
PHOTOVOLTAICS (SOLAR ELECTRIC)

- Photovoltaic (PV) devices can generate electricity directly from sunlight using an electronic process that occurs naturally in semiconductors. Electrons in these materials are dispatched by solar energy and will travel through an electrical circuit, powering electrical devices or sending electricity to the grid.
- PV devices are used as small as to power calculators to as large as solar power plants.



HOW DOES PHOTOVOLTAICS WORK

- Photons strike and ionize semiconductor material (usually Silicon) on the solar panel, causing valence electrons to break free of their atomic bonds. Due to the semiconductor structure, the electrons are forced in one direction creating a flow of electrical current.



SOLAR HEATING AND COOLING

- Solar heating and cooling (SHC) technologies will collect the thermal energy from the sun and use this heat collected to provide hot water, space heating, cooling, and pool heating for residential, commercial, and industrial purpose.
- It is mostly used in Houses or bigger buildings.

CONCENTRATED SOLAR POWER

- Concentrated solar power(CSP) systems generates power by using mirrors or lenses to concentrate a large area of sunlight, or thermal energy, onto a small area. Electricity is generated when the concentrated light is converted to heat, which drives a heat engine (usually a steam turbine) connected to an electrical power generator or powers a thermochemical reaction
- It has 4 method to concentrate solar energy

4 METHODS TO CONCENTRATE SOLAR ENERGY

Parabolic Trough

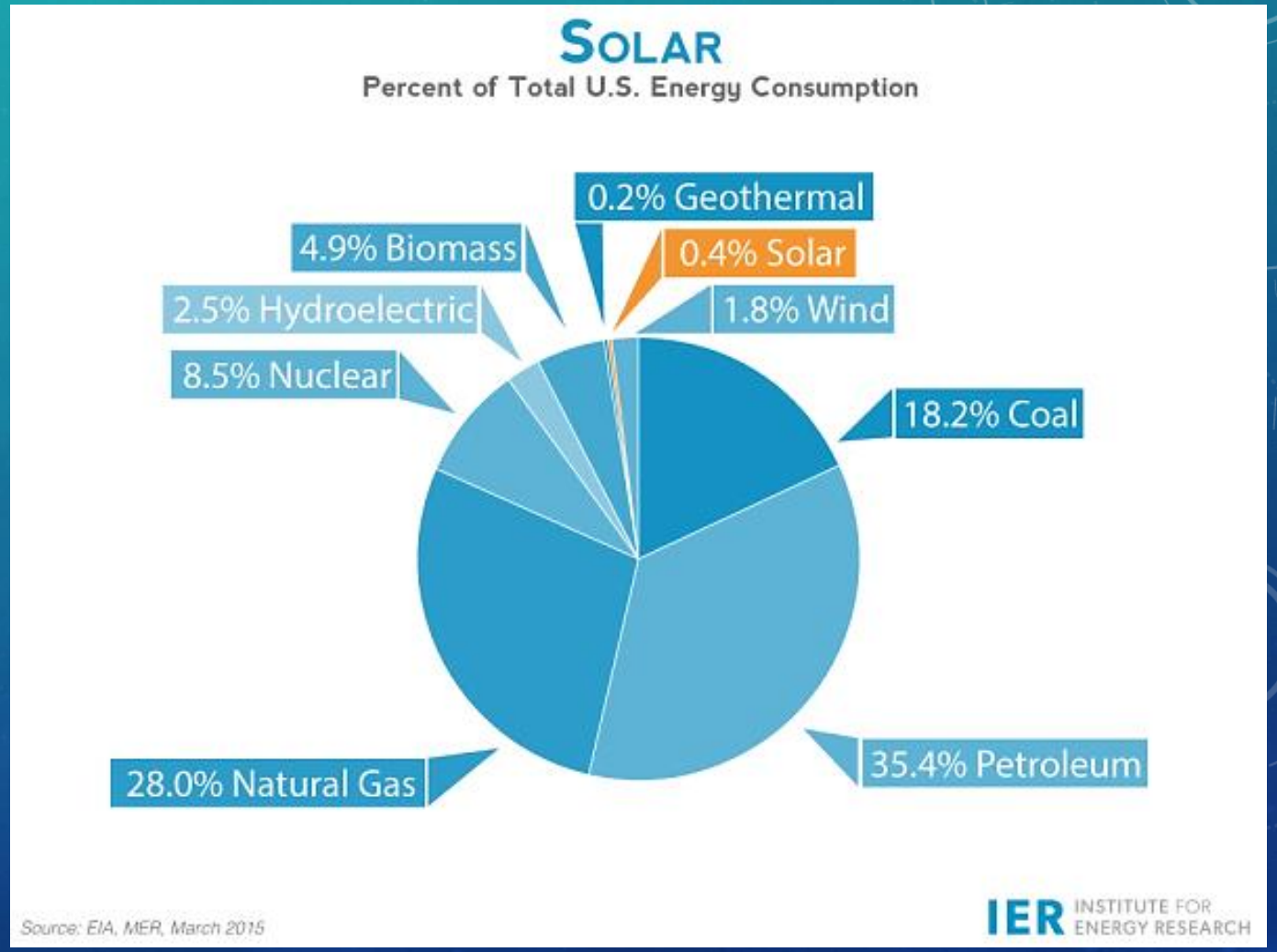
Compact Linear Fresnel Reflector

Power Tower

Dish-Engine

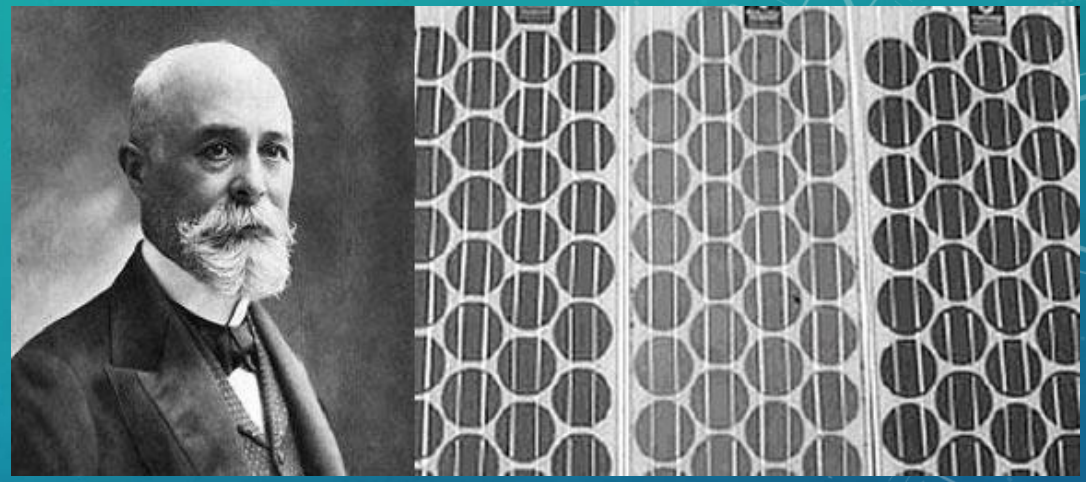
AMOUNT OF ENERGY SUPPLIED BY SOLAR

- In 2013, only 0.4% of total U.S. energy consumption came from solar power, but it has been increased by 4 times compared to 2011.
- In global scale, 0.5% of energy was supported by Solar energy. ("Solar Encyclopedia," 2015).



HISTORY OF SOLAR POWER

- In 1883 American scientist Charles Fritts developed the first solar cell, applying selenium to a thin layer of gold, but this method was only able to achieve 1% efficiency, which couldn't do anything much .

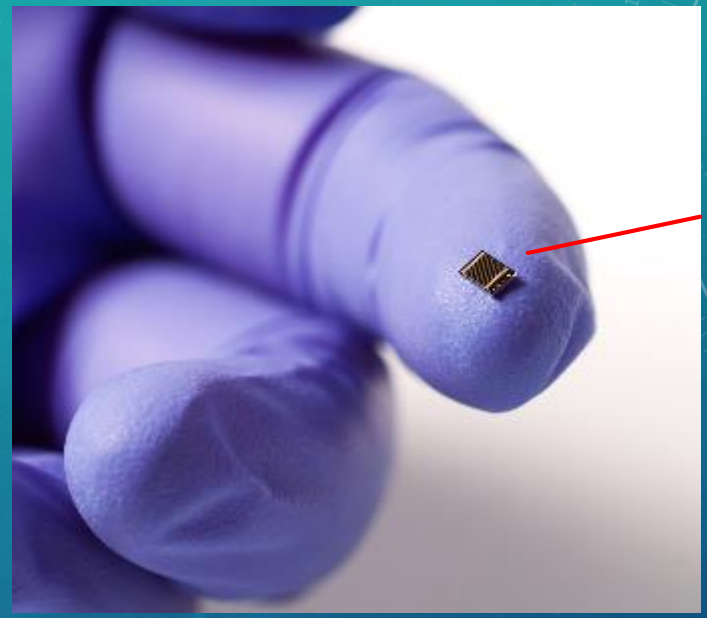


Charles Fritts and first Solar cell

- 1954, Daryl Chapin, Calvin Fuller, and Gerald Pearson discovered silicon solar cells. Which reached efficiency of 6% and made the basis of modern solar cells we see today.
- 1950s and 60s, space industry's need for a sustainable power source in space for the earliest satellites led to investment and rapid development in solar technology.
- Even after the advancement with space race, solar technology was still too expensive to be commercially used. In the early 70s, Dr. Elliot Berman designed a much lower cost solar cell, using lower-grade silicon and cheaper housings which brought the cost per watt down from $100 to only $20, finally made able to use commercially. (U.S. Department of Energy, 2014).

MODERN SOLAR CELL

- World Record of efficiency of solar cell today is 44.7% made in 2013 by the German-French team of Fraunhofer ISE, Soitec, CEA- Leti and the Helmholtz Center Berlin.
- Normal solar panels have efficiency of around 20% or less, depends on price, material, and design used
- Solar powers are likely produced in dry, hot area with more sun light. Because you can simply make more energy. Especially for non-PV solar technologies, which uses heat.

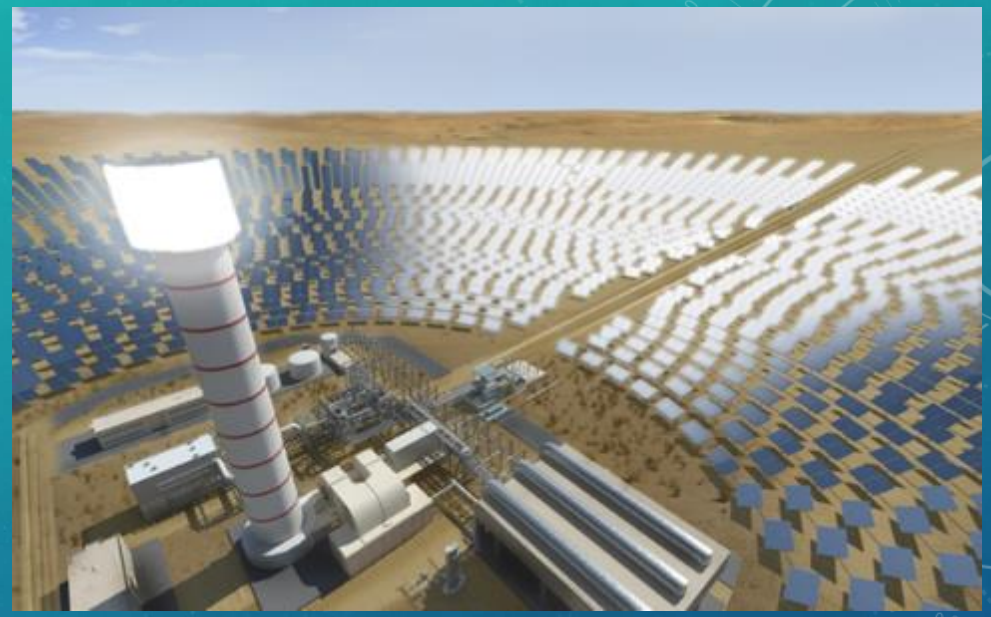


World record:
44.7% efficiency

>20% efficiency

MODERN SOLAR TECHNOLOGIES

- PV and Solar Heating and Cooling doesn’t require much infrastructure, you can just put on roof of buildings. But Concentrated solar requires large land, and also needs to be in isolated area because it creates huge light, and it’s very annoying.
- It also could make disaster to wild life, because the Concentrated solar power will attract bugs with light and burn down birds came for the bugs attracted to it.
- Solar Technologies are very rapidly growing industry and many new technologies are created.



FUTURE SOLAR PANELS

- Sharp has Launched Solar Windows, which will work as Solar panels, heat shield, and privacy screens.
- The company explains that the future housings will be all made out of solar panel included materials. Which means all roof, wall, and windows will be making solar powers, as common money-saving building material. ("Sharp to Launch Windows," n.d.).

Sharp’s see-through solar panel

PROS AND CONS OF SOLAR ENERGY COMPARED TO OTHER SOURCES

Pros	Cons
Renewable	Depends on the weather
Abundant source of energy	Expensive
Quiet	Concentrated solar sometimes burn birds down
Environmentally friendly	Certain solar cells require materials that are expensive and rare in nature.
Able to make energy in space like satellites	

CONCLUSION

My most surprising finding is the solar window, I did not know that it was possible to make solar panels with some light going through.

In my opinion, Solar is the energy with most possibility in future, because of the amount of energy available for us, the easiness for placing the solar panel, and new technologies being made rapidly everyday like the solar window. I believe Solar cell house is possible in my life time and everyone is going make their energy at their own house.

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