RENEWABLE ENERGY

Powered by High Tech Centre for Nigerian Women and Youths

WHAT IS ENERGY?

In physics, energy is the quantitative property that must be transferred to an object in order to perform work on, or to heat, the object. Energy is a conserved quantity; the law of conservation of energy states that energy can be converted in form, but not created or destroyed.

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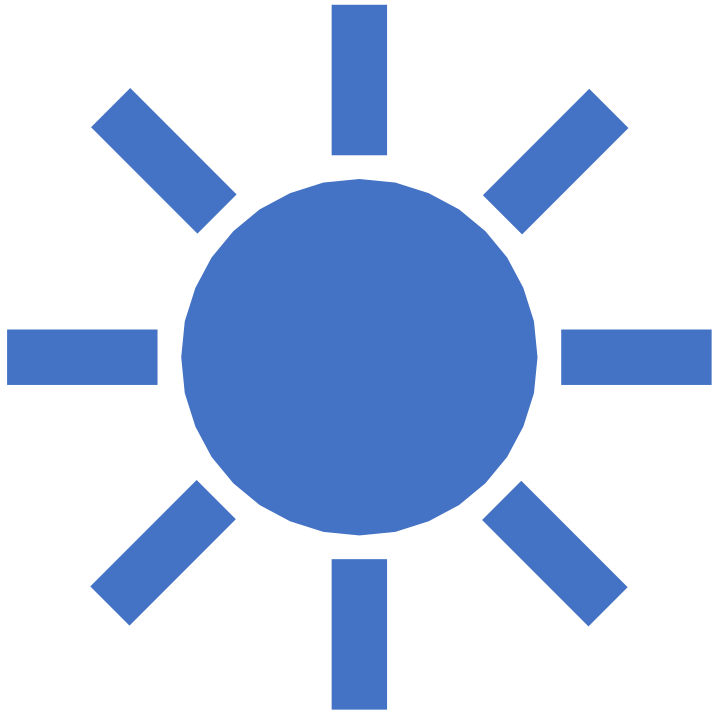
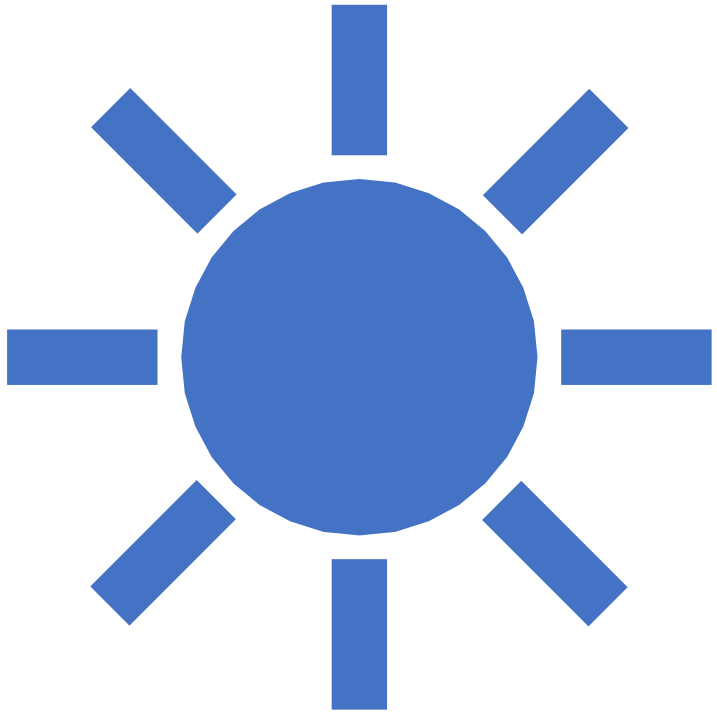


The SI Unit of Energy

The SI unit of energy is the joule, which is the energy transferred to an object by the work of moving it a distance of 1 metre against a force of 1 newton



Forms of Energy

Common forms of energy include:

- The kinetic energy of a moving object,
- The potential energy stored by an object's position in a force field (gravitational, electric or magnetic)
- The elastic energy stored by stretching solid objects
- The chemical energy released when a fuel burns
- The radiant energy carried by light
- The thermal energy due to an object's temperature

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What is Renewable Energy?

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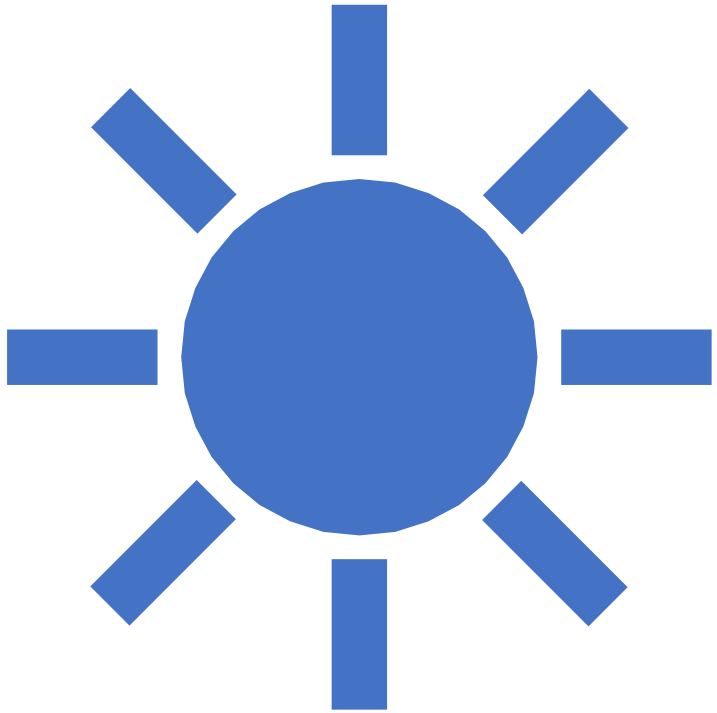

Renewable Energy

Renewable energy is energy generated from natural resources—such as sunlight, wind, rain, tides and geothermal heat. Renewable energy is energy that is generated from natural processes that are continuously replenished.

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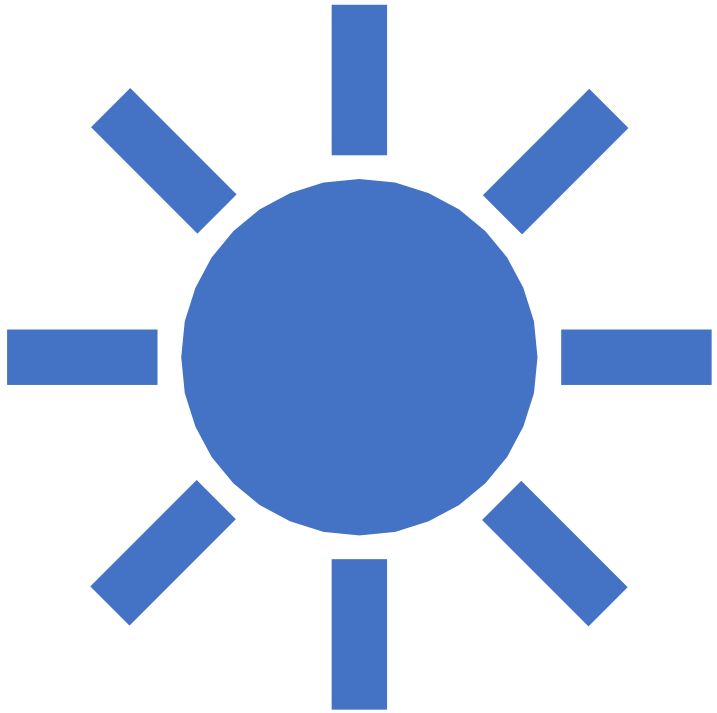
RENEWABLE RESOURCES

Solar Energy

Water

Wind



Non Renewable Energy

Non-renewable energy comes from sources that will run out or will not be replenished in our lifetimes—or even in many, many lifetimes. Most non-renewable energy sources are fossil fuels: coal, petroleum, and natural gas.

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Non renewable sources of energy

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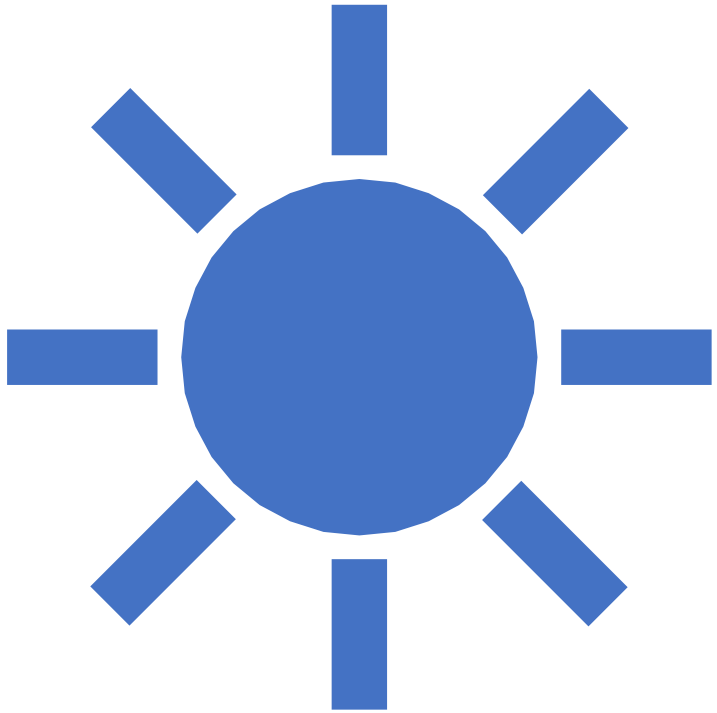
Non renewable resources

Fossil fuels

Natural gas

Coal

Most fossil fuels, such as oil, natural gas and coal are considered non renewable resources in that their use is not sustainable because their formation takes billions of years.



Characteristics of Renewable Energy

- They are capable of regeneration.
- They are renewed along with exploitation and hence, always available for use.
- The regeneration of these sources involves some ecological processes on a time scale.
- The renewable sources become nonrenewable if used at a greater rate than the environment's capacity to replenish them.
- These resources comprise materials like food, timber, raw materials for clothing's, leather etc. These also include oxygen, fresh water solar energy and biomass.

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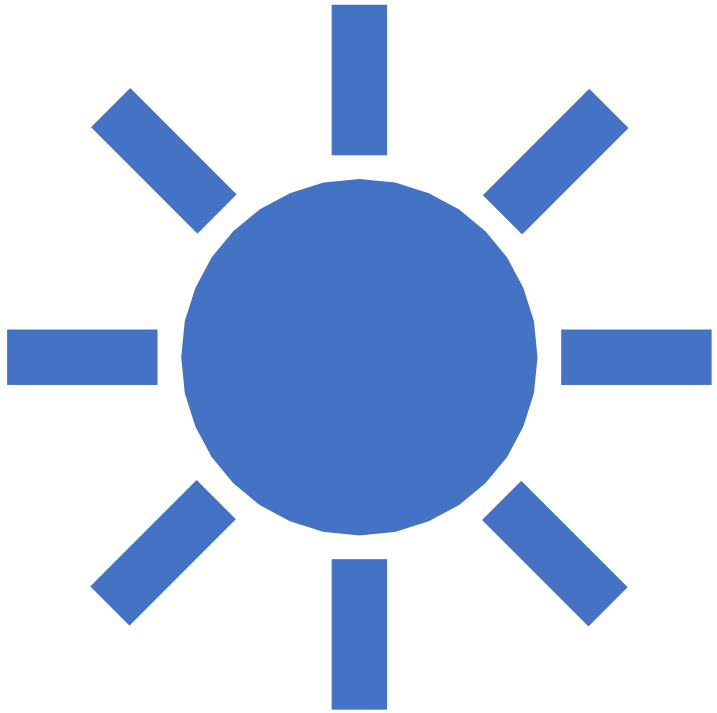

Types of Renewable Energy

The five major Renewable energy resources are:

- Solar
- Wind
- Water (hydro)
- Biomass
- Geothermal

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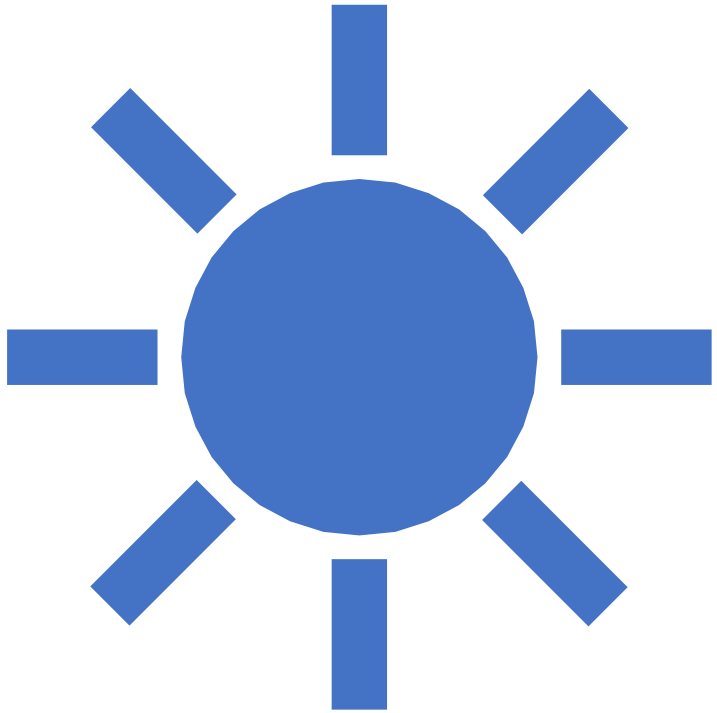

Uses of Renewable Energy

- Solar Energy for Heat

Solar energy is a versatile and renewable source of energy. At its core, every source of energy, even fossil fuels, were originally powered by seemingly omnipresent solar energy. In the home, solar energy can be used to warm water for bathing or cleaning in the same way that solar bags are used among camping enthusiasts. They are filled with water and placed in the sun to warm, then attached to a solar shower and used as the source for shower water

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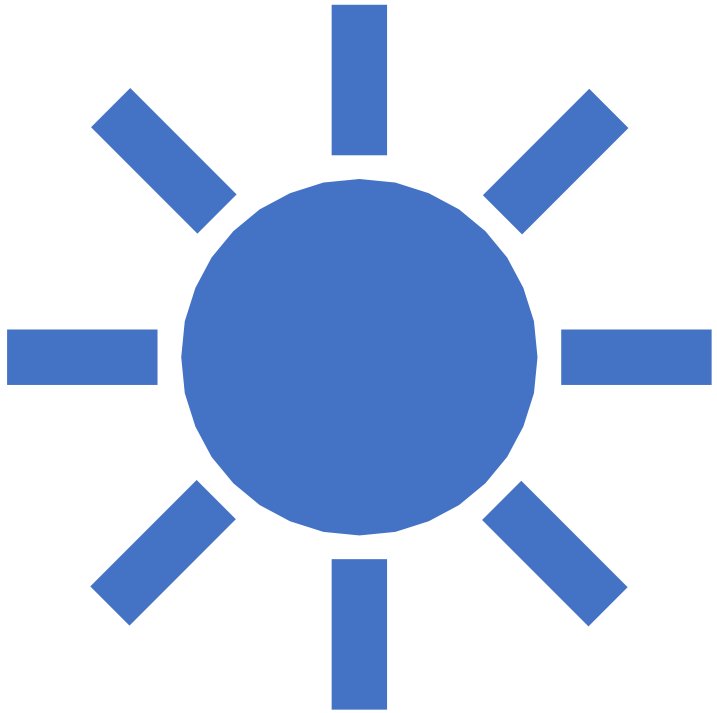

Uses of Renewable Energy

Solar Panels

- Solar panels can be used to collect solar energy and turn it into electricity, and more and more they are used in homes. When used as a major power source, solar panels are often quite large and may be mounted on the roof of a home. The solar energy collected is converted to electricity and can be used and stored, as with purchased electricity. Solar panels can also be used to charge batteries and perform smaller electric tasks as well.

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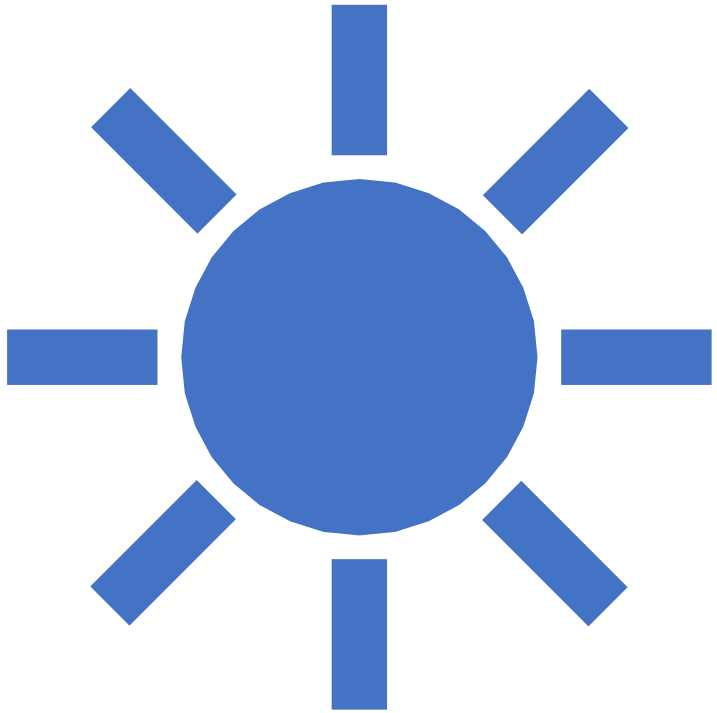
Uses of Renewable Energy



Water

- Water can also be used to gather electricity by hydroelectric power plants, which harness the flow of runoff water in rivers, streams and lakes. According to **"The Citizen-Powered Energy Handbook,"** by Greg Pahl, there is great potential to use hydroelectric power in urban areas, where there is a constant flow of water through municipal pipes.
- Water, though its volume on the Earth is finite, is considered to be a renewable resource, because conservation efforts in local areas can alleviate a water shortage.

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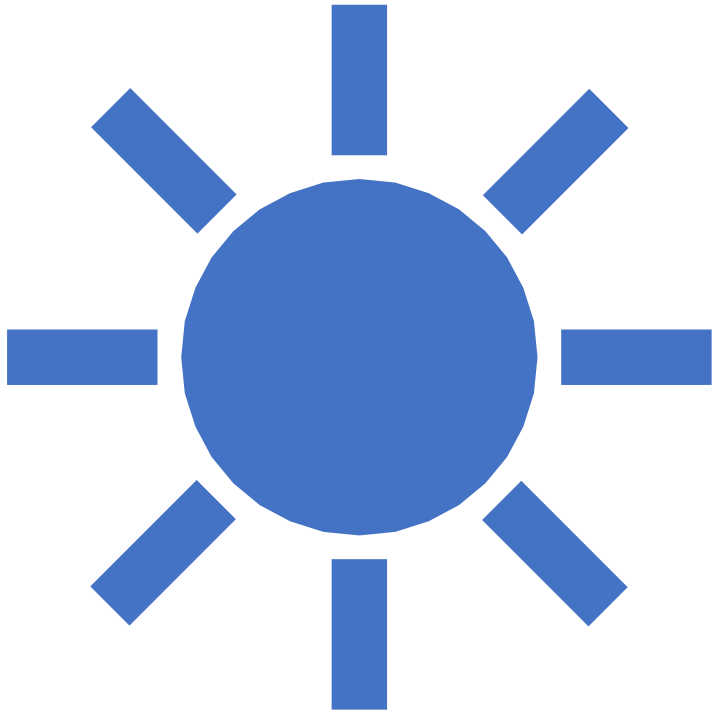

Uses of Renewable Energy

Wind

- A windmill is typically attached to a generator that is powered by its rotation: When the wind blows, its force turns the windmill. Wind energy was first used not to produce electricity, but to perform repetitive mechanical tasks, such as pump water from wells or to grind grain. Today, windmills can be used for a variety of situations, including when a small amount of power is needed. They can be used most places, as they can be made any size.

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Introduction to Solar Energy

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What is Solar Energy?

Solar energy is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaics, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis.

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Advantages of Solar Energy

- Solar power is pollution free and causes no greenhouse gases to be emitted after installation
- Reduced dependence on foreign oil and fossil fuels
- Renewable clean power that is available every day of the year, even cloudy days produce some power
- Return on investment unlike paying for utility bills
- Virtually no maintenance as solar panels last over 30 years
- Creates jobs by employing solar panel manufacturers, solar installers, etc. and in turn helps the economy

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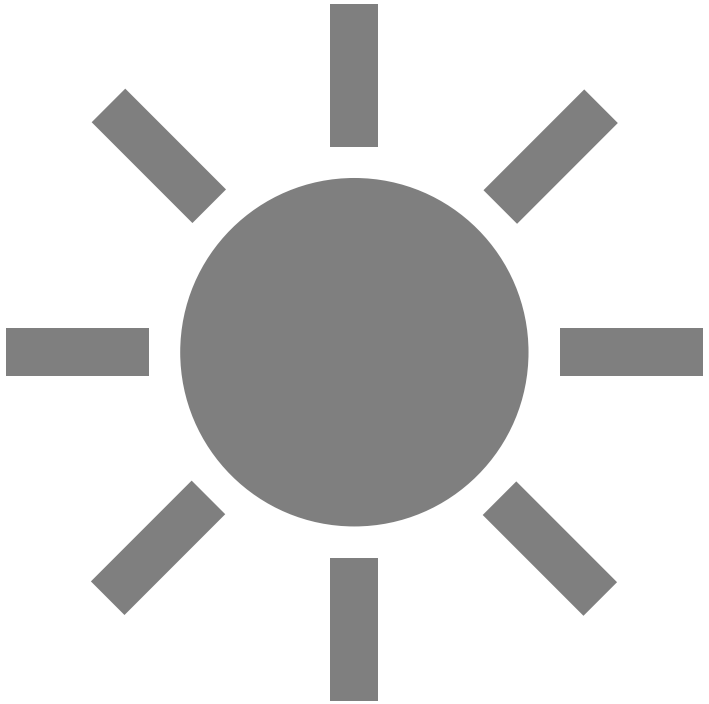
Advantages of Solar Energy *continued*

- Ability to live grid free if all power generated provides enough for the home / building
- Can be installed virtually anywhere; in a field to on a building
- Use batteries to store extra power for use at night
- Solar can be used to heat water, power homes and building, even power cars
- Safer than traditional electric current
- Efficiency is always improving so the same size solar that is available today will become more efficient tomorrow
- Aesthetics are improving making the solar more versatile compared to older models



Disadvantages of Solar Energy

- High initial costs for material and installation and long ROI
- Needs lots of space as efficiency is not 100% yet
- No solar power at night so there is a need for a large battery bank
- Devices that run on DC power directly are more expensive
- Depending on geographical location the size of the solar panels vary for the same power generation

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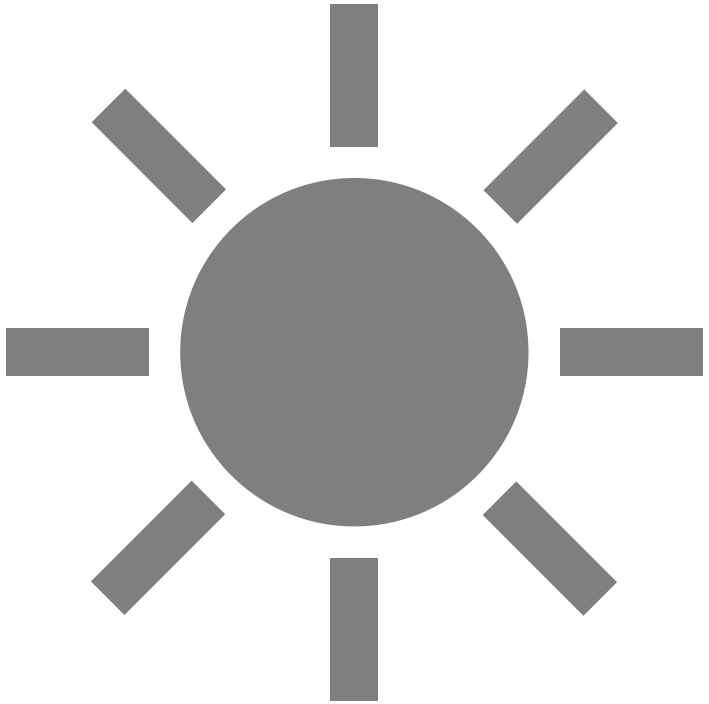

Disadvantages of Solar Energy *continued*

- Cloudy days do not produce much energy
- Solar panels are not being massed produced due to lack of material and technology to lower the cost enough to be more affordable
- Solar powered cars do not have the same speeds and power as typical gas powered cars
- Lower production in the winter months

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Photovoltaics

- **Photovoltaics** (**PV**) is the conversion of light into electricity using semiconducting materials that exhibit the photovoltaic effect, a phenomenon studied in physics, photochemistry, and electrochemistry.
- A photovoltaic system employs Solar panels, each comprising a number of solar cells, which generate electrical power. PV installations may be ground-mounted, rooftop mounted or wall mounted. The mount may be fixed, or use a solar tracker to follow the sun across the sky.

Photovoltaic System (PV System)

- A photovoltaic system, or solar PV system is a power system designed to supply usable solar power by means of photovoltaics
- PV systems range from small, roof-top mounted or building-integrated systems with capacities from a few to several tens of kilowatts, to large utility-scale power stations of hundreds of megawatts. Nowadays, most PV systems are grid-connected, while stand-alone systems only account for a small portion of the market.

Components of a PV System

- Solar panels to absorb and directly convert sunlight into electricity
- A solar Inverter to change the electric current from DC to AC
- Charge Controller for regulating flow of electricity
- Batteries for storing electricity
- Well as mounting, cabling and other electrical accessories.

Solar Panel

- Solar panels (also known as "PV panels") are used to convert light from the sun, which is composed of particles of energy called "photons", into electricity that can be used to power electrical loads.
- Solar panels can be used for a wide variety of applications including remote power systems for cabins, telecommunications equipment, remote sensing, and of course for the production of electricity by residential and commercial solar electric systems.

Solar Inverter

- A solar inverter is one of the most important elements of the solar electric power system. It converts the variable direct current (DC) output of a photovoltaic (PV) solar panel into alternating 240V current (AC). This AC electricity then can be fed into your home to operate your appliances.
- New hybrid inverters include an integrated battery management system.
- Long lasting solar power systems require a high quality inverter with a robust convection cooling system.

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Charge Controller

- A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries.
- It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk.
- It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life.

Battery

- A battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smartphones, and electric cars.

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SOLAR CELL

- A solar cell, or photovoltaic cell, is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon

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TYPES OF SOLAR CELL

There are two Main types:

- Monocrystalline: Main Characteristic is that their edges are trimmed. They also have the highest efficiency rates since they are made out of high grade silicon. But they are also the most expensive
- Polycrystalline: Main characteristic is that their edges are not trimmed and they are fully rectangular

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Thank You

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