

Ways to Generate Electricity:

Please watch the following videos and fill in the notes below. To help you, you may want to put on the closed captioning and pause the video often to get all the answers.

Electricity:

<https://www.youtube.com/watch?v=ATEWuk-prck&t=102s>

Electricity is the physical flow of electrons and is referred to as an _____
_____.

The three main ways that electricity is created are:

1. _____ conversion:
 - The most _____ type of electricity generation
 - Where electricity is created by moving an electric conductor, like _____, inside a magnetic field.
 - Example: Generator connected to a turbine.
2. _____ Reaction:
 - Example: _____ or Fuel Cell
3. Solid _____ Conversion:
 - Uses the _____ properties of a solid
 - Different molecules when packed closely together will create an _____ when stimulated.
 - Example: Solar PV Cell

Electricity is the _____ regardless of how it is produced.

The rate at which electricity is produced is called a _____.

_____ : A quantity of energy used over a certain period of time. It is the measure you would see on your _____.

When electricity is produced it must be used _____.

We do not have the technology to store large amounts of electricity. We must balance electricity _____ with _____. We must make sure everyone get the electricity they need without creating excess electricity which would be inefficient.

Depending on the source for the electricity, there can be negative environmental impacts, such as:

- _____, which can cause negative health impacts
- _____ gases, CO2
 - o Globally, _____ of energy related carbon dioxide emissions are from electrical generation

Renewable energy sources, such as _____ or _____ power, create zero direct carbon emissions, but create electricity on an intermittent or inconsistent basis.

Hydrocarbon resources (fossil fuels), like _____ and _____, although carbon intensive are the most convenient sources used to generate base load power to meet minimum consumer demand at any given time.

Hydroelectricity

<https://www.youtube.com/watch?v=q8HmRLCgDAI>

Hydroelectricity: Refers to the conversion of energy from _____ to electricity.

It is considered a renewable energy source because the _____ is constantly renewed by the sun.

One of the first uses of hydro energy was from mechanical milling such as _____.

Modern hydropower plants produce electricity using _____ and _____.

The mechanical energy of moving water spins _____ on a turbine. This turbine is connected to an electromagnetic generator which creates electricity when the turbine spins.

Two main types of Hydroelectricity production:

1. _____
 - A dam is a large _____ constructed to raise the level of water and control its _____.
 - It uses the force of _____ to turn the turbine when the flow of water is released.
 - Pumped storage hydro is when a dam has a lower _____ which can be pumped back to the higher _____ to be released when energy is in higher demand.

2. _____ of River
 - Relies on _____ rates of rivers, diverting a portion of the water through turbines.
 - It is more intermittent because it is subject to _____.

Sizes of Hydro Power Plants:

1. Large Hydro: > _____ MW
2. Small Hydro: _____ KW to _____ MW
3. Micro Hydro: < _____ KW

The Hoover dam in the US is _____ MW. It is enough to serve _____ people.

Of all renewable energy sources, hydropower holds the largest share of worldwide electricity production.

The Benefits of Hydropower are:

- _____ competitive
- _____
- _____, it pairs well with other sources of energy
- Dammed reservoirs can also help with _____
- Reliable _____

Concerns with Hydropower:

- Damming a river has a major impact on the local _____
 - o Changing wildlife habitats

- Blocking _____ passage
- Forcing people in riverside communities to move
- Dam failures can be catastrophic
- They are not completely free of carbon emissions. Particularly due to the large quantities of _____ used during construction. Plant matter in the flooded areas makes _____, another greenhouse gas, as it decays under water.

Nuclear Energy:

https://www.youtube.com/watch?v=44ovdxOvP_A

Energy held in the _____ of an atom

Can be obtained by two types of reactions: _____ and _____.

Fission: Produces energy from the _____ of atoms, which releases _____, which can be harnessed to produce electricity. The most common fuel used for fission is _____, however other elements such as _____ and _____ can be used.

_____ of today's operating nuclear plants use nuclear fission to generate electricity.

Fusion: The same process that powers our _____. Fusion is a nuclear reaction in which atomic nuclei collide at a high speed and join to form a new type of atomic nucleus. Some of the matter is converted to _____ which produces energy. Fusion power offers the prospect of an almost inexhaustible source of energy. Nuclear fusion has not been successfully demonstrated on a commercial scale.

Nuclear power plants account for _____% of global electricity generation.

Nuclear energy through fission can produce _____ times more energy per atom than fossil fuels.

Nuclear plants have _____ power generating capacity and _____ operating costs.

Nuclear energy does not emit _____ emissions.

Nuclear power holds a wide variety of environmental and health issues:

The largest concern is the generation of _____: uranium mill tailings, spent reactor fuel, and other radioactive wastes. Some of materials can remain radioactive and hazardous to human health and the environment for thousands of years. Nuclear accidents make nuclear power controversial.

Fossil Fuels:

<https://www.youtube.com/watch?v=zaXBVYr9Ij0>

Fossil fuels are a group of energy sources that were formed from ancient _____ and _____ during the _____ Period, approximately _____ to _____ million years ago.

At that time, the world was covered in _____. Organisms would die and sink to the bottom of swamps and oceans and over millions of years started _____ under layers of sand, clay, and other minerals. Different types of fossil fuels were formed depending on the combination of _____ matter, _____, _____ and _____ conditions while decomposing.

Three Major types of fossil fuels

1. _____
 - Formed from ferns, plants and trees which _____ due to pressure and heat
2. _____
 - Formed from small organisms like zooplankton and _____
3. _____
 - Formed from the same process as _____, only it was exposed to more heat and pressure

Fossil fuels are sought after energy sources because they have a _____ energy _____.

They have a variety of applications from _____ production to _____ fuels.

They can also be used to make a variety of common products from _____ to _____ to even some _____.

Fossil fuels are considered _____ resources because they take millions of years to form which means once they are used the resources will not be replenished in a _____ lifetime.

Companies have been forced to develop _____ for extracting more challenging or unconventional reserves.

This means additional _____, environmental concerns and higher _____.

Fossil fuels are the largest emitters of carbon dioxide, a _____ which causes _____.

Wind Power

<https://www.youtube.com/watch?v=Z5c50-hcD0>

Wind is moving air cause by _____ in _____ pressure.

Wind speeds vary based on _____, _____, and _____. Because of this there are some locations better suited for wind energy than others.

Energy is derived from wind by converting the air's motion into _____ energy.

The mechanism used to convert air motion into electricity is a _____.

A turbine is usually made of _____ blades. These blades are connected to an electromagnetic generator that generates electricity when the wind causes the blades to _____.

A major advantage of wind is that the production of electricity has no direct _____.

The wind does not blow all the time, causing _____ issues for power grids. The _____ for wind power has generally been higher than conventional electricity generation.

NIMBY means _____

Concerns for NIMBY are _____ use, _____, and _____ disruption.

Solar PV:

<https://www.youtube.com/watch?v=gI5tY5Noacc>

Solar _____ cells is a technology that converts the sun's energy into _____ electricity by using _____. When the sun hits the semiconductor in the PV cell, _____ are freed and form an electric current.

There are various semiconductor materials, the most mainstream being crystalline _____.

Solar PV can only use _____ sunlight, which means when the sun doesn't shine, electricity isn't produced.

One of Solar PV's advantages is that it transitions electricity generation from big _____ facilities to smaller decentralized production sites like the _____ of your _____.

This turns energy consumers into _____, people that produce and consumer their own electricity.

Solar PV utilizes the most _____ renewable resource on earth, the _____.

There is _____ times more solar energy coming to the earth's surface than our global annual fossil fuel demand.

Traditional concerns about solar PV were about _____, intermittency, and _____.

Now concerns are around _____ compatibility, lack of solar industry _____, and the use of _____ and _____ metals that make up the cells.