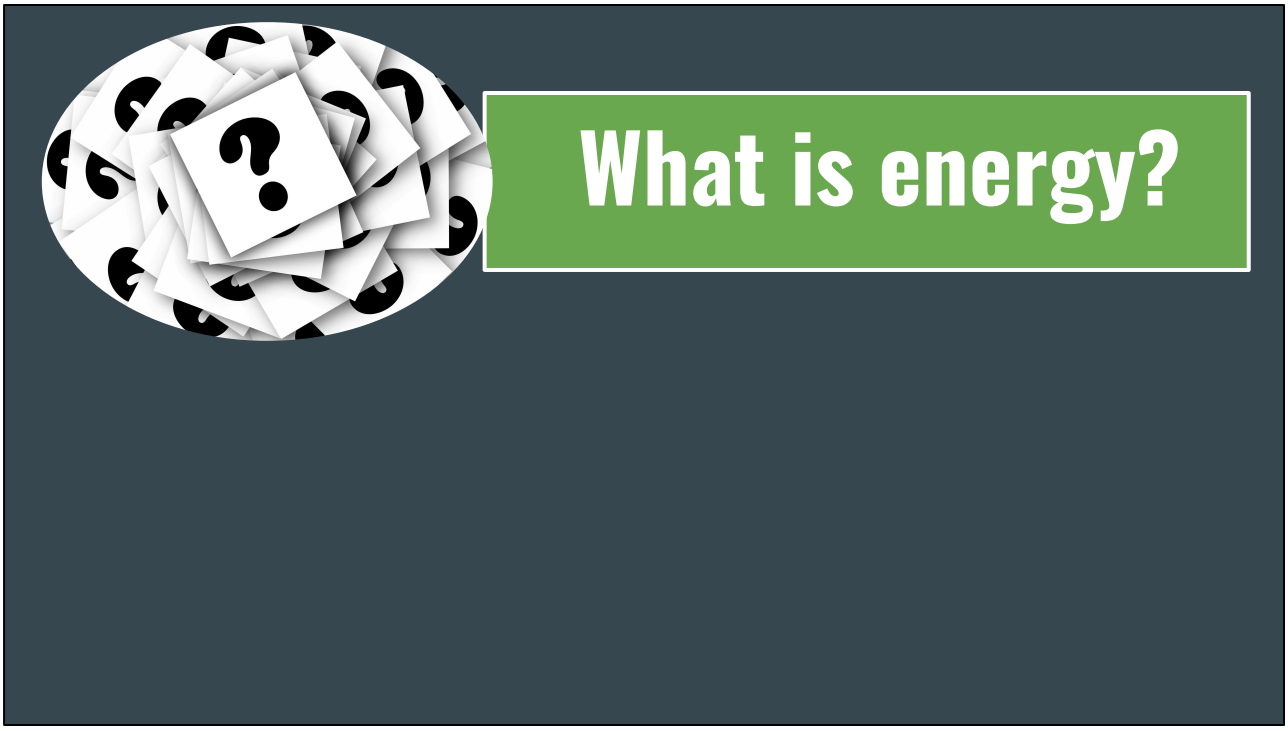
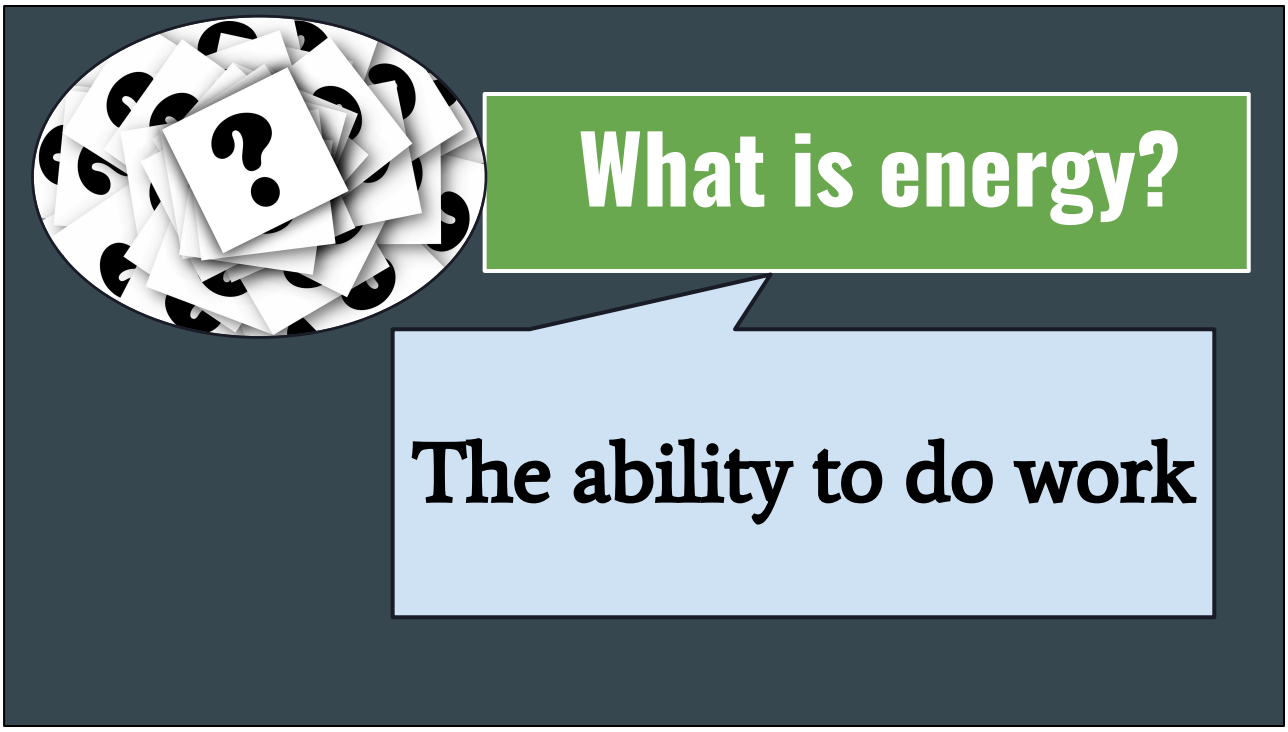
A Brief History of Bioenergy

OSU EXTENSION
4-H YOUTH DEVELOPMENT

Cornfield: Image by Albrecht Fietz from Pixabay



Question Mark: Image by Gerd Altmann from Pixabay



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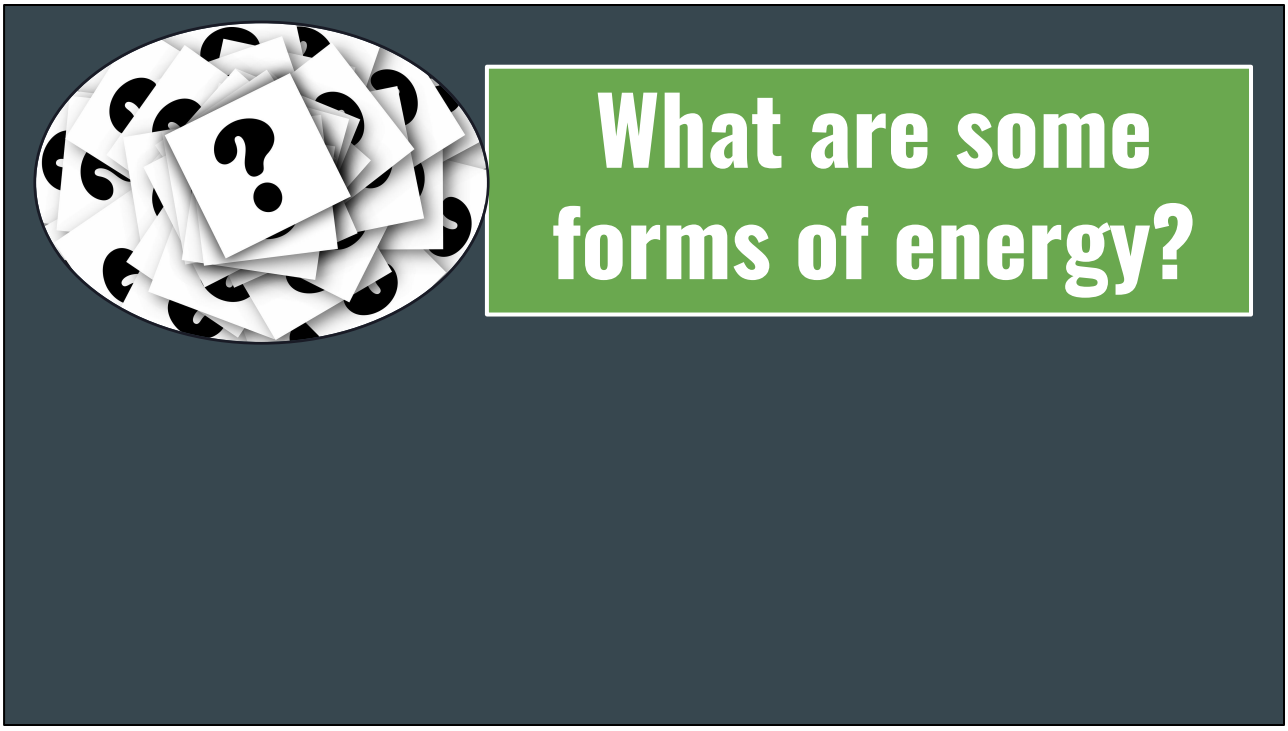


Question Mark: Image by Gerd Altmann from Pixabay

What are some forms of energy?

Heat

Light

Motion

Electrical

Gravitational

Chemical

Question Mark: Image by Gerd Altmann from Pixabay

Sources of Energy...

Non-Renewable

Energy sources that cannot be easily replenished.

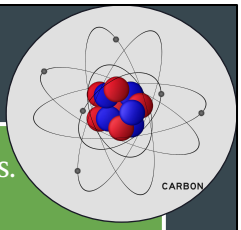
Fossil Fuels, Nuclear

Renewable

Energy sources that can be easily replenished.

Wind, Solar, Hydropower, Biomass, Geothermal

The Importance of Carbon...



Many sources of energy are considered carbon resources.
Carbon is one of humans' favorite sources of energy...
Carbon easily forms bonds with other elements, and these covalent bonds store large amounts of energy, when burned this energy is released.

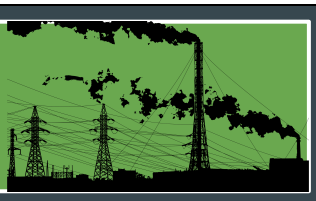
Living things are made up of large amounts of carbon.

Which energy sources, either renewable or nonrenewable, are formed from living things?

Energy sources formed from living things… fossil fuels (natural gas, coal, petroleum) and biomass. The difference is that fossil fuels were formed from living things that lived long ago, whereas biomass is from recently living things.

Carbon Image: Image by burlesonmatthew from Pixabay
Key: Image by OpenClipart-Vectors from Pixabay
Question Mark: Image by kropekk_pl from Pixabay

Sources of Energy for Electricity...

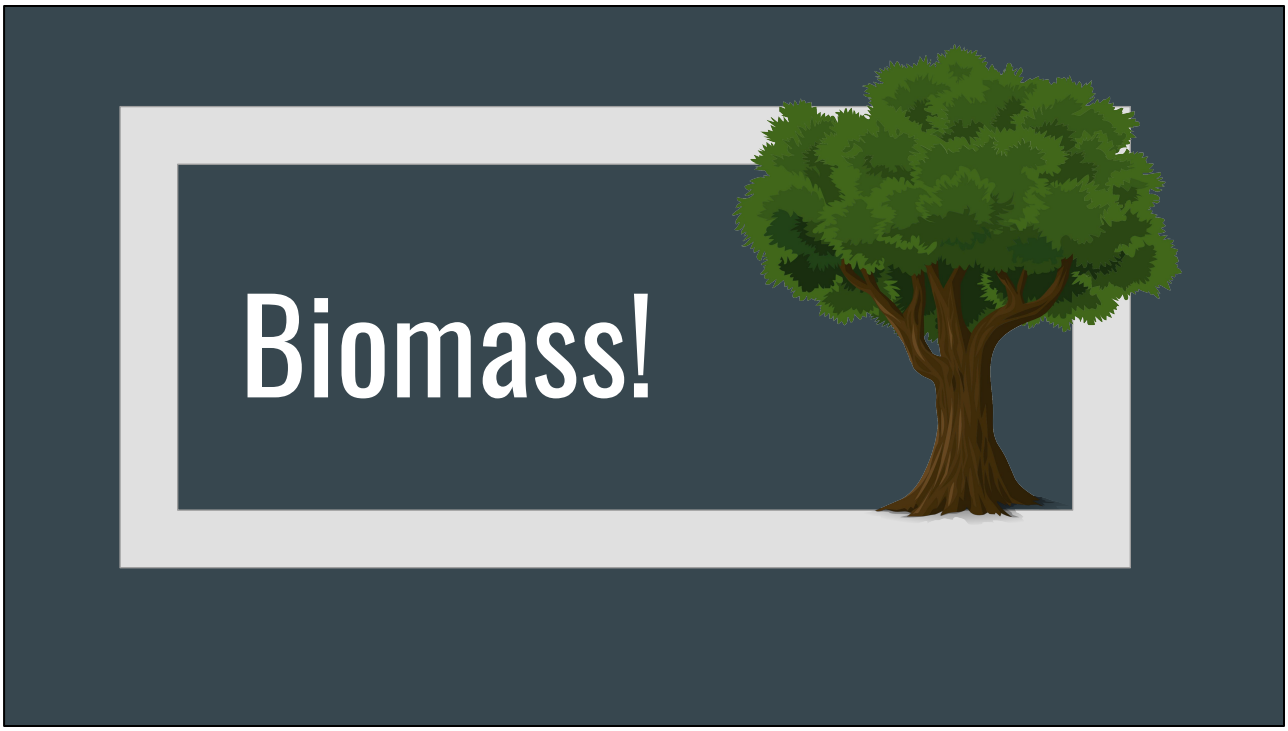


In the U.S. the primary sources of energy used for electricity production are:

- Natural Gas (38%)
- Coal (22%)
- Nuclear (19%)
- Renewables (20%)
  - Renewable sources include: wind, solar, hydropower, biomass, and geothermal.
- Petroleum (1%)

61% percent of the energy sources used for electricity production are fossil fuels (a natural fuel, such as coal or gas, formed in the geologic past from the remains of living organisms).
Fossil fuels are made of large amounts of carbon.
There is one other carbon source used for electricity production that is not a fossil fuel…

Electrical Image: Image by Gordon Johnson from Pixabay



Tree Image: Image by OpenClipart-Vectors from Pixabay

Bioenergy is a form of renewable energy that comes from recently living organic materials- known as biomass.

The prefix BIO means LIFE.

What are some examples of biomass that are used for energy?

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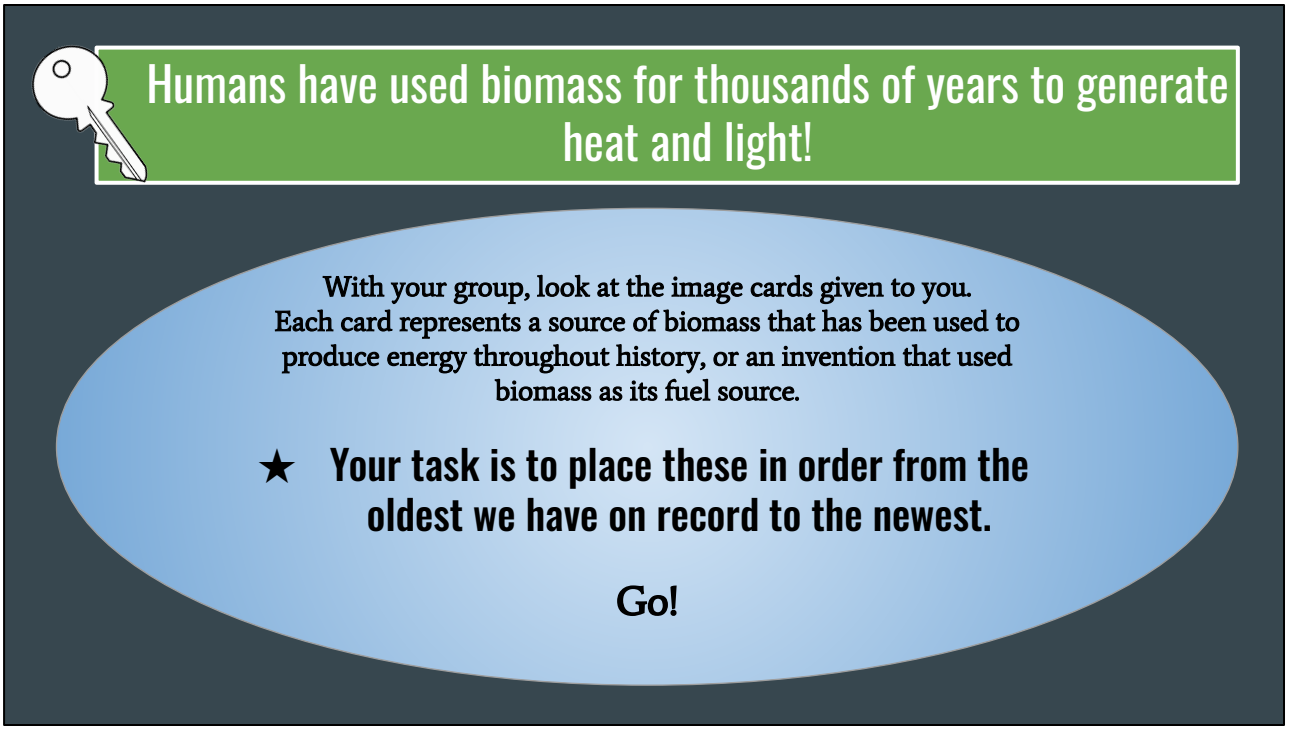

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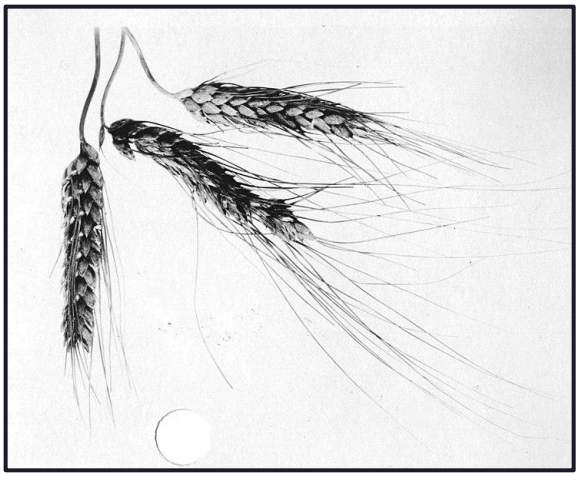
Forest Residue

Humans have used wood or other forest residue (dried leaves, etc) to produce fire (heat and light) for over 100,000 years!

Campfire Image by Hamza Ait Omlacho from Pixabay

Grains/Crops

Sugary crops and grains have been used to produce ethanol, through distillation, since the 1100's. Ethanol can be burned and was used in candles and for cook stoves. It is still used today for heat, light, and fuel purposes.

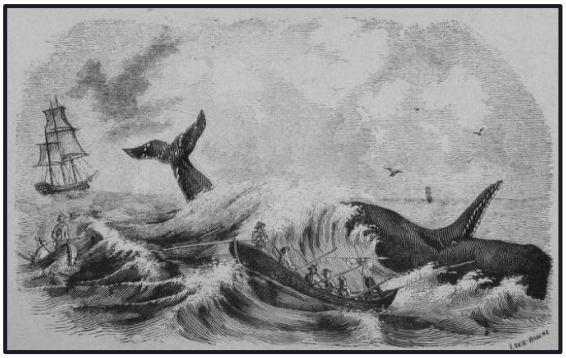


https://commons.wikimedia.org/wiki/File:Wheat_MET_25-3-152.jpg

Vegetable/Animal Oils

Since the 1200's, different types of fish oils have been recorded as used being for heat and light. In the 1700's whaling became popular and whale oil served as one of the most popular sources of bioenergy until the 1830's when cleaner burning alternatives were introduced.

In Ancient Greece, olive oil and other vegetable oils were also used as heat and light sources.



Whaling:https://commons.wikimedia.org/wiki/File:Charles_Nordhoff,_Whaling_and_fishing,_1856.JPG

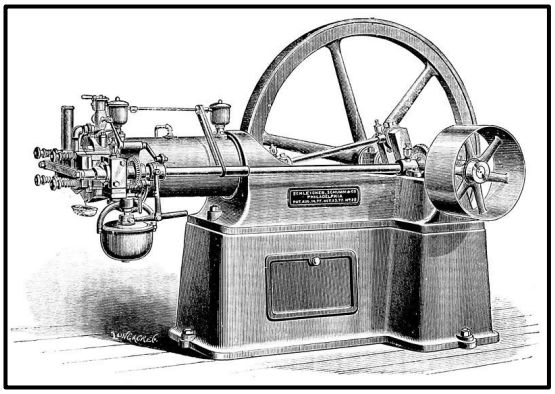
Pine Sap

Pine sap, also known as “Naval Stores” was a major industry in the U.S. from the 1700’s to the 1960’s. Pine sap was used in the shipping industry, but it was also used to produce turpentine (through distillation) that was a major source of lamp oil.

Turpentine Old: https://www.loc.gov/pictures/item/2017748998/

The Internal Combustion Engine

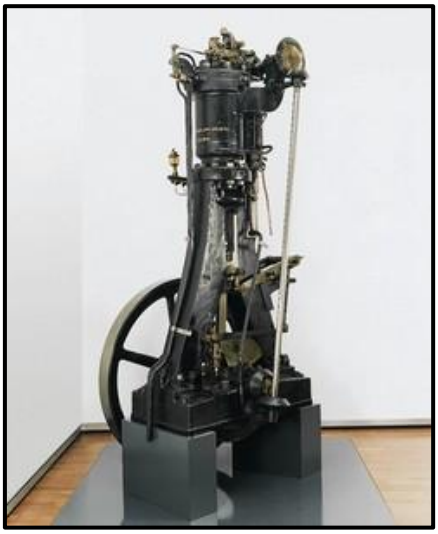
In 1826, Samuel Moray released an internal combustion engine that ran on ethanol and turpentine (made through distillation of resin- pine sap).



Internal Combustion Engine: https://commons.wikimedia.org/wiki/File:PSM_V18_D500_An_american_internal_combustion_otto_engine.jpg

The Diesel Engine

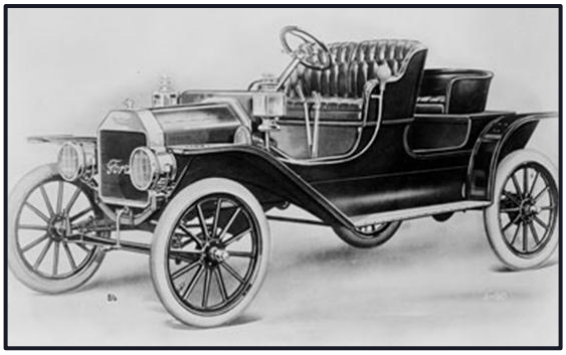
Rudloff Diesel released a prototype of a diesel engine in the 1890's, by 1900 they were running on peanut oil!
Diesel engines are a type of internal combustion engine and are still used today.



Diesel Engine: https://commons.wikimedia.org/wiki/File:First_Diesel.jpg

The Model T

In 1908, Henry Ford released a vehicle that could run on ethanol.



Model T: https://commons.wikimedia.org/wiki/File:Ford_Model_T_fra_1908.jpg

Algae

Algae is a more newly recognized source of bioenergy. In the 1980's, a federally funded program began to research its use in producing oil for fuels. Due to its quick growth, ability to grow in otherwise uninhabitable places for biomass, and its ability to absorb carbon, research is still being conducted today to make algae a more sustainable bioenergy source.

Algae/Seaweed: Image by Akerraren Adarrak from Pixabay

As society has changed, the sources of biomass we use, and how we utilize them for bioenergy, have evolved.

Bioenergy serves a very important role in transportation, the production of heat and electricity, and the creation of bioproducts (such as plastics) that we all use today.

Key: Image by OpenClipart-Vectors from Pixabay
Car: Image by OpenClipart-Vectors from Pixabay